GR

ORIGINAL SUBMISSION

000001

REC'D DEC 28 2006

REC'D 8 2006

DEC 28 2006

Palsgaard®

PALSGAARD A/S
DK-7130 Juelsminde . Denmark

Phone: +45 7682 7682
Fax: +45 7682 7683
E-mail: Direct@palsgaard.dk

CVR/VAT Reg. No: 26447038
Giro: 2 01 35 09
Bank: Danske Bank
Swift: DABADKKK
Export CVR No: DK 120447320

Robert L. Martin, Ph.D.
Office of Food Additive Safety (HFS-200)
Center for Food Safety and Applied Nutrition
Food And Drug Administration
5100 Paint Branch Parkway
College Park, MD 20740-3835
United States of America

21.12.2006 -

Re: GRAS Notification for Ammonium Phosphatide. (Ammonium Salts of Phosphatidic Acid). Exemption Claim.

Dear Mr. Martin,

Attached you'll find the GRAS Notification for Ammonium Phosphatide in triplicate.

In case you need additional information, please feel free to contact either my colleague Mr Viggo Norn (vn@palsgaard.dk) or myself at hhw@palsgaard.dk

Best regards

PALSGAARD A/S

Hanns-Henrik Wikman.
Technical Sales Manager

000002

Palsgaard®

REC'D DEC 28 2006

Gras Notification for Ammonium Phosphatide

1) Letter to Office Food Additive Safety, Food And Drug Administration

2) Ammonium phosphatide ,Chemistry, Properties, Manufacturing Process, Application in Food

3) International Evaluations of Ammonium Phosphatide as Food Additive

4) List of National Permissions

5) Summary of Toxicology Studies on the Ammonium Phosphatide

6) Toxicology Studies

7) Evaluation on the Safe Intake of Ammonium Phosphatide in the United States of America

8) Analytical Methods in Relation to Ammonium Phosphatide

9) Analysis of Ammonium Phosphatide in Chocolate Product

10) Codex Standard for Chocolate, Codex Stan 87-1981

1

Palsgaard®

PALSGAARD A/S
DK-7130 Juelsminde . Denmark

Phone: +45 7682 7682
Fax: +45 7682 7683
E-mail: Direct@palsgaard.dk

CVR/VAT Reg. No: 26447038
Giro: 2 01 35 09
Bank: Danske Bank
Swift: DABADKKK
Export CVR No: DK 120447320

Robert L. Martin, Ph.D.
Office of Food Additive Safety (HFS-200)
Center for Food Safety and Applied Nutrition
Food And Drug Administration
5100 Paint Branch Parkway
College Park, MD 20740-3835

19.12.2006 -

Re: GRAS Notification for Ammonium Phosphatide. (Ammonium Salts of Phosphatidic Acid). Exemption Claim.

Dear Mr. Martin,

Under the GRAS Notification Program, Palsgaard A/S hereby claims that Ammonium Phosphatide is Generally Recognized as Safe ("GRAS") for use as an emulsifier for chocolate and vegetable fat coatings as defined in CFR 21 § 163.
Therefore the emulsifier is exempted from the statutory premarket approval requirements of the Federal Food Drug and Cosmetic Act.
Ammonium Phosphatide is authorized for use in the European Union under the E-number E 442, and is listed by the Joint FAO/WHO Expert Committee on Food Additives ("JECFA") in the Combined Compendium of Food Additive Specifications. (Codex specification INS number 442).

(i) The name and address of the notifier.

Palsgaard A/S
Palsgaardvej 10
7130 Juelsminde
Denmark

(ii) The common or usual name of the substance.

The common name of the emulsifier is Ammonium Phosphatide.

(iii) The applicable conditions of use.

Ammonium Phosphatide is to be used by the food industry as an emulsifier mainly in chocolate and vegetable fat coatings. This emulsifier has the ability to lower the plastic viscosity in chocolate and coatings when added at amounts up to 0.7 %. Hereby the candy manufacturer is able to control the flow properties of the liquid mass during production. Ammonium Phosphatide has unique properties as it continues to lower the viscosity at increased dosages without raising the yield value of the liquid chocolate mass. The typical dosages of Ammonium Phosphatide is in the range 0.4 – 0.6 % to achieve the desired effect and in accordance with Good Manufacturing Practice.

(iv) Basis for the GRAS determination.

The GRAS determination is based on a scientific evaluation of the published toxicological studies on Ammonium Phosphatide combined with an evaluation of the consumption pattern of chocolate and vegetable fat coatings in the US.
The independent organisation DTC (Danish Toxicological Centre) has evaluated the comprehensive scientific literature available on Ammonium Phosphatide and concluded that the emulsifier is safe to use within the evaluation by JECFA establishing the accepted daily intake (ADI value) to 0-30mg per kg body weight per day.

The statistical data on consumption of chocolate and vegetable fat coatings by the US population compared with the established ADI value on Ammonium Phosphatide clearly support the safety of the use of Ammonium Phosphatide at a maximum rate of 0.7 % in chocolate and vegetable fat coatings.

Under CFR Title 21 § 184.1521 the emulsifier Monosodium phosphate derivatives of mono- and diglycerides is affirmed as GRAS. Ammonium Phosphatide is very similar to this substance in composition and is manufactured under the same chemical conditions. The only difference lies in the final process step where Ammonia is used as neutralizing agent instead of sodium carbonate.

(v) Available data and information.

Supporting documentation in triplicate is enclosed with this letter. Further data and information that are the basis for this GRAS determination and notification are available to the Food and Drug Administration for review and copying upon request.

Best regards

PALSGAARD A/S

Viggo Norn
R&D Director.

2

Palsgaard®

Ammonium phosphatide

Chemistry, Properties, Manufacturing Process, Application in Food

Viggo Creemers Norn

1.nov. 2007

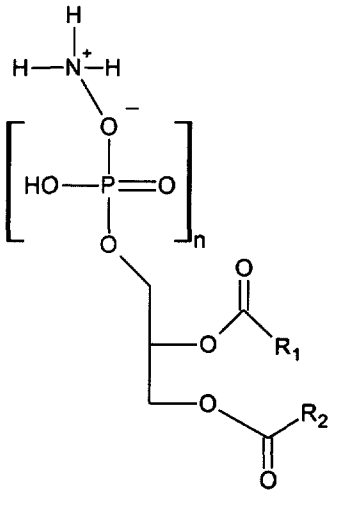
Introduction

An ammonium phosphatide is a food emulsifier in the form of ammonia neutralized phosphoric esters of mono- and diglycerides. The emulsifier is therefore a mixture of ammonium salts of various phosphatides. The original development of ammonium phosphatide goes back more than 50 years and was carried out by the British chocolate manufacturer Cadbury. The target of the work was to find an alternative to soy lecithin and avoid the problems of off-lavours connected with lecithin. Primarily ammonium phosphatide has been closely connected with the production of chocolate and even today its use is limited and only legalized for application in chocolate. Within the EU as well as the FAO/WHO the ammonium phosphatides are listed together with analytical parameters under the reference number E 422, and European legislation allows up to 1% addition of ammonium phosphatide to chocolate product.

Ammonium phosphatides consist of a mixture of phosphatidic acids compounds where the fatty acid composition is dependent on the source of vegetable fats or oil used. Another parameter for the final ammonium phosphatide is the relation between mono- and diglyceride, this relation will also be reflected in the final composition of the emulsifier. The mono- and diglycerides used for the ammonium phosphatide also include some triglycerides, which will normally be present in the commercial ammonium phosphatides as neutral oil or fat. The emulsifier appears as a yellowish to light brown semi solid material with a melting point in the range of 20 to 50 °C or in case of lower melting point as an oil. The ammonium phosphatides are characterized by a bland smell and taste and the mouthfeel is smooth like oil or fat.

Ammonium phosphatides can be identified with synonyms : Ammonium salts of phosphatidic acid, emulsifier YN, mixed ammonium salts of phosphorylated glycerides.

The general chemical structure of ammonium phosphatide is shown below



where R_1 and R_2 represent saturated or unsaturated hydrocarbon chain origin from fatty acids. and n is an integer typically n = 1 or 2.

Closely related to ammoniumphosphatides is the sodium phosphatides a food emulsifier with Gras 184.1521 accepted for use in various foods.

The ammonium phosphatides meet the specifications

phosphor content	3.0 –3.4%
ammonium calc. as nitrogen	1.2 – 1.5%
arsenic	max 3 mg/kg
heavy metals as Pb	max 10 mg/kg

Physical and chemical properties of ammonium phosphatides.

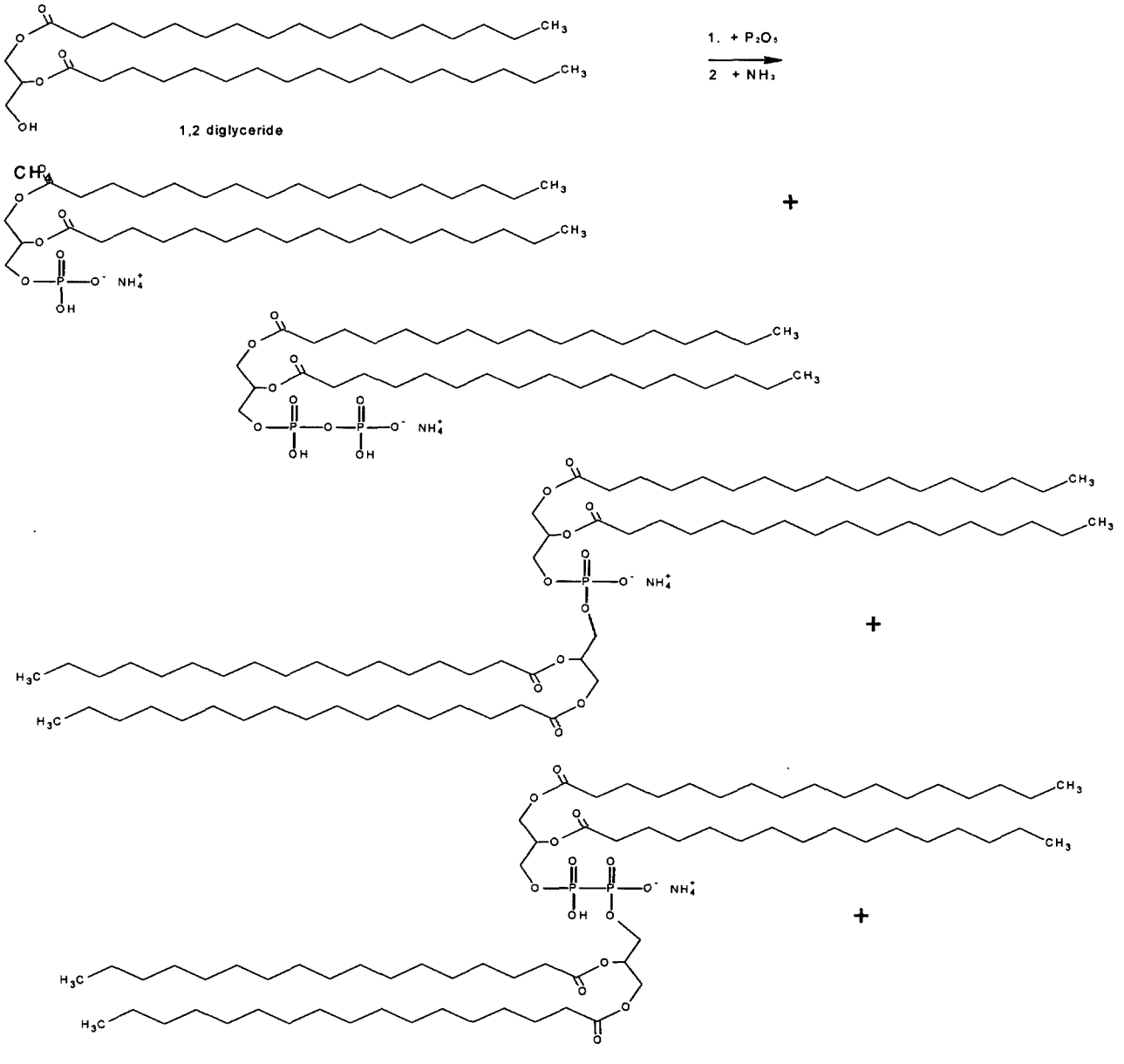
The physical appearance of the ammonium phosphatides depends on the source of fatty acid, thus fully hardened fatty acids as palmitic and stearic acids result in an emulsifier with a melting point above 50 °C, while unsaturated acids yield soft or liquid ammonium phosphatides with melting points below 40 °C. The ammonium phosphatides are found to be stable emulsifiers and for an ammonium phosphatide in melted form the properties have been monitored as the ability to reduce viscosity of chocolate which is unchanged even after 6 months storage at 60 °C. The emulsifier is soluble in fats and oils above the melting point and can be dissolved in several nonpolar organic solvents. The ammonium phosphatides are only slightly dispersable in water and in the literature no work has been reported concerning the relationship between the emulsifier and water. A preliminary examination of an ammonium phosphatide emulsifier, consisting of approximately 60% phosphatides and 40% triglycerides, when mixed with water, forms a stable dispersion of spherical bodies and when the dispersion was examined under a microscope in polarized light no bifringence was observed indicating mesomorphic phases were not present. The same kind of observation is reported for lecithin with triglycerides present and it is plausible that ammonium phosphatides, to certain extent, will act with water like lecithin. In two phase systems like rape seed oil and water a small addition of ammonium phosphatides is found to reduce the surface tension, thus 0.2% ammonium phosphatide will decrease the tension approximately 50% i.e. 10 dyn/cm.

Production of ammonium phosphatides

The process diagram is shown below

From the above it is clear that an ammonium phosphatide is a mixture of several substances originating from the starting material which consists of two principal glycerides i.e. monoglyceride and diglyceride, and both of those exist in two positional isomeric forms, which allow phosphorylation of the 1 or 2 position of the glycerol backbone. In addition the phosphorylation will result in monophosphate esters as well as diesters.

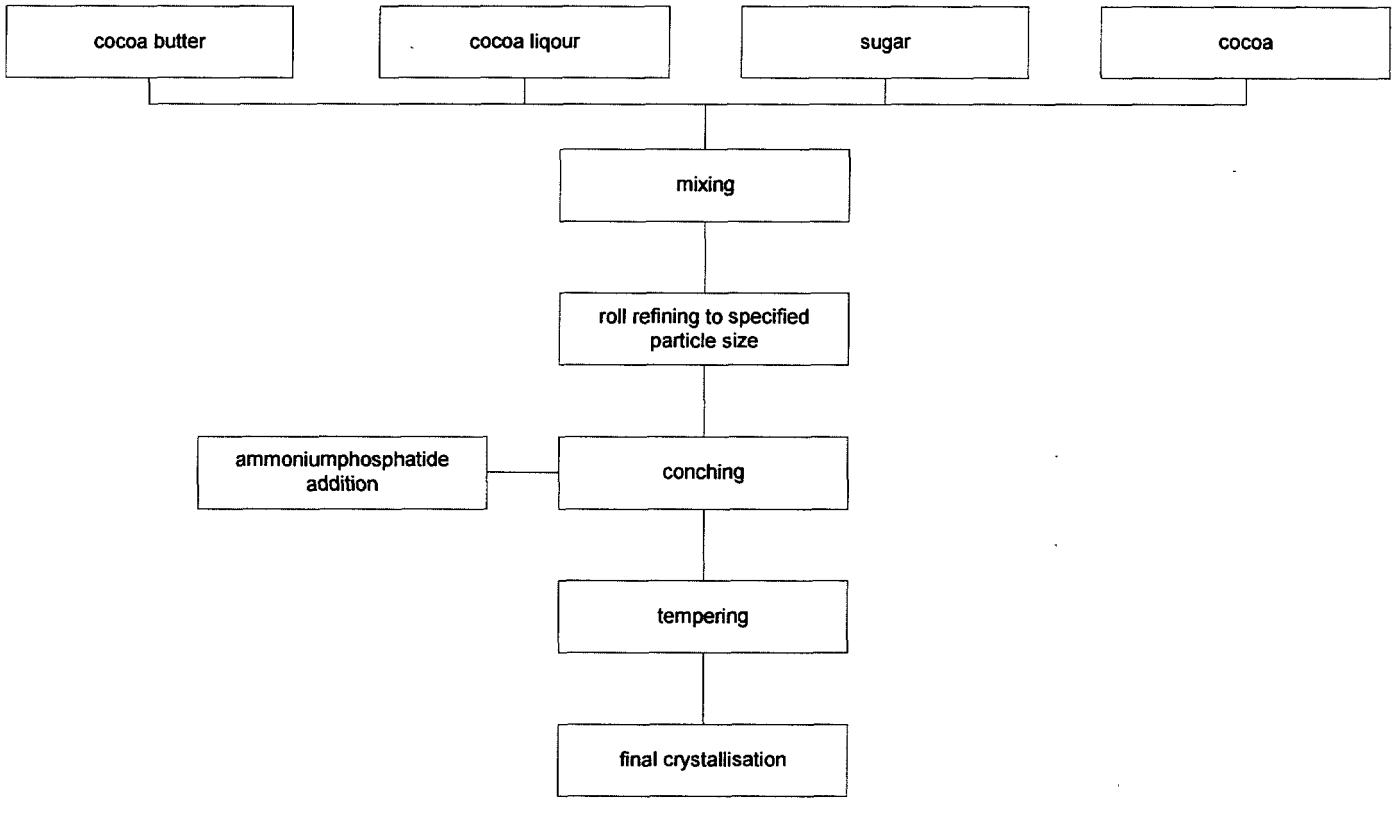
It is reported that chromatographic separation of some of the major fractions from the phosphatides before neutralization with ammonia yields six major fractions which have been identified identified. Five are diglyceride esters of phosphoric acid, in some cases the compounds are identified as double ester between diglycerides or diglyceride and monoglyceride. Only one is assigned the diester between monoglyceride structures. In addition to the orthophosphate esters comes diphosphate esters and again this type is identified as a diphosphate esterified with one or two diglyceride moieties. Some of the compounds isolated from phosphatidic acid are shown below.



Food applications of ammonium phosphatides.

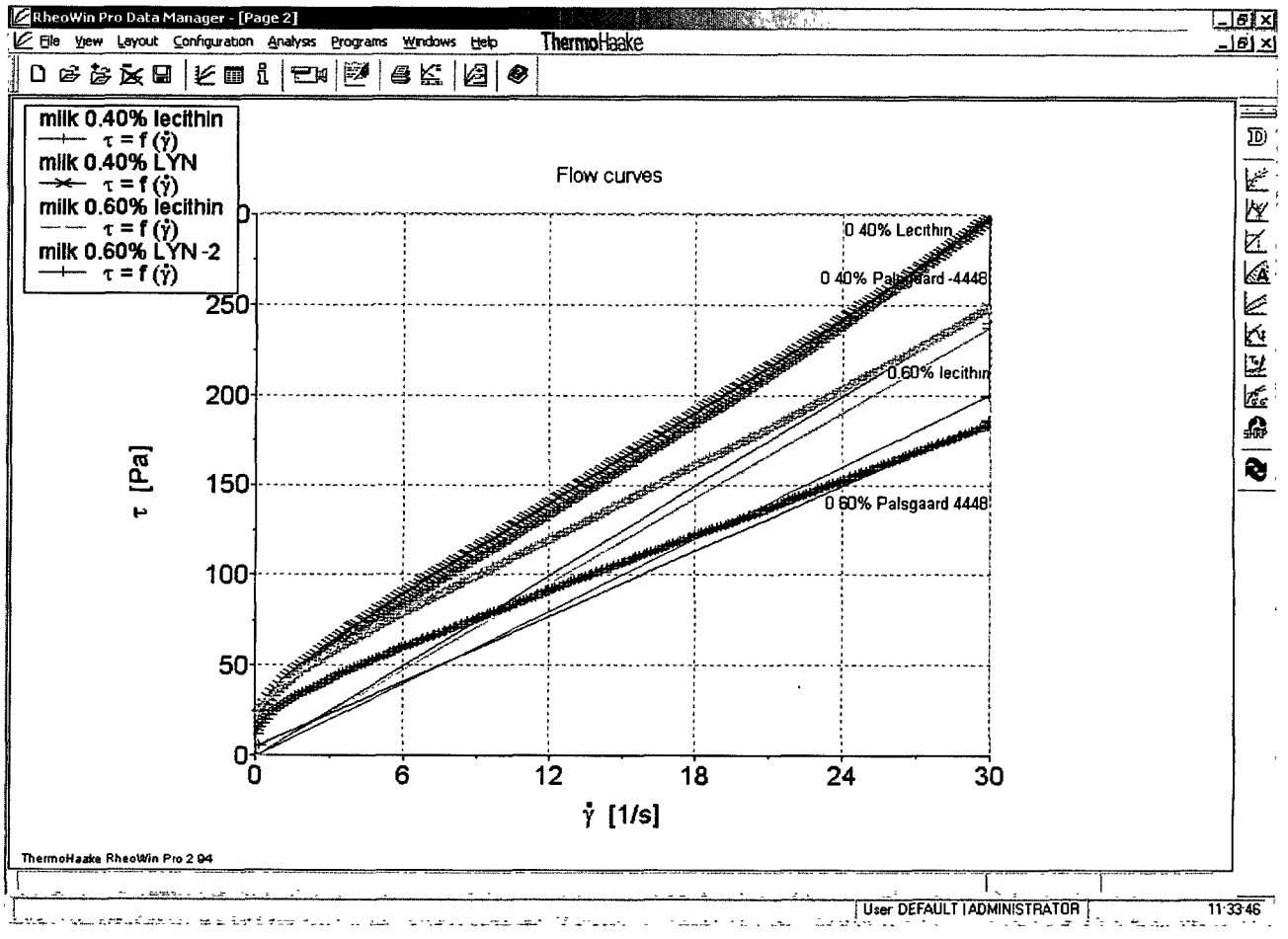
The idea behind the development of ammonium phosphatides was to obtain an alternative to soyabean lecithin for use in chocolate products, an application where the properties of the lecithin reduce the viscosity of chocolate in the melted form. The functionality of the ammonium phosphatides is like that of lecithin in reducing the viscosity controlling the rheology of chocolate systems, thus the addition to chocolate will reduce the plastic viscosity making a reduction of cocoa butter possible and making the chocolate easy to handle in operations like moulding and coating.

Chocolate and compound are multiphase systems where the continuous phase is triglycerides i.e. cocoa fat, in which solid materials, in form of finely grained sugar and cocoa, are dispersed. Chocolate is mostly produced in processes like the one shown in figure below. The first step is a mixing of all the major ingredients such as cocoa liquor, cocoa and sugar, to a crumble mass with a fat content in the range of 25% to 40%. The succeeding step is to get the right particle size of the solids.This refining is often done on roll refiners which grind the solids to the specified particle size i.e. for good qualities of chocolate maximum 35 µm. During the refining agglomerates of solids will also be rubbed out and the triglycerides will be better distributed due to the forces exerted on the chocolate. It means the cocoa butter will cover the surface of the solid particles to a higher extent and a better lubrication of the system is obtained. The resulting chocolate mix



BEST ORIGINAL COPY

is moved to the conching step, where the raw chocolate is mixed in heavy duty mixers, under controlled temperature, for several hours (4-72hours) depending on type and quality of the final chocolate. During the conching step moisture is reduced and in addition, undesirable volatiles, which impact the flavour of the chocolate, are removed. At the same time the mixing will help to break any agglomerates and attain the optimal wetting of the solid particles with triglycerides i.e. improve the lubrication of the chocolate. During the conching the dispersion will change from a rather dry appearance to a viscous fluid. To get a product which can be handled and of uniform quality from batch to batch ammonium phosphatides are added to the chocolate at the start of the conching and a second addition takes place toward the end, the last one being done to get the final adjustment of the fluid properties of the melted chocolate. The emulsifier will reduce the viscosity of the chocolate dramatically (see below), which will help attain the optimal coating of the solid particles with cocoa butter. The reduction of the viscosity will also result in a chocolate with flow properties allowing degasification and to fill out moulds without any defects or to secure good covering properties. The fluid dynamics of chocolate are an important and complex issue as chocolate is a dispersion with a very high content of solids and in molten form does not act as a simple Newtonian liquid, but exhibits a plastic flow which can be fitted to the Casson model. The effect of ammonium phosphatides on the viscosity of chocolate is shown in figure below, where the rheograms of a 30%(fat)



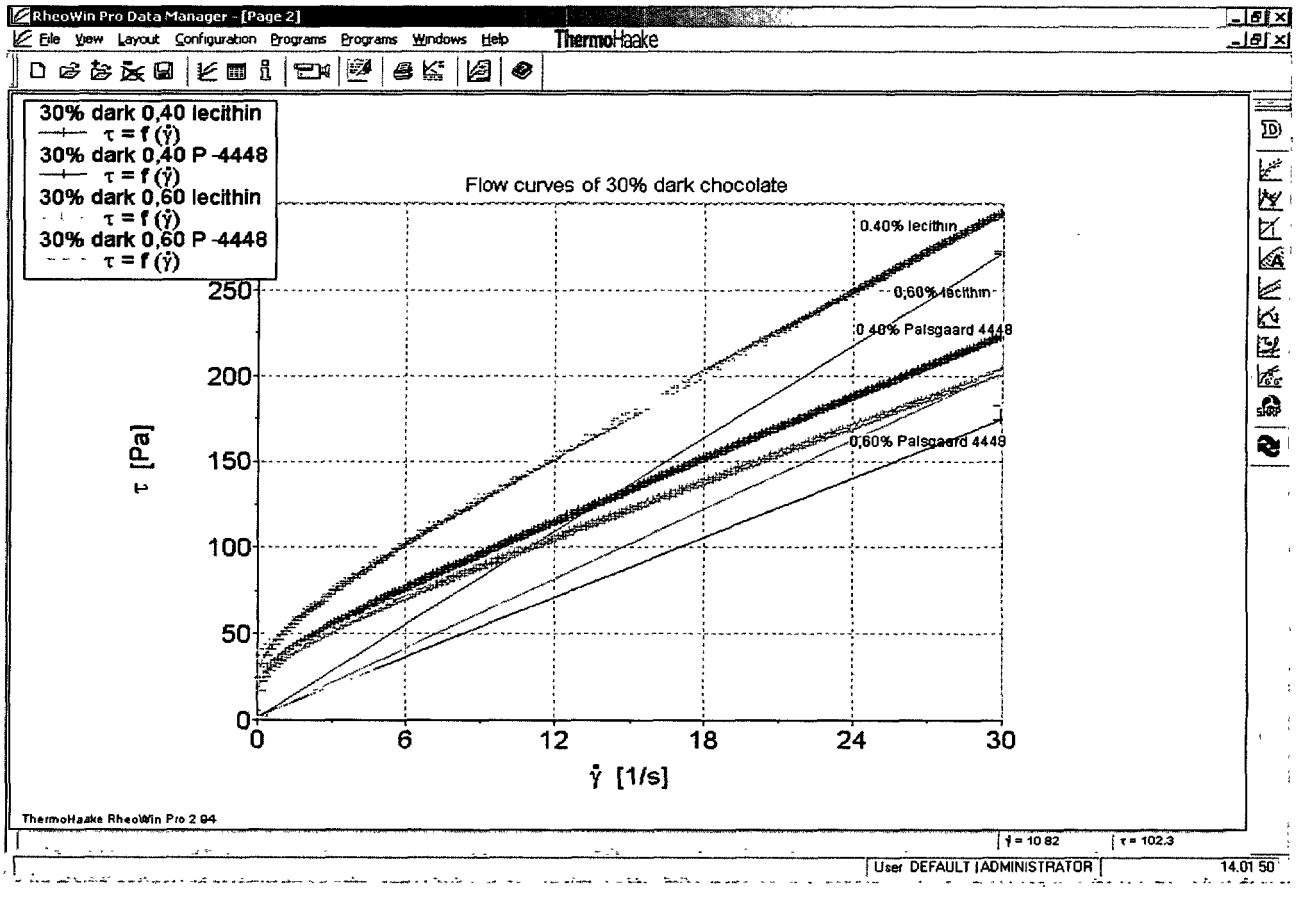
e

BEST ORIGINAL COPY

milk chocolate, where respectively 0.4% and 0.6% ammonium phosphatide (Palsgaard 4448) added, are recorded in the form of the shear stress versus the shear rates. The figure also the data for 0.4% and 0.6% additions of lecithin as references. In the 0.4% addition of emulsifier to the chocolate it is observed that the flow curves of ammonium phosphatide and lecithin added chocolates are nearly identical. In the case of the 0.6% addition the picture changes, here the ammonium phosphatide provides a further significant reduction of the viscosity and a comparison with the 0.6% lecithin curve shows the effect from the emulsifier is much more pronounced. At the same time the ammonium phosphatide also results in a significant lower Casson yield value c.f. table below an important parameter for chocolate when it comes to filling the moulds or when the product is used for coating.

	plastic viscosity	Casson yield value
milk chocolate added 0.40% lecitin	14.92 Pa	6.824 Pas
milk chocolate 0.40% Palsgaard 4448	15.75 Pa	6.398 Pas
milk chocolate 0,60% lecitin	17.59 Pa	4.956 Pas
milk chocolate 0.60% Palsgaard 4448	10.85 Pa	3.612 Pas

In the case of dark or bitter chocolates another picture, than the case of the milk chocolate, is observed. For lecithin it is observed that the increasing of the addition from 0.4% to 0.6% does not give any further reduction of the viscosity of the dark chocolate (see below). In the case of



ammonium phosphatide (Palsgaard 4448) an increase in the addition to the chocolate is found to decrease the viscosity but it is also found that the ammonium phosphatide in the dark chocolate is a much more efficient viscosity reducing agent in comparison to lecithin at both the 0.4% and 0.6% levels. Here the ammonium phosphatide curves are below the corresponding lines for lecithin. The table below shows the figures recorded for the plastic viscosities and the yield values and it is

	plastic viscosity	Casson yield value
dark chocolate added 0.4% lecithin	25.22 Pa	5.295 Pas
dark chocolate added 0.4% Palsgaard 4448	17,80 Pa	4.088 Pas
dark chocolate added 0.6% lecithin	28,37 Pa	4.803 Pas
dark chocolate added 0.6% Palsgaard 4448	18.02 Pa	3.553 Pas

observed that the extra addition of ammonium phosphatide has a positive effect in reducing both values while the extra addition of lecithin actually results in an increase of the plastic viscosity.

The exact mechanism behind the viscosity reduction effect of ammonium phosphatides is not known but it is likely that they act in the same manner as lecithin. The latter is thought to be associated to the hydrophilic surfaces of sugar and milk particles and it has been hypothesised that, due to moisture, sugar particles in the chocolate are aggregated through liquid bridges and the phopholipids will be absorbed on the moist carbohydrate surface forming a film and thus promote the de-agglomeration of the sugar particles.
Ammonium phosphatides differ with respect to this viscosity response when the emulsifier is added in higher concentrations. It is likely that the ammonium phosphatides, due to their less bulky ammonium groups, can pack more closely to the sugar surface and in this manner does not form multilayers at practical concentrations of the emulsifier. It is also possible that the ammonium moiety of the phosphatide, due to a stronger basicity, will exhibit a higher affinity to the carbohydrates than the corresponding nitrogen part of lecithin, and in this way the ammonium phosphatide will be absorbed to a higher degree on the sugar particles.

Often chocolate is used as a coating for different fillings and the latter will frequently be alcohol based in form of liqueur or brandy e.g. in filled pralines. With these types of products the industry faces the problem that the chocolate over time will absorb some of the water/alcohol and in serious cases the chocolate can be more or less dissolved. In both cases the products will be defective and of less appeal for the consumer and in the end unsaleable. In a study two dark chocolates were tested with an ethanol based filling, one chocolate had soy lecithin added as emulsifier and the other ammonium phosphatide (Palsgaard 4448) added as emulsifier. Two different alcohol solutions were tested; one with 8,5% ethanol in glucose syrup and a second with 8,5% ethanol in a sucrose solution. After seven days of storage in the alcohol syrups the absorptions were recorded as the gain in the weight of the moulded pieces of chocolate. The ammonium phosphatides were found to retard the absorption of the liqueur far better than the soy lecithin see table below

emulsifier	lecithin	ammoniumphosphatide Palsgaard 4448
moulded shape	key	key
% absorbed alcohol-glucose	182	98
% absorbed alcohol-sucrose	310	164

Summery of the benefits from using ammonium phosphatides as an alternative to soy bean lecithin.

Neutral taste. Ammonium phosphatides are very neutral/bland in taste and smell opposite soy bean lecithin which is well known to have a distinct flavour which develop further over time and thus limit the level of use.

Effiency. Ammonium phosphatides are in comparison with soy bean lecithin more efficient in reducing the plastic viscosities of chocolate, and in chocolate containing PGPR as emulsifier the ammonium phosphatides exhibit a synergism in reducing the viscosity and yield values.

Uniformity. Ammonium phosphatides exhibits an exellent uniformity from batch to batch, where soy bean lecithin is known to show significant variations.

Hygiejne and microbiological safety. Ammonium phosphatides are made from raw materials of high microbiological safety due to high processing temperatures, the same is the case in the process of the ammonium phosphatide which also are produced at high temperatures and in closed systems. In case of soy bean lecithin it is well know the compound due to the nature of raw the material as well as the low processing temperature are associated with a risk of pathogenic microbiological contamination, which is transferred to chocolate product as the latter in general are processed at low temperature too.

3

International Evaluations of Ammonium Phosphatide as Food Additive

Summary of Evaluation performed by FAO/WHO

18th Report of Joint FAO/WHO Expert Committee

Compendium of Food Additive Specifications , addendum 8, p 203-204

Toxicological Evaluation of Some Food Additives, Joint FAO/WHO Meeting June, 1974

Compendium of Food Additive Specifications , addendum 8, p 1-4

Specifications for Identity and Purity of Emulsifiers, 1978 FAO/WHO, p245-249

Compendium of Food Additive Specifications 52/1 JECFA, p 91-94

Combined Compendium of Food Additive Specifications, 2005 FAO

17th Report of Joint FAO/WHO Expert Committee, p 19 + 35-40

Toxicological Evaluation of Some Food Additives, Joint FAO/WHO Meeting June, 1973

Specifications for Identity and Purity of Food Additives, 13th Report 1969 FAO/WHO

Page 000019 has been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000020 - 000024 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000025 - 000027 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000028 - 000030 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000031 - 000034 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000035 - 000039 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000040 - 000045 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000036 - 000039 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000040 - 000045 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000046 - 000050 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000051 - 000056 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000057 - 000064 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000065 - 000067 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000068 - 000070 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000071 - 0000073 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000074 - 000078 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000079 - 000081 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

4

PALSGAARD® 4448

(Ammonium Phosphatide, E 442)

We presume that Ammonium Phosphatide has the following legal status:

PERMITTED TO USE:	NOT INCLUDED IN LEGISLATION
Argentina	Chile
Australia	Japan
Brazil	Pakistan
Bulgaria	South Korea
Canada	Singapore
China	Taiwan
EU	USA
Hong Kong	
India	
Indonesia	
Israel	
Malaysia	
Mexico	
New Zealand	
Norway	
Poland	
Romania	
Russia	
Switzerland	
Turkey	

Since the implementation of Directive 95/2/EC, Ammonium Phosphatide is legal to use in all the EU-member states.

PALSGAARD A/S

5

final
VN 5/9.01

Summary of toxicological studies on the ammonium phosphatide

content

Summary of toxicological studies

annex 1
Danish Toxicological Center

DTC
DANSK TOKSIKOLOGI CENTER

Summary of toxicological studies on ammonium phosphatide/emulsifier YN

Client:
Palsgaard
Nexus A/S

Prepared by:
Helle Buchardt Boyd
DTC

March 2001

000086

KOGLE ALLÉ 2, DK-2970 HØRSHOLM,
TEL: (+45) 4576 2055, FAX: (+45) 4576 2455
E-MAIL: DTC@DTC.DK, WWW.DTC.DK

Conclusion

Upon oral administration to rats, mice, guinea-pigs, and ferrets, Emulsifier YN is rapidly hydrolyzed in the intestine and absorbed. Non-hydrolyzed material absorbed is hydrolyzed in the liver. Of the phosphorous administered 40-87% is excreted by the feces, 4-18% by the urine, and 11-20% is retained in skeleton.

Single doses of emulsifier YN of at least 20 g/kg are tolerated by rats and mice, and rabbits tolerate at least 15 g/kg.

A no adverse effect level of at least 3g/kg/day was suggested in a 90 day and a 2 year feeding study in rats. In mice, a minimum no adverse effect level of 8.5 g/kg/day was suggested in an 80 week study.

A two-generation study on rats fed 6% emulsifier YN in their diet for 13 weeks before each mating showed no adverse effects.

All of the above mentioned studies are of older date (1967-1977). The results are, however, supported by a more recent (1994) teratology study carried out according to OECD guidelines. No teratogenic effects were noted at oral exposure up to ca. 4774 mg/kg/day on day 6-15.

All in all, a proposed no adverse effect level derived from data on animal exposure is 3 g/kg/day.

Summary of toxicological studies on ammonium phosphatide/emulsifier YN

Acute exposure

Colley and Gaunt (1967) reported that acute toxicity is low. No deaths were recorded within 10 days of administration as given in the table below:

Species	Body weight (g)	Route	Dose levels (g/kg)
Rat	5 males 135-170 5 females 110-130	oral	5,10 and 20*
		intraperitoneal	5 and 10
Mouse	5 males 25-35 5 females 15-25	oral	10 and 20*
		intraperitoneal	5 and 10
Rabbit	4 males and 4 females 1500-2500	oral	5,10 and 15
		intraperitoneal	5 and 10

* Dose divided into 2 of 10 g/kg given with a six-hour interval.

The dosing was done with 50% emulsifier YN in corn oil. There were no specific signs of toxicity, apart from lethargy and diarrhea during the first 24 hours.

Absorption, Distribution, Metabolism, Excretion

The metabolic fate of emulsifier YN in rats was studied by Feuer (1967). A single dose (60-300 mg/kg) of YH labeled with ^{32}P was administered by gavage or in the diet to 11 male and 10 female rats (Carworth SPF rats).

Up to 81.9, 85.3 and 87.1% of the label was excreted via feces within 1, 2 and 16 days respectively. Up to 3.9% of the dose was excreted in the urine at 24 h and up to 4.3% at 16 days.

Radioactivity was preferentially taken up in bone, liver and muscle, reaching levels at 24 h of 11.6, 2.4 and 2.1% of the dose respectively. These levels declined by day 16 to 6.8, 0.1 and 0.7%, respectively.

^{32}P was present in feces, probably as ^{32}P-YN, in urine as inorganic phosphate, in bone mainly as inorganic phosphate, in muscle as phosphate esters and in liver partly as phospholipids.

Incubation of ^{32}P-YN with simulated gastric juice, homogenate of intestinal mucosa, pancreatic lipase, trypsin or chymotrypsin resulted in the liberation of inorganic phosphate. Absorption of the so formed inorganic phosphate leads to phosphate incorporation into bone, phosphate esters, phospholipids and the remainder of the physiological pool of inorganic and organic phosphorus.

The metabolic fate of emulsifier YN was studied in three other species than the rat: the mouse, the guinea-pig, and the ferret (Philips et al., 1975). A single dose of YH labeled in the phosphatidic acid component with ^{32}P was administered.

In ferrets and guinea-pigs most of the label was excreted with the feces within 48 h, the ferrets clearing 60-70% in this time and the guinea-pigs between 40 and 60%. Urinary excretion of radioactivity followed a similar time course in both species. Between 5 and 10% of the dose of ^{32}P was excreted in the first 24 h, and thereafter the daily excretion fell to approximately 1% at day 3 and less than 0.5% by day 10. A total of between 9 and 18% was excreted with the urine. A considerable proportion of the dose was incorporated into the skeleton, between 15 and 20% remaining after 10 days.

The time course for both urinary and fecal excretion of ^{32}P is similar after inorganic ^{32}P and YN ^{32}P.

Autoradiography of mice bodies showed that a considerable quantity of radioactivity was absorbed rapidly after dosing, as indicated by its presence in skeletal tissue and liver after only 2 h. After 24 h the label was distributed over all the body tissue with particular concentration in bones and feces.

Both the liver and the intestinal mucosa of the three species contain enzymes capable of hydrolyzing the YN into lipid and inorganic phosphorus. However, in both rodent species the liver was less efficient than the intestinal mucosa, whereas the reverse was the case in the ferret.

Short-Term exposure

Gaunt et al. (1967) reported that short-term toxicity of emulsifier YN is low in rats. Groups of 15 male and 15 female weanling SPF rats of the Carworth Farm E strain were fed diets containing 0.0 (control), 0.75, 3.0, or 6.0% YN or 6.0% lecithin (for comparison) for 90 days. No adverse effects were recorded when examining hemoglobin content in blood, hematocrit value, total erythrocyte count, erythrocytes for Heinz bodies, and total and differential leucocyte counts. The osmotic fragility of erythrocytes of rats of the 6% YN or the 6% lecithin diet was comparable with that of the controls. No deaths or abnormalities of condition or behavior occurred throughout the 90 days. Body weights were not adversely affected. There were no abnormalities in terminal serum chemistry or renal function tests conducted at 6 or 13 weeks. No gross changes in organs were noted. Histological findings consisted of foci of round cell infiltration of the myocardium and storage fat in the liver parenchyma. A minimum no effect level of 6% in the diet of rats for 90 days (a level equivalent to 3g/kg/day) is suggested by this study.

Long-Term exposure

Gaunt et al. (1977) reported that long-term toxicity is low in mice. Groups of 50 male and 50 female mice were fed diets containing either 0 (control), 2 or 6% YN for 80 weeks. No significant adverse effects were noted when observing behavior, hematological parameters, weights, tumor incidence and organs macro- and microscopically. A minimum no adverse effect level of 6% in the diet of mice for 80 weeks (a level equivalent to 8.5 g/kg/day) is suggested by this study.

Brantom et al. (1973) reported that long-term toxicity was also low in rats. Groups of 48 male and 48 female SPF Wistar rats were fed diets containing 0 (control), 2 or 6% YN for 2 years. A similar group of rats was fed a diet containing 4% soy lecithin. These treatments did not adversely affect mortality, rate of body-weight gain, hematology, urine constituents, renal concentration ability, serum constituents or the incidence of tumors. Thyroid weight was increased in all treated groups, but this was the result of an increased incidence of parathyroid hyperplasia, thought to be due to spontaneous renal changes combined with an elevated intake of phosphate. A slightly increased incidence of myocardial fibrosis was also associated with the parathyroid hyperplasia. The incidence and severity of other histopathological changes were not influenced by feeding YN or lecithin. A minimum no adverse effect level of 6% in the diet of rats (a level equivalent of 3 g/kg/day) is suggested by this study.

Reproduction

In a two-generation study by Brantom et al. (1973) groups of 10 male and 30 female weanling Wistar rats (F_0-generation) were fed 0 (control) or 6% YN for 13 weeks, after which each group was divided into sub-groups of one male and three females and mated. Weanling off-spring was fed YN for 13 weeks, mated and so on until and including F_{1a}, F_{1b}, F_{2a}, and F_{2b} generations. There were no effects on fertility, the number of young or the growth of the young during lactation, and no abnormalities were seen.

Teratology study

Pregnant Sprague-Dawley rats were fed emulsifier YN in their diets on gestational day 6 through 15 at levels of 0 (control), 0.5, 2.5 or 5.0%, equivalent to mean intakes of 0, 480, 2381, and 4774 mg/kg/day, respectively. Body weights, along with food and water intake, were recorded daily from gestational day 0 to day 20, when the maternal reproductive system and offspring were examined. Fetuses were taken for either skeletal examination or internal examination. Emulsifier YN did not cause any adverse teratogenic or systemic effects in any of the dose levels. The study was carried out in accordance with guidelines based on OECD guidelines for testing of chemicals no. 414: "teratogenicity" with minor deviations, which did not affect the outcome of the study. Numbers of animals are summarized in the table below (Robbins, 1994):

	Number of females		Number of fetuses		
Group	Allocated to group	Pregnant	Total	With skeletal findings[a]	With visceral abnormalities[a]
Control	23	23	295	151/154	2/295
0.5%	25	22	303	152/155	3/303
2.5%	25	22	288	148/149	0/287
5.0%	24	23	294	151/153	2/294

[a] The figures shown are the numbers of affected fetuses/number of fetuses examined in each case

In conclusion, no teratogenic effects could be attributed to the exposure with emulsifier YN.

Conclusion

Upon oral administration to rats, mice, guinea-pigs, and ferrets, Emulsifier YN is rapidly hydrolyzed in the intestine and absorbed. Non-hydrolyzed material absorbed is hydrolyzed in the liver. Of the phosphorous administered 40-87% is excreted by the feces, 4-18% by the urine, and 11-20% is retained in skeleton.

Single doses of emulsifier YN of at least 20 g/kg are tolerated by rats and mice, and rabbits tolerate at least 15 g/kg.

A no adverse effect level of at least 3g/kg/day was suggested in a 90 day and a 2 year feeding study in rats. In mice, a minimum no adverse effect level of 8.5 g/kg/day was suggested in an 80 week study.

A two-generation study on rats fed 6% emulsifier YN in their diet for 13 weeks before each mating showed no adverse effects.

All of the above mentioned studies are of older date (1967-1977). The results are, however, supported by a more recent (1994) teratology study carried out according to OECD guidelines. No teratogenic effects were noted at oral exposure up to ca. 4774 mg/kg/day on day 6-15.

All in all, a proposed no adverse effect level derived from data on animal exposure is 3 g/kg/day.

References

Brantom PG, Gaunt IF, Hardy J, Grasso P, Gangolli SD. Long-term feeding and reproduction studies on emulsifier YN in rats. Fd. Cosmet. Toxicol., 11, pp. 755-769, 1973.

Colley J and Gaunt IF. Acute toxicity of emulsifier YN I rats, mice and rabbits. Unpublished study. 9.9.1967

Feuer G. Metabolic fate of ^{32}P-labelled emulsifier YN in rats. Fd. Cosmet: Toxicol., 5, pp. 631-43, 1967.

Gaunt IF, Grasso P, Gangolli SD. Short-term toxicity study of emulsifier YN in rats. Food and Cosmet. Toxicol., 5, pp. 623-629, 1967.

Gaunt IF, Butterworth KR, Grasso P, Ginocchio AV. Long-term toxicity study of emulsifier YN in the mouse. Fd. Cosmet. Toxicol., 15, pp.1-5, 1977.

Robbins MC. A teratology study with emulsifier YN in rats. Project no. 1331/1, Report no. 1331/1/2/94. BIBRA Toxicology International, Woodmansterne Road, Carshalton, Surrey, SM5 4DS UK, 7 April 1994.

Philips JC, Gaunt IF, Gangolli SD. Studies on the metabolic fate of 32-P-labelled emulsifier YN in the mouse, guinea-pig and ferret. Food and Cosmet. Toxicol., 13, pp. 22-30, 1975.

ANNEX

Expertise in Health and Environment for Industry

DTC was founded in 1982 and as of 1 October 2005 DTC conducted a merger with **DHI Water and Environment**. DTC continues as a business unit of DHI Water & Environment. Both institutes have long traditions for servicing industry and authorities Denmark and abroad in questions of water, health and the environment. Both institute: also members of the **Advanced Technology Group** in Denmark, as will be the new institute.

The new institute possesses broad international expertise in the fields of toxicology anc toxicology and offers strong interdisciplinary knowledge base for chemical substances a their effects on humans, animals and the environment. The institute has in-depth know of the European Union's new chemicals legislation REACH.

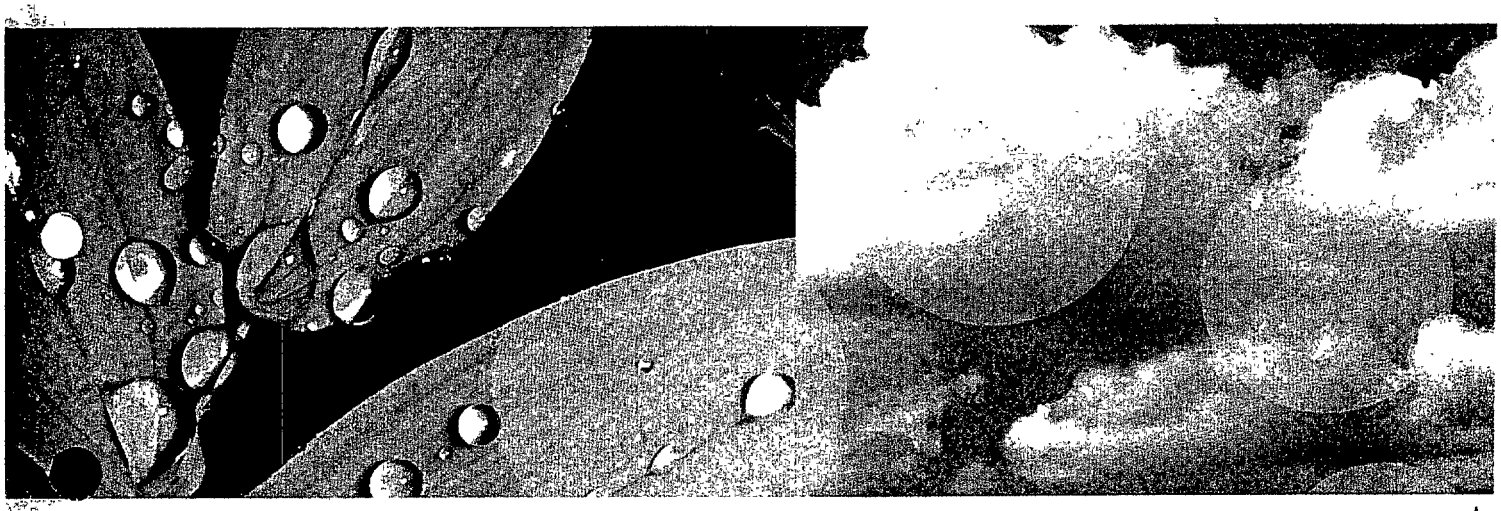
The institute has its own sizeable R&D activities. The staff includes 560 highly trained scientists and technicians, 200 of these positioned in our offices worldwide.

Focus on health, safety and compliance

Health, safety and compliance are requirements which both authorities and society at l: place on products brought to market. Legislation, health and safety are part and parcel product's entire lifecycle. This we know at DTC. Based on our wide-ranging professiona expertise, we provide advisory services to companies and authorities on chemical subst and their impact on people and the environment.

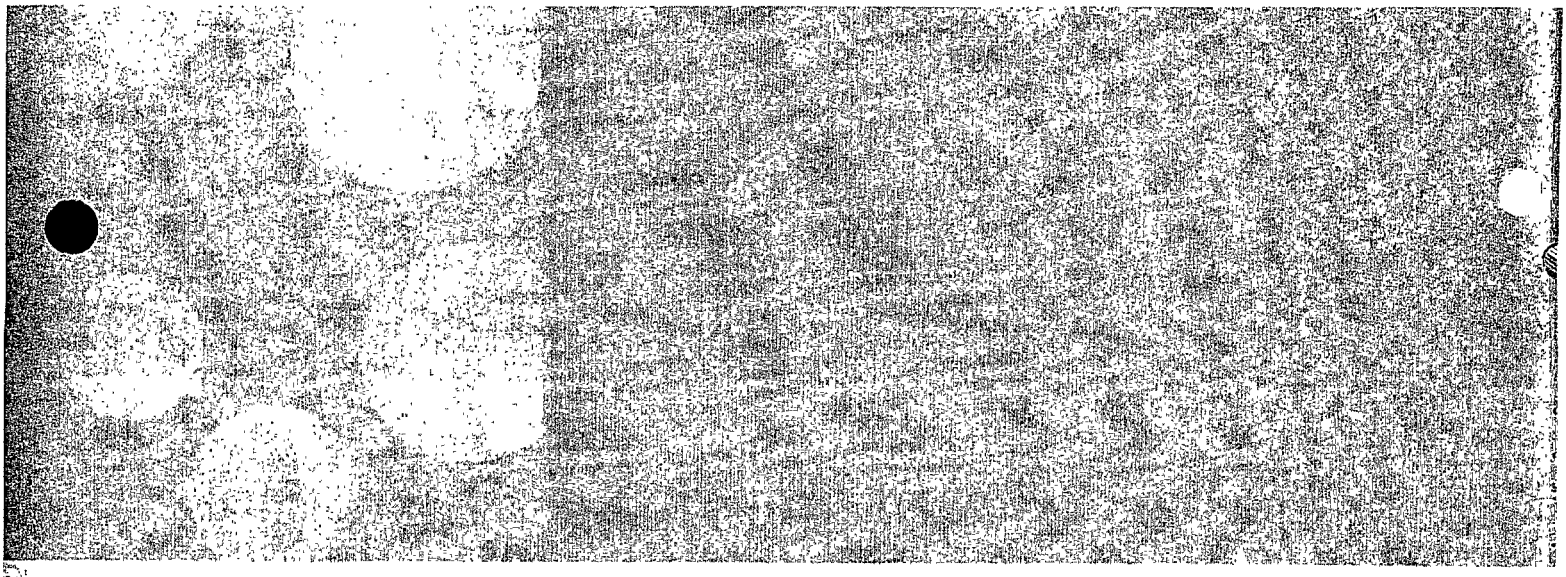
000093

Danish Toxicology Centre
– Health and Environment



BEST ORIGINAL COPY

DTC



On 1 October 2005 DTC merged with DHI Water & Environment.

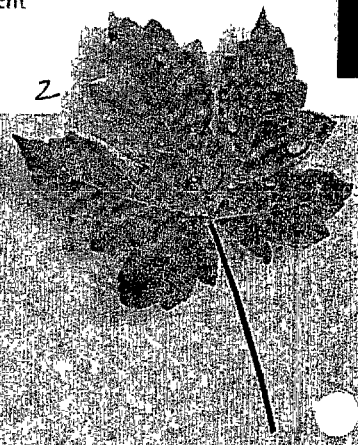
BEST ORIGINAL COPY

DHI Water & Environment
is an independent, international consulting and research organisation.

The consulting services are based on the development and application of know-how and advanced technologies within coastal, urban, river, ports and offshore engineering as well as ecology, water resources, hydrodynamics and human health and safety.

DHI's services and products include consultancy, laboratory testing, hydraulic model testing, software tools and reference materials. Our staff numbers 560 working in Denmark and in our 18 international offices. DHI is a member of the GTS – Advanced Technology Group, a network of seven independent Danish research and technology organisations.

000095



DTC

DTC Health and Environment
a business unit in DHI Water and Environment
Kogle Allé 2
DK-2970 Hørsholm
Denmark
Tel. +45 4576 2055
Fax +45 4576 2455
dtc@dhigroup.com

Find out more about DTC at www.dtc.dk

Coloplast:

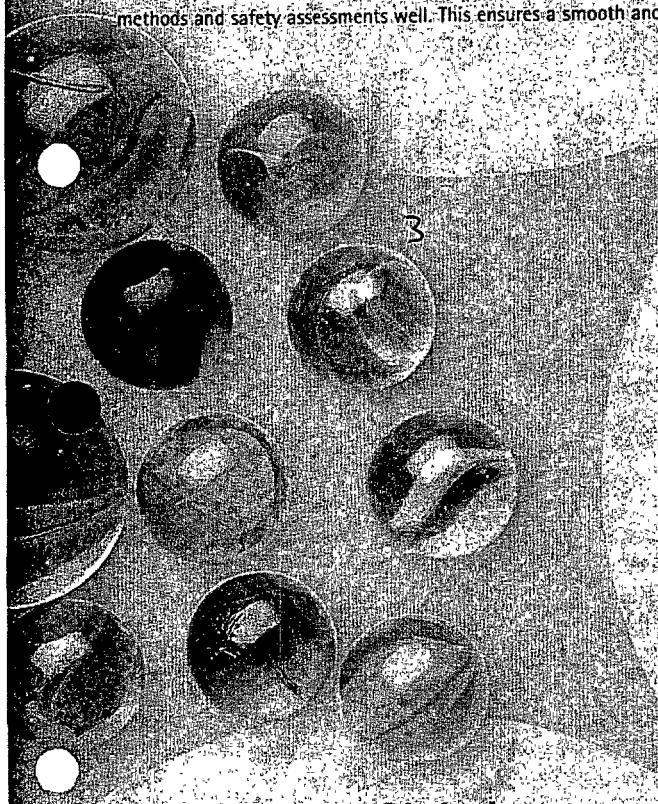
BLUE-STAMPING OF SAFETY ASSESSMENTS

Coloplast is in charge of assessing the safety of its own products. DTC is Coloplast's partner when independent approvals of the assessments are required.

In 2004 Coloplast launched its Assura Night Bag – a plastic pouch for collecting urine from urostomy patients. Prior to the launch, Coloplast carried out a safety assessment documenting that the pouch can be used without any risk to people or the environment. The product had previously been launched in several markets where a third-party assessment was not required. However, the German authorities demanded an independent assessment of the safety assessment carried out by Coloplast before the pouch could be marketed in the German market.

"In such situations DTC is in charge of the blue-stamping based on a thorough review of our safety assessment and the literature to which we have referred," explains Lykke Oldenburg, group environmental engineer at Coloplast:

"Our collaboration goes back a long way, which means that DTC knows our working methods and safety assessments well. This ensures a smooth and efficient process."



Safeware Quasar:

SAFETY DATA SHEETS – EASY AND EFFICIENT

DTC Phrase & Regulatory Data Modules for SDS Professional streamlines the translation and authoring of safety data sheets.

Safety Data Sheets are the most important document vehicles in the Chemical Industry for supplying "Cradle to Grave" information up and down the supply chain.

Safeware Quasar has implemented the DTC Phrase Library and Reference Database at more than 150 sites within its SDS Professional software using a variety of combinations of languages to meet its market and customer demands.

"Working with DTC and using the excellent data provided has definitely given Safeware a competitive edge in this highly competitive global market."
(Simon Robinson/Hazi Mistry, Safeware Quasar)

BEST ORIGINAL COPY

000096

MicroZymes Global:

ONE STEP AHEAD OF LEGISLATION

DTC's status as an independent institute was decisive when MicroZymes Global was on the lookout for a partner. The Ez-trim food supplement has just been launched following thorough preliminaries by DTC.

MicroZymes Global did their homework well before launching Ez-trim – a food supplement to keep your stomach happy. Food supplements are not covered by legislation governing pharmaceutical and naturopathic remedies, and the requirements which had to be fulfilled in terms of the product's toxicological and physiological effects were therefore not as strict. Nevertheless, DTC was asked to carry out an in-depth analysis.

"We are convinced that it pays to conduct thorough, independent analyses. Customers have a right to know the effects as well as any side-effects – even though the product is not a pharmaceutical or naturopathic remedy as such. We are now in possession of independent documentation from DTC. And this means that we are one step ahead of the requirements covering our products," says Elisabeth Fog Schultz,

Focus on health, safety and compliance

Health, safety and compliance are requirements which both public authorities and society at large place on products brought to market. Legislation, health and safety are part and parcel of a product's entire lifecycle. This we know at DTC. Based on our wide-ranging professional expertise, we provide advisory services to companies and authorities on chemical substances and their impact on people and the environment.

CHEMICALS

DTC helps companies to get a grip on chemicals. We offer consultancy on the marketing of chemical products and on alternative solutions as well as aid to prepare product information material. We also handle registration, nationally and in the EU, undertake assessments of cleaner technology, monitor legislation and plan toxicological tests. Furthermore, we offer safety assessments of the working environment.

DTC is abreast of the EU's new chemical legislation REACH. We advise companies about preliminary screening of chemical substances and raw materials, while also advising authorities on the implementation of the new legislation.

FOODS

DTC's food safety section provides advisory services to product developers, researchers, companies and authorities on foods, packaging, process equipment, feedstuffs and biotechnological production.

We know the relevant legislation and can advise on the safety of using new raw materials, excipients and materials which come into contact with foods. Furthermore, we possess expert knowledge about microorganisms, both desired microorganisms, such as starter cultures, and undesired ones, such as pathogenic and product-impairing microorganisms.

PHARMACEUTICALS

DTC provides advisory services to product developers, researchers and scientists, companies and authorities within the fields of pharmaceuticals, medical equipment and chemicals.

We are up-to-date on current legislation and in regular contact with relevant authorities and CROs in Europe and the USA. We are specialists on safety assessments, specialising in new test methods which do not involve animal testing.

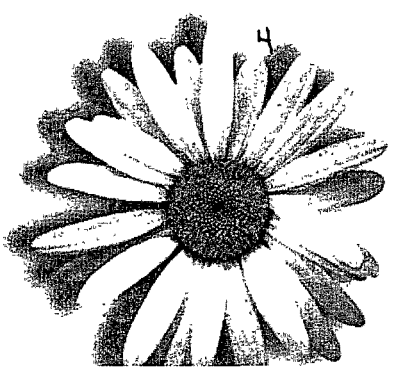
CONSUMER PRODUCTS

Manufacturers are increasingly required to document that their products contain no hazardous substances. Environmental label approvals are the consumers' guarantee of product safety and are often important to the marketing of certain products.

DTC advises on the composition of, for example, cosmetic products, skin-care products, detergents, toys and drinking water installations, and we offer guidance to companies applying for environmental label approvals or preparing environmental product information.

We are up-to-date with current legislation and are in regular contact with relevant authorities, thereby ensuring that we provide the latest information about current requirements. Furthermore, we apply our expert knowledge about the impact of chemical substances and microorganisms on people's health when conducting safety assessments.

BEST ORIGINAL COPY



Knowledge-based growth

BEST ORIGINAL COPY

The coming years will present a number of new challenges for companies and public authorities within the chemical area. DTC is ready to take up these challenges.

REACH: NEW DEMANDS ON THE CHEMICALS SECTOR

In future, the industry itself must document that its chemicals are safe before marketing them. That is one of the consequences of REACH – the new EU legislation for the chemicals sector. The new rules will affect all companies involved in the product chain for chemical substances, but very few know about the consequences. This is where DTC can help.

In collaboration with DHI, the University of Southern Denmark and the Confederation of Danish Industries, DTC has developed an analysis tool to clarify the need to adapt import and production to the new rules.

GLOBALISATION: INCREASED DOCUMENTATION REQUIREMENTS

Harmonisation within the EU is well advanced. Also when it comes to safety data sheets which are required to accompany chemical products with details of hazards and risks to people and the environment. However, a number of national regulations survive, both within and outside the EU.

For importers and exporters of chemical products, there is an increasing need to stay up-to-date with national regulations, and it is DTC's ambition to enable them to achieve this. For this purpose we have developed three new databases which make it significantly easier to prepare national and multilingual safety data sheets for chemical products.

DTC's Chemical Regulatory Database (ChemRegDb) contains updated classification lists, threshold value lists and national substance lists for 30 European countries, for a number of Asian countries, Australia, Canada and the USA. DTC Phrase Module has been extended to include 5 language modules and now contains 26 European, 4 Asian and Arabic language modules. The latest addition is a legal database containing information about national chemical rules for the EU member states, EU applicant countries and countries which are party to association agreements with the EU (e.g. Norway, Iceland and Switzerland).

ETHICS AND SUSTAINABILITY: A HEALTHY BUSINESS

There is a lot of talk about ethics and sustainability. Many of DTC's clients have long since turned the ever-stricter requirements into a competitive advantage – and good business:

When a company develops sustainable products, it takes care to document that the products do not contain hazardous substances – even when this is not required by legislation. Such documentation then becomes a key element in its marketing and branding activities. DTC will, in future, help more companies to turn their compliance with ethical requirements into a competitive advantage.

PRODUCT DEVELOPMENT: COSTS IN THE MEDICO SECTOR

Costs have always been critical to product development in the medico sector, yet intensifying competition may put an even greater focus on costs in future. When a company selects raw materials, it will be vital for it to be informed of the toxicity and biocompatibility of the constituents as early as possible in the process. If not, product developers risk making wrong choices, which makes for a long and expensive development phase.

000098

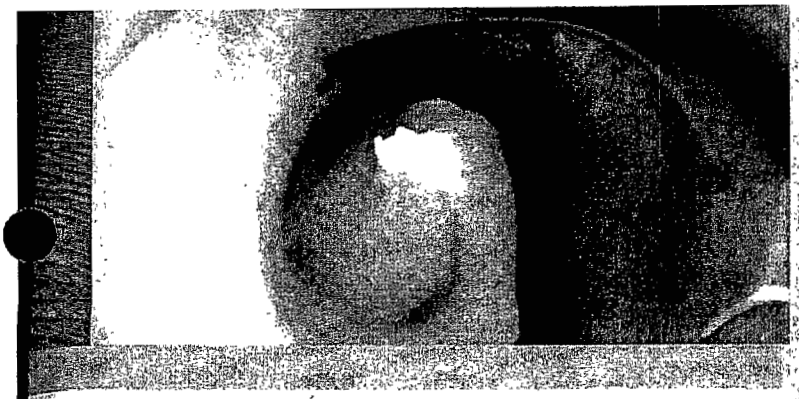
DTC possesses long-standing experience from the screening and assessment of chemical substances, and we can advise with regard to selecting substances which will subsequently be approved in the final safety assessment of the end product. This saves companies undertaking costly testing based on false premises.

000098

TEST METHODS OF THE FUTURE: THE HIGHEST ETHICS AND SAFETY FOR YOUR MONEY

5

A high level of ethics, safety and cost-consciousness are very real requirements which DTC's working methods must meet. We expect a growing interest in tests replacing animal testing with in-vitro or in-silico tests – tests outside of the



BEST ORIGINAL COPY

living organism or computer-simulated studies. DTC has a sound understanding of both types of testing, and can – by means of modelling and simulation – optimise the value of data obtained in the early stages of the development of pharmaceuticals and medical equipment.

We are continuing our development of applications for absorption models and physiological modelling, while being experienced in the use of models for risk assessment.

FOOD SAFETY: FROM EMERGENCY TROUBLE-SHOOTING TO CONSULTANCY

Food safety is a big issue in modern society. Restoring consumer confidence can take a long time for products or manufacturers with a safety record problem, and an increasing number of companies are now acknowledging that safety assessments must be incorporated into the early stages of product development – and long before a product has to be recalled on suspicion of containing hazardous substances.

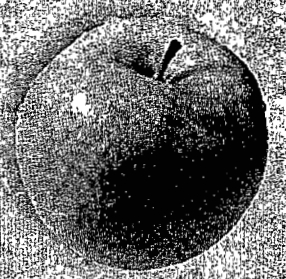
DTC is always pleased to be involved as early as possible in the product development cycle, advising for example on the excipients to be used. We can also come on board at the point at which an HACCP analysis of production is carried out. At each critical control point, we offer guidance on risks and possible alternatives. On this basis, the company can decide on a contingency plan in the event of any undesirable incidents.

NEW AREAS OF RESEARCH IMPOSE SAFETY REQUIREMENTS: NANOTECHNOLOGY:

Nanotechnology opens up scope for new materials and new applications for known materials. The technology is considered a promising technology within a number of areas, including IT, electronics, pharmaceuticals, medical equipment, energy and the environment. However, the use of nanotechnology involves a risk of exposure to nanoparticles. Data indicate that existing methods for assessing the hazardous effects of substances are not sufficient when it comes to nanoparticles. DTC is following developments within nanotechnology closely, and is ready to meet the new challenges.

000099

Selected references



Aalborg Portland A/S, DK
ALK-Abello A/S, DK
Ameron International, UK
ARKEMA A/S, DK
AstraZeneca, UK
Bak & Ubrenfeldt A/S, DK
Berendsen Textil Service A/S, DK
BioGaia AB, SE
Bioneer A/S, DK
Boehringer Ingelheim Danmark A/S, DK
Brodrene Hartmann A/S, DK
BST-Foreningen, DK
Carl Bro Energi & Miljø, DK
Carl Bro International, Phare Env. Consortium, DK
Cheminova A/S, DK
Chr. Hansen A/S, DK
Citroen A/S, DK
Colopiast A/S, DK
Counties Information, DK
CPS Chemical Products & Services A/S, DK
DakoCytomation Denmark A/S, DK
Damixa A/S, DK
Dancee, DK
Danisco A/S, DK
Danish Distillers A/S, DK
Danish Environmental Protection Agency, DK
Ditec Danmark A/S, DK
Dyrup A/S, DK
Ecolab GmbH, D
ECOonline, N
EDS Electronic Data Systems (Deutschland) GmbH, D
EU Commission – Joint Research Centre (JRC), I
EU Commission Services DG ENV.C3, B
FeF Chemicals, DK
Ferring Pharmaceuticals A/S, DK
Ferrosan A/S, DK
Forbo Flooring A/S, DK
Forbrugerstyrelsen, DK
Ford of Europe Incorporated, D
Fosroc A/S, DK
Foss Analytical A/S, DK
Frederiksborg Council, Env. Dept., DK
Genmab A/S, DK
Haldor Topsøe A/S, DK
Hempel A/S, DK
Henkel Norden Technologies AB, SE
Hexal A/S, DK
HydroTexaco A/S, DK
Kirby Customer Service, USA
Kuwait Petroleum (Danmark) A/S, DK
KWH PIPE (Danmark), DK
Lego Systems A/S, DK
Leica Microsystems A/S, DK
Leo Animal Health A/S, DK
LEO Pharma A/S, DK
LIP Bygningsartikler, DK
Lundbeck, H. A/S, DK
Mærsk Olie og Gas AS, DK
Magna Industrial Company Limited, Hong Kong
Maritime Council of Health & Safety, DK
Maxit a.s., DK
MicroZymes Global, DK
Monsanto Danmark A/S, DK
Nordic Industrial Fund, N
Nordisk Wavin A/S, DK
Novo Nordisk A/S, DK
Novozymes A/S, DK
Nycomed Danmark A/S, DK
Nynas Naphthenics AB, Stockholm, SE
Osteologix A/S, DK
Peugeot Danmark – K.W. Bruun Import, DK
Plastindustrien i Danmark, DK
Porsche – Michael Larsen Automobiler, DK
Rhodia France, F
Riemann & Co. A/S, DK
Rockwool International, DK
Safeware Quasar LTD, UK
Schering-Plough A/S, DK
Semler Services A/S, DK
Skjern Papirfabrik A/S, DK
Spangenberg's Eftfr., DK
Star Pipe A/S, DK
Struers A/S, DK
Symenex A/S, DK
Tejohn Oil ApS, DK
Teknos Technology A/S, DK
Tepro Machine & Pac System AB, S
Tetra Pak Hoyer A/S, DK
Toyo Ink MFG. Co. Ltd., Japan
Ulrcar Entreprenør A/S, DK
Universal Fastgørelse, DK
Unomedical A/S
UpFront Chromatography A/S, DK
Uponor A/S, DK

Case

Clarification of regulatory requirements to novel foods

In connection with the use of the new bulk sweetener tagatose, DTC was asked to clarify the regulatory requirements concerning research studies of the sweetener.

Based on our combined knowledge of regulations, toxicology and assessment methods, we drew up an estimate of time and cost to develop tagatose in order to obtain authorisation to market the sweetener.

Today, tagatose is produced in Denmark from lactose and approved for use in the USA.

In connection with clarification of regulatory requirements, we can also assist with:

- planning of experiments
- invitation of offers from contract research organisations (CROs)
- monitoring of studies, including test reports
- elaboration of dossier when applying for marketing authorisation

This gives you a sound basis for making decisions concerning strategy in relation to markets, investments, etc.

000100

BEST ORIGINAL COPY

Food ingredients and additives

DTC provides independent consultancy and quality assurance of food ingredients and additives within the following spheres:

- **Foodstuffs regulation** – product development, requirements to producers, update of international regulations
- **Safety and risk assessments** – assessment of ingredients, processing aids, and foodstuffs
- **Product development** – toxicological assessments and expert guidance on ingredients and production methods
- **Development of procedures** – guidance on process flows and work procedures for optimum production safety
- **Human health and the environment** – assessment of effect of substances on foodstuffs, and ultimately the human health and impacts on the environment

We offer impartial and independent advice and product assessments to producers of ingredients and additives. You may not have the necessary expertise close at hand - or you may face an unexpected drawback with ingredients or additives.

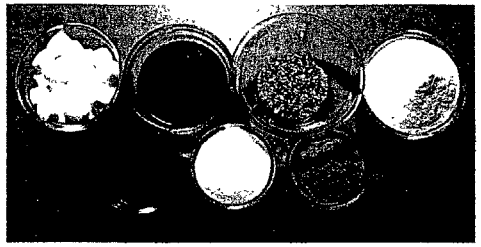
For more information

Danish Toxicology Centre
Kogle Allé 2
DK-2970 Hørsholm, Denmark
Tel: +45 4576 2055
Fax: +45 4576 2455
www.dtc.dk

Helle Buchardt Boyd
Tel: +45 4576 2055
hbb@dtc.dk

DTC – FOOD SAFETY SECTION
From farm to fork – and back again
DTC's Section for Food Safety advises product developers, researchers, companies and authorities on foodstuffs, feeding stuffs, cosmetics, and biotechnological production. Key words for our approach are health, safety and sustainability from farm to fork.

FOOD INGREDIENTS AND ADDITIVES



- Does your organisation need a safety assessment of an ingredient or an additive?
- Are you uncertain whether the amount of an ingredient you want to add to a food may have adverse health effects?
- Would a professional discussion partner make your choice of processing aids easier?
- Would in-depth studies of scientific literature or toxicological data searches help you prepare safety data sheets or risk labelling?
- Are you about to compile a dossier on an ingredient or an additive – or to give notice of a substance to the authorities?
- Do you need an update on Danish or EU regulatory requirements?
- Are you looking for documentation for safety of an ingredient or additive – or assistance with setting up trials in animals?

If the answer is yes, then DTC's Food Safety Section can help you.

DTC provides toxicological expertise and independent product assessments to food enterprises and manufacturers of ingredients.

DTC
Food safety
documentation & knowledge

Aromas and flavourings

DTC carries out assessments of aromas to determine if the proposed use is safe with regard to human health. Our assessments are based on the procedures and guidelines laid down by the Danish Veterinary and Food Administration, EFSA, the Council of Europe and JECFA.

Chemically-defined flavourings
Under the guidance of the Danish Veterinary and Food Administration, a positive list of aromas is in the making at EU level. It is a huge task to evaluate the many substances according to the specified procedure. DTC follows the results of the work closely and use the most recent information in our assessments. If we are asked to evaluate a substance that has not previously been assessed, we base our assessment on the procedures and guidelines established by EU.

Reaction aromas
Reaction aromas are assessed in accordance with the guidelines for "safety evaluation of thermally process flavourings" determined by the Council of Europe.

Fermented aromas
These aromas are assessed in accordance with guidelines for "flavouring preparations produced by enzymatic or microbiological processes" determined by the Council of Europe. Guidelines also exist for assessment of aroma preparations produced from plant cell cultures.

Smoke aromas
Primary smoke aromas must be approved by EFSA. As a minimum, the application must include toxicological data based upon:

- in vitro mutagenicity tests in a prokaryotic system
- in vitro gene mutation tests in mammalian cell cultures
- in vitro tests for chromosome damage in mammalian cell cultures
- 90-day feeding trial in experimental animals

DTC can assist in setting up protocols for such tests, in addition to inviting offers from test laboratories, assessment of test results, and submission of dossiers with application.

Processing aids

Which limits apply to processing aids? Which is the optimum alternative with regard to human health, for consumers and occupational health alike?

Let DTC help you to decide.

Functional Foods

New functional foods must comply with the newest regulations on health and safety.

Know-how and experience
Food safety and nutrition have been primary areas of focus at the DTC for many years.

It is an advantage with a qualified discussion partner as early as in the product development process as possible; to get ideas on how a product can be improved – preferably before you invest time, money and marketing on a product that subsequently may be disputed.

Assessments
We assess functional foods and their possible effects on health with regard to nutrition, toxicology, microbiology and more. We carry out assessments not only with a view to the population as a whole but also to identify possible most susceptible groups.

We also emphasize the importance of exploring interactions with other foodstuffs, dietary supplements and drugs.

Our expertise is primarily in the toxicological field, but we also have extensive knowledge of related fields such as nutrition, microbiology and genetics. We keep abreast of developments in the field of toxicology; it is no longer just about hazards to health but also about what is beneficial to health.

For instance, we are updated on current research on anti-mutagenic substances in plants, natural estrogenic substances, effects of preparation methods, and the like.

Enzymes
- and their use in foodstuffs

A new regulation on enzymes in foodstuffs is on its way from the European Commission. This will apply to enzymes in both processing aids and additives.

According to the new regulation, enzymes will be subject to approval including an assessment of their safety. The approval of enzymes will be undertaken by EFSA.

DTC can assist you with assessment of health aspects of enzyme products and compilation of the necessary documentation for approval of enzymes by EFSA.

Jan 2005

000101

Feedingstuffs - Regulatory affairs

Enzymes and Micro-organisms for Use in Animal Nutrition

Pre-market approval is mandatory for enzymes and micro-organisms to be used as additives in animal feedingstuffs within the European Union. The conditions for approval are laid down in several EU directives, and especially in Commission Directive 94/40/EC.

The requirements for approval of enzymes and micro-organisms are stringent. The directive requires characterisation of the product, documentation of efficacy and assessment of safety for the production animal, for occupational health, for the consumer and for the environment. The documentation and data requirements can be summarised as follows:

1. Identity: Physical, chemical and biological characteristics of all formulations, purity and proposed application, as well as methods for qualitative and quantitative detection of the additive in pre-mixtures and feedingstuffs.

2. Efficacy: Studies demonstrating technological improvement of the characteristics of the feedingstuff, of the animal production or of the animal health, or improvement of the food.

3. Safety: Assessments concerning the safe handling and use of the additive and safety for the production animal itself, the consumer, and the environment.

DTC offers

- Assistance to the manufacturer/ mporter in management of projects for obtaining the data and documentation needed for the preparation of the dossier;
- Evaluation of scientific data (expert report);
- Preparation of the full dossier or part of the dossier;
- Contact with the rapporteur during review of the dossier as well as answering and commenting on questions from the member states and the Commission;
- Discussion partner in the design of both safety and efficacy studies;
- Co-ordinating and contracting safety and efficacy studies.

DTC carries out all consultancies in strict confidentiality.

For further information, please contact Stephen Wessels (sww@dtc.dk) or Ann Detmer (ad@dtc.dk) at DTC

DTC

DTC - Danish Toxicology Centre
Kogle Allé 2 - 2970 Hørsholm
Phone: 45 76 20 55 (Monday-Thursday 08:30-16:00, Friday 08:30-15:00 CET)
Fax: 45 76 24 55Web: www.dtc.dk, E-mail: dtc@dtc.dk - webmaster@dtc.dk

May 2003

GR

6

Toxicological studies on the ammonium phosphatide

content

A teratology study with Emulsifier YN in rats (BIBRA)

Acute toxicity of Emulsifier YN in rats, mice and rabbits (Colley et al.)

Short term Toxicity Study of Emulsifier YN in Rats (Gaunt et al.)

Long-term Toxicity Study of Emulsifier YN in Mice (Gaunt et al.)

Metabolic Fate of ^{32}P-labelled Emulsifier YN in Rats (Feuer)

Long-term Feeding and Reproduction Studies on Emulsifier YN (Brantom et al.)

Studies on the Metabolic Fate of ^{32}P-labelled Emulsifier YN in the Mouse, Guinea-pig and the Ferret (Phillips et al.)

BIBRA
TOXICOLOGY
INTERNATIONAL

A teratology study with Emulsifier YN in rats

BIBRA Toxicology International
Woodmansterne Road Carshalton
Surrey SM5 4DS Great Britain
Telephone 081-643 4411
Fax 081-661 7029

STUDY TITLE

A teratology study with Emulsifier YN in rats

AUTHOR

Mark C. Robbins

STUDY COMPLETED ON

7 April 1994

TESTING FACILITY

BIBRA Toxicology International
Woodmansterne Road
Carshalton
Surrey
SM5 4DS UK

SPONSOR

Palsgaard Industri A/S
Palsgaardvej 10
DK-7130 Juelsminde
Denmark

LABORATORY PROJECT IDENTITY

Project No. 1331/1

Report No. 1331/1/2/94

CONTENTS

		Page
GOOD LABORATORY PRACTICE		6
1.	ABSTRACT	10
2.	OBJECTIVE	11
3.	MATERIALS	
3.1.	Test article	12
3.2.	Animals and maintenance	12
4.	EXPERIMENTAL DESIGN	
4.1.	Assignment to treatment groups and animal identification	14
4.2.	Administration of test article	14
4.3.	Duration of treatment	14
5.	METHODS	
5.1.	Method of analysis of Emulsifier YN in rodent diet	15
5.2.	Mixing of Emulsifier YN with rodent diet	15
5.3.	Efficiency of mixing and stability of Emulsifier YN with rodent diet	16
5.4.	Preparation of study diets	16
5.5.	Observations during the study	16
5.6.	Mating	17
5.7.	Necropsy	18
5.8.	Examination of foetuses	18
5.9.	Analysis of data	19
6.	RESULTS	
6.1.	Analysis of Emulsifier YN in rodent diet	20
6.2.	Environmental conditions	20
6.3.	Observations of condition and behaviour	21
6.4.	Body weights	21
6.5.	Food intakes	21
6.6.	Calculated intakes of Emulsifier YN	22
6.7.	Water intakes	22
6.8.	Mating	22
6.9.	Uterine and litter examination	23

6.10. Foetal skeletal examination 23

6.11. Foetal visceral examination 25

7. DISCUSSION 27

8. REFERENCES 29

9. TABLES

Table 1. Body weights (g) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T1

Table 2. Food intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T3

Table 3. Calculated intakes (mg/kg/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T5

Table 4. Water intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T6

Table 5. Summary of total findings at necropsy examination of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T8

Table 6. Summary of mean findings at necropsy examination of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T9

Table 7. Summary of incidence of findings in stained skeletons of rat pups from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T10

Table 8. Summary of incidence of findings in the internal examination of rat pups from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN T12

10. APPENDICES

Appendix 1. Manufacturers certificate of analysis for diet batch No. 9181 fed to the rats on study 1331/1 A1

Appendix 2 Stability and efficiency of mixing of Emulsifier YN in the diet and study diet analysis. A3

Appendix 3. Temperature and relative humidity of the animal room used to conduct the teratology study with Emulsifier YN A4

Appendix 4. Observations of condition and behaviour of rats during the teratology study with Emulsifier YN A6

Appendix 5. Individual body weights (g) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A7

Appendix 6. Individual food intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A15

Appendix 7. Individual water intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A23

Appendix 8. Mating record A31

Appendix 9. Individual litter data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A35

Appendix 10. Individual uterine data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A39

Appendix 11. Individual foetal data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN A43

GOOD LABORATORY PRACTICE

Acceptance of report

I hereby declare that the study described in this report was conducted under my supervision and that to the best of my knowledge and belief the study was conducted in compliance with accepted international standards of Good Laboratory Practice.

Study Director:
M.C. Robbins

Signature ..... Date ..

This report is approved by BIBRA Management as an accurate reflection of the study conducted.

Head of Customer & Information Services Division:
P.G. Brantom, BSc, PhD, MIBiol, MCIM.

Signature ..... Date .....

Director:
S.E. Jaggers, BSc, PhD, MIBiol.

Signature ..... Date .....

Quality Assurance Programme

The study critical phases were inspected according to the following programme. As far as can be reasonably established, the methods described and the results reported accurately reflect the raw data generated during the study.

Critical dates	QAU Inspection date	QAU Report Study Director Acceptance date	QAU Report Management Acceptance date
Protocol compliance	27 May 1993	27 May 1993	1 June 1993
Pre-study check	19 August 1993	19 August 1993	19 August 1993
Efficiency and stability study			
- Mixing	2 August 1993	4 August 1993	9 August 1993
- Analysis	2+3 August 1993	4 August 1993	5 August 1993
Study diet - Mixing	19 August 1993	19 August 1993	20 August 1993
Smearing/Mating	19 August 1993	19 August 1993	20 August 1993
Necropsy	8 September 1993	10 September 1993	14 September 1993
Skeletal			
- Staining	20+21 September 1993 + 19 October 1993	19 October 1993	19 October 1993
- Examination	2 November 1993	8 November 1993	9 November 1993
Internal			
- Examination	3 November 1993	8 November 1993	9 November 1993
Process Inspections			
Animal receipt and randomization	20 July 1993		21 July 1993
Animal husbandry	2 July 1993		14 July 1993

Data/report audits

The data for this study and the draft and final reports were audited between 11 November 1993 and 6 April 1994. Audit reports were accepted by the Study Director between 11 January 1994 and 6 April 1994 and by BIBRA Toxicology International Management between 14 January 1994 and 6 April 1994.

Protocol deviations

The following deviations from the final protocol were noted during the conduct of the study:

(i) The nominal, rather than the actual analysed concentrations of the test article were used in the test article intake calculations.

(ii) Two dead foetuses were not examined.

There were no other protocol deviations or other events which were considered to have affected, or potentially affected, the outcome of the study.

Quality Assurance
P.B. Ellis, BSc.

Signature .. [redacted] ..... Date . [redacted]

CRITICAL DATES

Receipt and randomization of animals	:	10 August 1993
Start of mating (Day -1)	:	from 16 August 1993
Start of treatment (Day 6)	:	from 23 August 1993
End of treatment (Day 15)	:	from 1 September 1993
Necropsy (Day 20)	:	from 6 September 1993

Responsible staff

Study Director	: M.C. Robbins
Animal services	: S.J. Crees, FIAT.
Analytical Services	: D.G. Walters, BSc, CChem, MRSC.
Statistician	: J.S. Smith, BSc, MSc, FSS.
Genetic & Reproductive Toxicology	: B.J. Phillips, BSc, PhD, MIBiol.
Quality Assurance	: P.B. Ellis, BSc.
Head of Customer and Information Services Division	: P.G. Brantom, BSc, PhD, MIBiol, MCIM.
Director	: S.E. Jaggers, BSc, PhD, MIBiol.

Archives

All raw data, documentation, any relevant specimens and a copy of the protocol and final report will be retained, for a period of 10 years, in the BIBRA Toxicology International archives, under the appropriate reference. Specimens will be retained as long as they afford evaluation.

1. ABSTRACT

Four groups of 25 female Sprague-Dawley strain rats were individually housed with male Sprague-Dawley rats for periods of up to five days until mated. Emulsifier YN was fed in the diet at levels of 0 (Control), 0.5, 2.5 or 5.0%, equivalent to mean intakes of 480, 2381 and 4774 mg/kg/day respectively, to the female rats, from between 6 and 15 days inclusive after positive evidence of mating was observed. Body weights, along with food and water intakes, were recorded daily from day 0 of pregnancy to necropsy on day 20, when the maternal reproductive system and offspring were examined. Foetuses were taken for either skeletal examination after evisceration, and staining with alizarin red S, or for internal examination after preservation in Bouins fluid.

No treatment related changes in condition or behaviour of pregnant rats were observed throughout the study. Although body weights and food intakes were largely unaffected by treatment, the water intakes of all three Emulsifier YN treated groups were occasionally statistically significantly lower than control intakes during parts of the treatment period. This effect did not follow any obvious pattern or dose relationship and may be due to some abnormally high water intakes of a few of the control group rats. Treatment with Emulsifier YN had no effect on any uterine parameters or the numbers, weights or sex of the foetuses. There were no treatment related gross abnormalities of any foetus, nor were there any skeletal or visceral changes that were considered treatment related.

In summary, Emulsifier YN did not cause any adverse teratogenic or systemic effects when fed to female Sprague Dawley rats at concentrations in the diet of up to 5.0%, equivalent to a mean intake of 4774 mg/kg/day, under the conditions of this study.

2. OBJECTIVE

The objective of this study was to investigate the possible teratogenic effects of Emulsifier YN when administered in the diet to rats during the period of organogenesis in accordance with the UK Department of Health Guidelines for the Testing of Chemicals for Toxicity, Appendix 6, Embryotoxicity (including teratogenicity) and Reproduction Studies, Amended July 1985, and based on the OECD Guidelines for the Testing of Chemicals No. 414 "Teratogenicity".

3. MATERIALS

3.1. Test article

The test article, Emulsifier YN, Batch No. L 2206300 was supplied by the sponsor as a light brown semi-solid and was stored in a domestic refrigerator set at +4°C, in the original container.

The specification and analyses for purity were the responsibility of the sponsor.

3.2. Animals and maintenance

Sexually mature male and female Sprague Dawley rats (approximately 9 weeks old) were obtained from a virus -antibody free colony (Harlan Olac Ltd., Bicester, Oxon, UK). They were housed in the study room for six days prior to mating to allow them to acclimatise to the study conditions. Prior to mating, the animals were housed in groups of four according to sex in polypropylene cages with stainless-steel grid floors. The cages were suspended on racks over paper for removal of excreta. During mating, one male and one female were housed together for periods of up to five days and nights in the same type of cage. During pregnancy the females were housed singly in the same type of cage.

Each cage carried a label stating the following:

- project number (1331/1)
- project licence number
- study director (M.C. Robbins)
- test article
- dose level
- sex of animals contained
- identification number of animals therein
- date of starting and finishing treatment
- date of necropsy where appropriate.

The racks of cages were kept in a room used solely for the study and controlled to the following conditions:

Temperature	:	19-24°C	
Relative humidity	:	45-70%	
Light	:	Artificial,	12 hr light (06.00 to 18.00 GMT) 12 hr dark (18.00 to 06.00 GMT)
Air changes	:	Approximately 15/hr with no recirculation using high efficiency filters	

The rats were fed a nutritionally adequate diet (R/M 3 (E) SQC F.G., Special Diets Services, Witham, Essex) in stainless steel pots designed to limit spillage. Diet from Batch No. 9181 was used throughout the study and a copy of the manufacturer's analysis certificate is shown in Appendix 1. Domestic mains tap water was supplied to each cage in a bottle fitted with a stainless steel drinking nozzle. Samples of this water are taken from the BIBRA facility at approximately six-monthly intervals and analyzed by the supplying authority. The records of these analysis are retained on a central file.

It was considered that there were no contaminants present in the food or water which could have affected the outcome of the study.

4. EXPERIMENTAL DESIGN

4.1. Assignment to treatment groups and animal identification

The rats were assigned to cages of four animals, by sex, on receipt by use of computer generated random numbers. Females were assigned temporary numbers, and, on confirmation of mating were given a permanent identification number as indicated by an ear punch code, using random number techniques, and thus allocated to group. Male rats were given an ear punch code on receipt. The proposed animal numbers and treatment groups are shown below:

Group	Treatment	Animal No. and Sex	
1	0% Control	1-25	Female
2	0.5% Emulsifier YN	26-50	Female
3	2.5% Emulsifier YN	51-75	Female
4	5.0% Emulsifier YN	76-100	Female
5	0% Control	101-200	Male

The male rats do not strictly form part of this study and apart from observations of condition and behaviour over the three week mating period, no other data was recorded.

4.2. Administration of test article

The test article was given at a constant concentration (w/w) in the diet of each group.

4.3. Duration of treatment

Female rats were fed diets containing the test article continuously for a period of 9 days, between days 6 and 15 of pregnancy. They were then fed control diet for a further 5 days until necropsy on day 20.

5. METHODS

5.1. Method of analysis of Emulsifier YN in rodent diet

Samples of diet (10.00 g) were vortex mixed with chloroform (50.0 ml) for 5 minutes and then placed in an ultrasonic bath at 40°C for 10 minutes. Extracts were filtered through Anotop 25 Plus 0.2 μm cartridges and three aliquots (1.00 ml) were taken from each, diluted with chloroform (9.00 ml) and 0.1 M cuprammonium sulphate (1.00 ml)was added. After shaking for 30 minutes, the mixtures were allowed to settle before filtering through phase separator paper (Whatman PS1). The UV absorbances of the filtrates at 260 nm were then measured in 1 cm quartz cuvettes against a chloroform reference using a dual beam spectrophotometer.

The concentration of Emulsifier YN in the diet was calculated by reference to the mean absorbance of triplicate diet samples, spiked with 6% (w/w) Emulsifier YN, after subtraction of the mean absorbance from duplicate control diet samples.

Although recovery of the test article from the diet was quantitative, due to the high levels of endogenous material in the diet which was also capable of complexing with the cuprammonium ion (approximately four times the lowest level of Emulsifier YN admixture), the accuracy of the method was limited to ± 0.1% (w/w) Emulsifier YN in the diet.

5.2. Mixing of Emulsifier YN with rodent diet

The required quantity of Emulsifier YN was warmed, in a glass beaker placed in a water bath, to approximately 50-60°C to produce a mobile liquid. This was added to a known quantity of diet and mixed using an electric hand mixer. This was further blended with control diet using a paddle mixer to produce a 20% premix. The premix was then added to further control diet and mixed in a cone mixer to give a 5.0% mixture. Quantities of this 5.0% Emulsifier YN diet were diluted further with control diet to produce the 2.5 and 0.5% diets.

5.3. Efficiency of mixing and stability of Emulsifier YN with rodent diet

Batches of diet were prepared to contain Emulsifier YN at each of the concentrations intended for use, using the method of mixing proposed for preparing the study diets. Six samples were taken from various parts of each mixture and were analyzed for test article concentration. The mixing procedure was considered adequate if the mean concentration was within ± 10% of the intended and the coefficient of variance was less than 10%.

Batches of diet at each of the concentrations prepared were stored in closed containers at +4°C. Samples from each of these containers were taken and analyzed for test article content at 7, 14 and 21 days after mixing and these results were used to define the frequency of preparation of study diets.

Further samples of each concentration of diet were placed in rat feeding pots under animal room conditions. One pot of each concentration was removed and samples of each were taken and analyzed for test article content after 1, 3 and 7 days. These results were used to define the periods between replacing the study food containers.

5.4. Preparation of study diets

Diet mixtures were prepared twice, with a two week period between each mix. Duplicate samples of each study diet were taken for analysis. Diet mixtures were stored in stainless steel containers at +4°C prior to use.

5.5. Observations during the study

Daily records were kept of the humidity, maximum and minimum temperatures, and the temperature in the animal room at the time of recording.

Each animal was examined daily in its cage for variations in behaviour or condition.

A careful clinical examination of pregnant females was performed daily and any variation of their appearance, the appearance of their excreta or of their behaviour was noted.

Body weight

Each female was weighed daily between days 0 to 20 of pregnancy.

Food and water intakes

The food and water intake of each female rat was measured daily from day 0 to day 20 of pregnancy.

5.6. Mating

Following acclimatization, one male was housed overnight with one female using random number techniques. Females were examined each morning and the presence of a vaginal plug either in the animal or on the paper under the cage was taken as positive evidence of mating. If a vaginal plug was present under the cage, but was not observed in the animal, vaginal smears were examined for the presence of sperm. The day of sperm or vaginal plug detection was designated day 0 of pregnancy and the mated females were randomly assigned to treatment groups by use of computer-generated random numbers (Section 4.1.). On allocation to group, each female was uniquely identified with an ear-punch code. Females with no positive evidence of mating were housed with the same male for up to five consecutive nights. If no evidence of mating had occurred after this, the male was removed for two nights over a weekend, and then returned to the female for up to a further five nights. This was repeated until mating was successful or until sufficient females in each treatment group were considered to be pregnant.

On examination of pregnant females, 16 days after the start of mating, it was apparent that only 18 of the 25 mated control group rats were

pregnant. In order to produce sufficient pregnant rats in this group, the seven non-pregnant rats were re-housed with the same males that they were originally mated with until further evidence of mating was observed, or until a sufficient number of these females had mated.

5.7. Necropsy

On day 20 of pregnancy each female was killed and subjected to a post-mortem examination during which any abnormalities of the thoracic and abdominal viscera were noted. The numbers of corpora lutea, implantation sites and the position of sites with dead, live or resorbed foetuses were recorded. The intact uterus was weighed as was each live foetus. Each live foetus was examined for gross, externally visible abnormalities.

Alternate foetuses from each uterine horn were preserved in 99% ethanol and Bouin's solution. Any suspected of having gross abnormalities were preserved in ethanol.

5.8. Examination of foetuses

The foetuses preserved in ethanol were eviscerated and processed for staining with alizarin Red S. All stained preparations were examined and any abnormalities, variants and variations of the degree of ossification recorded. The sex of each foetus was recorded during the evisceration process.

All foetuses preserved in Bouin's solution were examined by free-hand sectioning of the head and palate (Wilson and Warkany, 1965) and by dissection of the abdomen and thorax. The sex was recorded as part of the abdominal dissection.

5.9. Analysis of data

The results of the treated groups were compared with those of the control using appropriate statistical methods and accepting a level of probability of less than 0.05 as indicating significance.

Bodyweight, food intakes, water intakes, number of pre-implantation losses, number of early and late resorptions, total number of post-implantation losses, number of live foetuses and weight of foetuses from the treated and control groups were compared using analysis of variance, the procedure of Least Significant Difference, the Mann-Whitney test and Student's t-test. The incidence of abnormalities in the skeletal and visceral examinations of foetuses from the treated and control groups were compared by Fisher's Exact test.

6. RESULTS

6.1. Analysis of Emulsifier YN in rodent diet

The results of the stability and efficiency of mixing of Emulsifier YN in the diet, and study diet analyses are given in Appendix 2.

The 2.5 and 5.0% diets in the mixing efficiency study had a coefficient of variance of less than 5% and all test diets had a mean analysed concentration of between 97.4 and 98.3% of nominal. At the 0.5% level however, the coefficient of variance was 23%. In view of the limitations of the analysis, the results were nevertheless considered to be adequate confirmation of homogeneity of the test diets and of a satisfactory method of mixing and dilution.

The stability studies were to some extent, similarly constrained by the limitations of the analysis, but from the results it is apparent that, within these limits, there was no marked loss of test article from the diet on storage in either open food pots for up to 7 days, or closed containers at +4°C for 14 days. There did, however, appear to be some loss of test article from the 2.5 and 0.5% diets (to 90.0 and 78% of nominal respectively) after storage for 21 days in closed containers.

The results from the stability studies indicated that the prepared diets were stable for at least two weeks, and this was the schedule used for mixing and feeding the study diets. The study diets were all analyzed to be within ± 10% of the nominal concentration with the exception of the second mix of the 0.5% diet, when although the analyzed concentration was 88% of nominal, given the analytical limitations, this diet was considered acceptable for use.

6.2. Environmental conditions

The temperature and relative humidity recorded in the animal room used to conduct study 1331/1 remained within the protocol defined limits for the duration of the study (Appendix 3).

6.3. Observations of condition and behaviour

No adverse observations of condition or behaviour that could be considered related to treatment were observed in any animal at any time during this study (Appendix 4).

6.4. Body weights

There were no marked differences in the body weights of the rats treated with Emulsifier YN, except on days 10 and 13 of pregnancy, when the mean body weights of the 2.5% Emulsifier YN treated group were statistically significantly lower than that of the controls (Table 1). These minor differences are not considered to be of toxicological significance as the mean body weight gains for each group were similar in every case, as detailed below:

Summary table of bodyweight gain

	Weight gain (g) in period (day of pregnancy)			
Group	0-6	6-9	9-15	15-20
Control	29.3	15.6	35.0	72.1
0.5% Emulsifier YN	30.8	14.0	35.7	77.7
2.5% Emulsifier YN	28.2	13.8	34.7	73.7
5.0% Emulsifier YN	30.1	14.3	36.8	75.9

(The values are calculated from the mean values in Table 1)

6.5. Food intakes

There were no obvious differences in the food intakes of the rats fed Emulsifier YN from the controls, except between days 19 and 20 of pregnancy when a statistically significantly higher mean food intake was recorded for the group fed 5.0% Emulsifier YN (Table 2). This difference is not considered to be of toxicological importance.

6.6. Calculated intakes of Emulsifier YN

The intakes were calculated from the nominal concentrations of Emulsifier YN, body weights and food intakes, and are presented in terms of mg/kg body weight/day for each group of rats daily, between days 6-15 of pregnancy inclusive (Table 3). The average intakes over the treatment period (means of the intakes in table 3) are, for the 0.5, 2.5 and 5.0% groups, 480, 2381 and 4774 mg/kg/day respectively.

The nominal, rather than the actual analysed concentrations of Emulsifier YN were used in the calculations of test article intake because a second batch of test diets was prepared, and although this second batch was fed to the test rats from a particular date, the rats involved were in differing stages of pregnancy. This deviation from the protocol was not considered to have affected the outcome of the study in any way.

6.7. Water intakes

There were no marked differences in the water intakes of the treated groups compared to controls over the first seven days of pregnancy. During the period when the test article was being fed, between days 6 and 15 of pregnancy, the water intakes of all three treatment groups were lower than those of the controls and these changes were, on sporadic occasions, statistically significantly different. There was no obvious pattern or consistency to these differences, and it is possible that they may be due to higher than average water intakes of some of the control animals during part of the treatment period. After the end of the treatment period, the water intakes of the treated groups approximated those of the controls and there was one occasion, between days 17 and 18, where the intake of the 2.5% Emulsifier YN group was statistically significantly lower (Table 4).

6.8. Mating

Positive evidence of mating was observed in twenty three of the 25 females assigned to the control group, with two rats, originally assigned

numbers 11 and 16 remaining un-mated. These 23 animals were all found to be pregnant. At necropsy, 22/25 rats were found to be pregnant from the 0.5% and 2.5% Emulsifier YN treated groups. One animal was found to be pregnant although no evidence of mating was observed and the random number system used designated this rat as number 76 (the last number in the randomization schedule), and was therefore nominally assigned to the 5.0% Emulsifier YN treatment group. As the date of mating was unknown, this rat was removed from the study (Appendix 8). Of the remaining twenty four rats assigned to the 5.0% Emulsifier YN treatment group, 23 were found to be pregnant.

Data from any animal that did not mate, or that was found non-pregnant, have not been reported as they were not considered relevant to this study.

6.9. Uterine and litter examination

The findings relating to the uterine contents and the foetuses are presented in terms of total number (Table 5) and group means (Table 6). There was a statistically significantly lower number of corpora lutea present in the 2.5% Emulsifier YN treated group. The incidence of the numbers of females with post-implantation losses in the control and 0.5% Emulsifier YN treated groups appeared to be higher than in the 2.5 and 5.0% treatment groups. In one rat, dam No. 12, all foetuses were either early or late resorptions, and this is finding is largely responsible for the differences seen in the numbers of post-implantation losses in the control group. There were no other notable differences between the control and the Emulsifier YN treated groups.

6.10. Foetal skeletal examination

There were numerous findings in the skeletons of foetuses from all treatment groups, including the controls, and the summary of the incidence of each finding is given in Table 7. The vast majority of the findings were classified as being variant (spontaneous skeletal variations)

and findings reported as such are not considered to be foetal abnormalities.

The predominant observations were in the number of metacarpals and caudal vertebrae centrae, where these findings were seen in 74 and 75%, respectively of all foetuses. The presence of forelimb proximal phalanges was apparent in 58% and small sternebrae in 52% of all foetuses examined. Other less common observations were in the number of caudal vertebrae arches (29% of all foetuses), dumbbell shaped or absent sternebrae (in 10 and 4% of all foetuses respectively), and in the presence of the 14th rib bases which were recorded in 13 and 8% (for left and right respectively) of all foetuses. All of these observations were classified as variant, being spontaneous skeletal variations.

There were occasional differences in the incidence of variant skeletal observations in the Emulsifier YN treated groups that were statistically significant when compared to control incidences. These were in the numbers of caudal vertebrae centrae where the incidence of this finding in the foetuses of those animals from the 2.5 and 5.0% Emulsifier YN treated groups was slightly, but statistically significantly higher than the control incidence. There were also a few occasions where the incidence of the variant findings seen in the 0.5 and 5.0% treatment group was statistically significantly lower than the control incidence. These were in the number of metacarpals and the presence of forelimb proximal phalanges in the 0.5% group, and in the number of metatarsals in the 5.0% Emulsifier YN group. There was no clear dose-response relationship to any of these differences and they were not considered to be treatment related.

There was no dose relationship to the few minor skeletal abnormalities seen and these were considered to be incidental findings and not related to treatment.

There were two incidences of a dead foetus, and one of these was designated for skeletal examination. This was from a 2.5% Emulsifier YN treated rat (dam No. 70, foetus R5) and from its weight (approximately 54% of mean foetal litter weight) and appearance, this was probably a very late resorption and as such was not examined.

Major skeletal abnormalities were seen in only one foetus. This was from a control animal (dam number 14, foetus L6). The second dead foetus was also from this litter (foetus R1), and was designated for visceral examination. The other foetuses in this litter had a normal range of skeletal variations. The major abnormalities observed in one foetus, and the presence of a dead foetus, were, as they were from a control treated dam, considered to be incidental.

6.11. Foetal visceral examination

The frequency of visceral abnormalities was very low with only one abnormality found in the control group, a small right eye in one foetus, and two abnormalities found in separate foetuses in the 5.0% Emulsifier YN treated group, a small right kidney in one foetus and a shortened palate and tongue with slight hydrocephalus in another. The very low frequency of the abnormalities found in the 5.0% Emulsifier YN group were not statistically significantly different from control and these findings were not considered to be treatment related.

There were also a few small foetuses (less than 75% of mean foetal weight) seen in the control and 0.5% Emulsifier YN groups, but not in the 2.5 and 5.0% treatment groups (Table 8). The incidences of these were not statistically significantly different to controls. The dead foetus from control dam No. 14 was not examined. This minor protocol deviation is not considered to have affected adversely the outcome of the study.

The summary table shows the number of females and the number of foetuses reported in the four groups.

Summary of number of animals

Group	Number of females		Number of foetuses		
	Allocated to group	Pregnant	Total	With skeletal findings[a]	With visceral abnormalities[a]
Control	23	23	295	151/154	3/295
0.5% Emulsifier YN	25	22	303	152/155	3/303
2.5% Emulsifier YN	25	22	288	148/149	0/287
5.0% Emulsifier YN	24	23	294	151/153	2/294

[a] The figures shown are the numbers of affected foetuses/number of foetuses examined in each case

7. DISCUSSION

There were no changes in body weight, body weight gain or in the food intakes of the rats fed Emulsifier YN from days 6-15 of pregnancy that were considered to be related to treatment. The lower water intakes in the pregnant rats from all three test groups over the treatment period did not follow any obvious pattern or indicate any dose relationship and are therefore considered to be unrelated to treatment. This is further supported by the apparent abnormally high water intake values of some control rats which may be due to unnoticed leakage, rather than actual water intake. The lower number of corpora lutea in the 2.5% group was not due to treatment, since Emulsifier YN was not given until after ovulation and implantation. Although there was no difference, statistically, in the number of post-implantation losses, the numbers were lower in the 2.5 and 5.0% Emulsifier YN treated groups than in the control or 0.5% groups. This finding is partly due to all of the foetuses in one control rat being early or late resorptions. The significance of these differences is unclear, but they are unlikely to be a result of treatment. There were no other marked differences in uterine or litter data.

In the vast majority of foetuses, there were no severe defects observed in the examination of the skeleton or of the viscera and soft parts, indicating an absence of teratogenic effect. The one foetus that had major abnormalities was from the control group. Although there was a generally higher incidence of the numbers of caudal vertebrae centrae and caudal vertebrae arches in the treated groups, there was no clear dose relationship and the background or control incidence of these spontaneous skeletal variations was also high. For these reasons, these results are not taken to indicate a teratogenic effect of Emulsifier YN.

This study has shown that administration of Emulsifier YN in the diet at concentrations up to 5.0%, (equivalent to a mean daily intake of 4774 mg/kg/day) during the period of organogenesis has no teratogenic potential in the rat under the conditions of this study. The results given

here are also comparable to those previously reported in a two generation reproduction study where no signs of foetal toxicity or teratogenicity were encountered in Wistar strain rats fed Emulsifier YN at dietary levels of up to 6% (Brantom *et al*, 1973).

8. REFERENCES

Brantom, P.G., Gaunt, I.F., Hardy, J., Grasso, P. and Gangolli, S.D. (1973) Long-term feeding and reproduction studies on Emulsifier YN in rats. *Fd Cosmetic. Toxicol.* 11, 755-769.

Wilson, J.G. and Warkany, J. (1965). Teratology, Principles and Techniques. The University of Chicago Press, Chicago.

Table 1. Bodyweights (g) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	n	Days of pregnancy 0	1	2	3	4	5	6	7	8	9	10
0% Control	23	193.1 (12.93)	198.2 (12.29)	205.0 (13.10)	210.6 (12.96)	213.7 (13.40)	218.0 (12.07)	222.4 (11.54)	226.9 (11.96)	232.4 (12.43)	238.0 (11.81)	244.7 (12.62)
0.5% Emulsifier YN	22	191.7 ns (6.95)	196.2 ns (6.52)	204.0 ns (7.37)	209.6 ns (6.26)	213.1 ns (7.90)	217.5 ns (6.98)	222.5 ns (7.26)	225.0 ns (9.67)	230.3 ns (8.00)	236.5 ns (8.16)	244.5 ns (8.56)
2.5% Emulsifier YN	22	189.0 ns (12.05)	193.7 ns (11.38)	199.2 ns (10.51)	204.9 ns (11.27)	210.4 ns (10.94)	213.7 ns (12.56)	217.2 ns (13.13)	221.9 ns (12.74)	225.4 ns (14.33)	231.0 ns (13.94)	237.2 * (12.86)
5.0% Emulsifier YN	23	189.7 ns (11.42)	195.0 ns (11.71)	202.0[22] ns (12.34)	207.6 ns (12.46)	211.6 ns (13.32)	215.1 ns (13.21)	219.8 ns (14.23)	225.0 ns (13.82)	228.4 ns (14.65)	234.1 ns (14.86)	240.8 ns (14.69)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests.
ns $p > 0.05$, * $p \leq 0.05$.
Superscripts indicate the sample size (n) when it is different from that given.
Individual data reported in appendix 5.

000135

Table 1. (Continued).

Group	n	Days of pregnancy 11	12	13	14	15	16	17	18	19	20
0% Control	23	249.8 (11.56)	253.3 (11.85)	259.0 (12.34)	265.0 (12.25)	273.0 (14.21)	285.2 (14.68)	299.6 (14.06)	313.4 (17.88)	328.4 (20.08)	345.1 (21.65)
0.5% Emulsifier YN	22	249.1 ns (8.95)	251.9 ns (9.82)	257.5 ns (9.76)	264.0 ns (9.71)	272.2 ns (10.52)	284.7 ns (10.45)	300.7 ns (11.01)	314.6 ns (12.01)	331.0 ns (13.33)	349.9 ns (14.28)
2.5% Emulsifier YN	22	242.7 ns (13.71)	246.0 ns (14.48)	250.8 * (14.48)	257.1 ns (15.35)	265.7 ns (15.68)	276.7 ns (16.99)	291.5 ns (18.24)	306.8 ns (19.00)	320.9 ns (22.22)	339.4 ns (22.77)
5.0% Emulsifier YN	23	246.6 ns (15.12)	250.6 ns (16.82)	256.4 ns (15.82)	262.6 ns (18.35)	270.9 ns (18.91)	283.0 ns (19.86)	298.0 ns (21.42)	314.2 ns (25.96)	327.4 ns (28.37)	346.8 ns (30.32)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests calculated using the untransformed data. Except:-
Study day 16:- Levels of significance from two-sided least significance difference tests calculated from data transformed by $-1/y^2$.
Study day 18:- Levels of significance from two-sided pooled two sample t-tests calculated using the untransformed data.
ns $p > 0.05$, * $p \leq 0.05$.
Individual data reported in appendix 5.

000136

Table 2. Food intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	n	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0% Control	23	18.9 (4.00)	21.3 (4.28)	21.7 (4.28)	23.4 (4.24)	22.7 (3.10)	22.4 (2.64)	23.1 (2.31)	23.7 (2.55)	22.6 (2.31)	23.0 (2.25)
0.5% Emulsifier YN	22	19.5 ns (2.06)	19.7 ns (2.43)	21.0 ns (4.33)	24.5 ns (4.61)	22.6 ns (3.72)	22.5 ns (2.65)	23.0 ns (2.77)	23.4 ns (2.94)	22.7 ns (3.19)	23.3 ns (2.68)
2.5% Emulsifier YN	22	20.7 ns (4.24)	20.5 ns (3.61)	20.3 ns (4.16)	23.4 ns (4.77)	22.8 ns (3.09)	22.3 ns (3.61)	23.1 ns (2.38)	22.3 ns (3.73)	22.9 ns (2.38)	22.4 ns (3.28)
5.0% Emulsifier YN	23	20.4 ns (3.59)	21.4 ns (5.29)	21.5 ns (4.04)	23.1 ns (3.05)	23.3 ns (3.87)	22.1 ns (4.53)	23.5 ns (2.97)	22.3 ns (2.08)	22.1 ns (2.51)	22.1 ns (2.77)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests calculated using the untransformed data. Except:-
Study days 1-2:- Levels of significance calculated from data transformed by $\log_{10} y$.
ns $p > 0.05$.
Individual data reported in appendix 6.

000137

Table 2. (Continued).

Group	n	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0% Control	23	23.7 (3.02)	25.1 (3.30)	25.2 (2.91)	23.6 (3.77)	22.9 (2.91)	23.5 (3.16)	24.7 (3.56)	27.3 (4.93)	26.1 (2.95)	23.3 (3.12)
0.5% Emulsifier YN	22	23.8 ns (2.92)	25.1 ns (2.71)	24.7 ns (3.59)	23.6 ns (4.11)	24.0 ns (3.79)	23.0 ns (2.70)	26.1 ns (2.81)	26.9 ns (3.92)	27.1 ns (3.08)	24.6 ns (3.02)
2.5% Emulsifier YN	22	22.6 ns (2.70)	24.0 ns (2.96)	23.8 ns (2.74)	22.2 ns (3.02)	23.6 ns (2.46)	23.5 ns (3.42)	24.2 ns (3.32)	25.6 ns (3.05)	26.4 ns (2.36)	23.3 ns (3.21)
5.0% Emulsifier YN	23	23.0[22] ns (3.05)	24.4[22] ns (2.74)	25.1 ns (4.35)	23.1 ns (2.78)	25.3 ns (8.08)	24.7 ns (4.36)	25.0 ns (2.84)	27.7 ns (3.77)	26.9 ns (3.21)	26.0 * (4.82)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests calculated using the untransformed data. Except:-
Study days 14-15:- Levels of significance calculated from data transformed by -1/y.
ns $p > 0.05$, * $p \leq 0.05$.
Superscripts indicate the sample size (n) when it is different from that given.
Individual data reported in appendix 6.

000138

Table 3. Calculated intakes (mg/kg/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (control), 0.5, 2.5 and 5.0% Emulsifier YN.

Group	n	Days of pregnancy 6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15
0% Control	23	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)
0.5% Emulsifier YN	22	511.9 (57.02)	507.5 (62.34)	480.4 (65.87)	475.9 (53.12)	477.5 (51.39)	499.0 (59.46)	478.7 (63.20)	447.7 (77.29)	440.5 (70.73)
2.5% Emulsifier YN	22	2606.2 (220.95)	2462.5 (354.77)	2481.0 (282.24)	2359.4 (305.19)	2324.0 (220.14)	2437.3 (247.03)	2375.0 (249.00)	2163.8 (284.35)	2218.9 (186.55)
5.0% Emulsifier YN	23	5221.0 (511.60)	4896.0 (382.15)	4729.3 (487.18)	4592.3 (482.03)	4648.9[22] (562.03)	4867.5[22] (453.27)	4888.7 (764.37)	4407.3 (556.74)	4694.8 (1562.66)

Means and standard deviations calculated using the nominal concentrations of Emulsifier YN in the diet.
Superscripts indicate the sample size (n) when it is different from that given.
Individual data not reported but calculated from data in appendices 2, 5 and 6.

000139

Table 4. Water intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	n	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0% Control	23	36.2 (10.65)	40.9[21] (10.82)	41.8[21] (9.09)	42.8[22] (9.23)	42.8[22] (8.76)	45.0[22] (11.00)	43.7[22] (10.48)	45.5 (9.02)	44.7[22] (8.12)	47.9 (10.07)
0.5% Emulsifier YN	22	34.0 ns (7.09)	39.3 ns (12.81)	38.2 ns (8.05)	41.8 ns (7.68)	41.2 ns (8.34)	42.6 ns (11.29)	40.0 ns (11.78)	40.0 * (7.33)	40.6[21] ns (8.67)	42.5 * (7.76)
2.5% Emulsifier YN	22	34.2 ns (7.75)	37.3 ns (7.50)	38.7[21] ns (6.69)	41.6 ns (7.92)	41.0 ns (6.60)	41.5 ns (8.59)	40.7 ns (11.52)	41.1[21] ns (8.92)	40.6 ns (6.98)	41.7 * (7.39)
5.0% Emulsifier YN	23	36.4 ns (8.94)	40.4[21] ns (8.73)	40.5[21] ns (7.71)	42.0[22] ns (8.71)	44.8[22] ns (9.85)	44.7 ns (10.98)	42.7 ns (8.08)	41.0 ns (7.11)	40.0 * (7.05)	41.5 * (7.39)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests.
ns $p > 0.05$, * $p \leq 0.05$.
Superscripts indicate the sample size (n) when it is different from that given.
Individual data reported in appendix 7.

000140

Table 4. (Continued).

Group	n	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0% Control	23	52.6 (10.78)	54.7 (11.39)	56.1[22] (14.67)	53.9 (14.10)	53.0[22] (10.33)	52.0 (11.10)	55.1 (10.14)	57.8 (11.04)	57.7 (11.77)	55.1 (10.21)
0.5% Emulsifier YN	22	49.1 ns (9.89)	48.9 * (8.53)	51.4 ns (12.13)	50.5 ns (11.62)	51.3 ns (11.13)	48.8 ns (10.89)	51.5 ns (8.95)	55.3 ns (8.72)	56.0 ns (9.23)	51.7 ns (8.88)
2.5% Emulsifier YN	22	47.0 ns (7.80)	49.9 ns (7.70)	47.5 * (5.79)	44.6 ** (5.83)	45.8 * (5.30)	49.0 ns (7.43)	50.8 ns (7.02)	51.5 * (6.90)	55.0 ns (10.58)	51.5 ns (8.05)
5.0% Emulsifier YN	23	47.7 ns (9.38)	49.6 ns (9.47)	48.4 * (10.02)	46.6 * (8.85)	48.5 ns (9.61)	54.0 ns (11.51)	53.5 ns (8.99)	57.6 ns (10.23)	58.0 ns (11.72)	55.9 ns (11.89)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests calculated using the untransformed data. Except:-
Study days 12-13:- Levels of significance calculated from data transformed by $-1/y$.
Study days 13-14:- Levels of significance calculated from data transformed by $\log_{10} y$.
ns $p > 0.05$, * $p \leq 0.05$, ** $p \leq 0.01$.
Superscripts indicate the sample size (n) when it is different from that given.
Individual data reported in appendix 7.

000141

Table 5. Summary of total findings at necropsy examination of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	Corpora Lutea	Implantations	Pre-implantation losses	Resorptions		Post-implantation losses	Live foetuses	Male foetuses	Female foetuses	Number of pregnant females
				Early	Late					
0% Control	357	330	30	19	15	34	295	151	144	23
0.5% Emulsifier YN	348	314	36	7	4	11	303	168	135	22
2.5% Emulsifier YN	299	291	17	3	0	3	287	142	145	22
5.0% Emulsifier YN	339	303	37	8	1	9	294	153	141	23

Individual data reported in appendices 9 and 10.

000142

Table 6. Summary of mean findings at necropsy examination of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	Number of pregnant females	Corpora Lutea	Implant-ations	Pre-implantation losses	Resorptions		Post-implantation losses	Number of females with Post-implant-ation losses	Live foetuses	Mean Sex-Ratio	Mean weight (g)		
					Early	Late				Male:Female	Uterine	Litter	Foetal
0% Control	23	15.5 (2.64)	14.3 (2.90)	1.4^{21} (3.09)	0.8 (2.01)	0.7 (1.67)	1.5 (2.56)	10	12.8 (3.88)	1.17	80.0^{22} (14.62)	51.7^{22} (10.80)	3.9^{22} (0.26)
0.5% Emulsifier YN	22	15.8 ns (2.38)	14.3 ns (2.33)	1.9^{19} ns (2.00)	0.3 ns (0.57)	0.2 ns (0.50)	0.5 ns (0.67)	9	13.8 ns (2.35)	1.45	80.7 ns (13.88)	52.5 ns (8.92)	3.8 ns (0.24)
2.5% Emulsifier YN	22	13.6 * (2.65)	13.2 ns (2.25)	0.9^{19} ns (0.94)	0.1 ns (0.35)	0.0 ns (0.00)	0.1 ns (0.35)	3	13.0 ns (2.30)	1.16	79.1^{21} ns (11.70)	51.4 ns (9.17)	4.0 ns (0.22)
5.0% Emulsifier YN	23	14.7 ns (2.86)	13.2 ns (3.88)	2.2^{17} ns (2.96)	0.3 ns (0.88)	0.0 ns (0.21)	0.4 ns (0.94)	5	12.8 ns (4.07)	1.41	77.3 ns (22.45)	50.0 ns (15.84)	3.9 ns (0.36)

Means, standard deviations and levels of significance resulting from comparing 0% Control against other groups using two-sided least significant difference tests calculated using the untransformed data. Except:-
Pre-implant losses:- Levels of significance from two-sided Mann-Whitney tests calculated using the untransformed data.
Early:- Levels of significance from two-sided Mann-Whitney tests calculated using the untransformed data.
Late:- Levels of significance from two-sided Mann-Whitney tests calculated using the untransformed data.
Post-implant losses:- Levels of significance from two-sided Mann-Whitney tests calculated using the untransformed data.
Live foetuses:- Levels of significance from two-sided least significance difference tests calculated from data transformed by y^2.
ns $p > 0.05$, * $p <= 0.05$.
Superscripts indicate the sample size (n) when it is different from that given.
Individual litter, uterine and foetal data reported in appendices 9, 10 and 11.

000143

Table 7. Summary of incidence of findings in stained skeletons of rat pups from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0, 0.5, 2.5 or 5.0% Emulsifier YN

Key	Type of finding			Classif-fication	Incidence of findings at dose level (%) of Emulsifier YN			
					0	0.5	2.5	5.0
S_S	Sternebrae	:	small	Variant	76	90	75	76
S_A		:	asymmetrical	Variant	2	2	7	6
S_B		:	bicentral	Variant	1	0	0	1
S_X		:	absent	Variant	9	8	3	6
S_D		:	dumbbell-shaped	Variant	15	18	10	17
S_{IO}		:	incompletely ossified	Variant	0	4	2	1
X_{IO}	Xiphisternum	:	incompletely ossified	Variant	10	11	6	4
X_X		:	absent	Minor	4	6	0	2
X_S		:	small	Variant	0	1	1	0
X_A		:	asymmetrical	Variant	0	2	0	0
R_W	Ribs	:	wavy	Minor	0	0	1	0
RB_L		:	left 14th base	Variant	19	14	16	30
RB_R		:	right 14th base	Variant	11	12	8	17
R_{NO}		:	number	Variant	2	3	2	2
VCe/C	Vertebrae	:	caudal, number	Variant	106	111	122**	120*
VCe/TH	centrae	:	thoracic, abnormal	Minor	1	0	0	0
VCe/TD		:	thoracic, dumbbell	Variant	2	0	1	2
VCe/LUM		:	lumbar, abnormal	Minor	1	0	0	0
VCe/SAC		:	sacral, absent	Major	1	0	0	0
VAr/C	Vertebrae	:	caudal, number	Variant	42	36	51	46
VAr/SAC	arches	:	sacral, abnormal	Minor	1	0	0	0
PG/IS	Pelvic girdle	:	ischium, abnormal	Major	1	0	0	0
PG/IL		:	ilium, abnormal	Major	1	0	0	0
PG/P		:	pubis, abnormal	Major	1	2‡	0	0
F_{MN}	Forelimbs	:	metacarpals, number#	Variant	122	98**	121	112
F_{PP}		:	presence of proximal phalanges#	Variant	90	75*	99	93
F_{DP}		:	absence of distal phalanges	Variant	3	1	0	0
F_{LB}		:	long bone, abnormal	Major	1	0	0	0
H_{MN}	Hindlimbs	:	metatarsals, number#	Variant	7	9	3	1*
H_{PP}		:	presence of proximal phalanges	Variant	6	4	4	1
H_{DP}		:	absence of distal phalanges	Variant	2	2	1	3
H_{LB}		:	long bone, abnormal	Major	1	0	0	0
SC_{IO}	Scapula	:	incompletely ossified	Minor	1	0	0	0
C_{IO}	Clavicle	:	incompletely ossified	Minor	1	0	0	0

continued....

Table 7. continued

Key	Type of finding			Classif-fication	Incidence of findings at dose level (%) of Emulsifier YN			
					0	0.5	2.5	5.0
$SKFN_{IO}$	Skull	:	frontal and nasal bones incompletely ossified	Variant	1	1	0	0
SK/P_{IO}		:	parietals, incompletely ossified	Variant	1	1	0	0
SK/I_{IO}		:	interparietals, incompletely ossified	Variant	1	1	0	0
SK/S_{IO}		:	supra occipital, incompletely ossified	Variant	0	1	0	0
SK/S_X		:	supra occipital, absent	Major	1	0	0	0
MI		:	missing parts (due to processing error)		33	41	29	36
TOTAL NUMBER OF FINDINGS					577	554	562	576
TOTAL NUMBER OF FOETUSES					154	155	150	153
Dead foetus	Not examined				0	0	1	0
NAD	None detected				3	3	1	2

Individual findings from the skeletal examination are shown in Appendix 11.

All findings are non-significant (P>0.05) when compared with controls except those marked with asterisks where the finding is significantly increased (or decreased #)
* = p<0.05; ** = p<0.01 (Fisher's Exact Test).

‡ Classified as a minor abnormality in the stage of development in these two foetuses.

Table 8. Summary of incidence of findings in the internal examination of rat pups from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0, 0.5, 2.5 or 5.0% Emulsifier YN

Type of defect	Classification	Incidence of findings at dose level (%) of Emulsifier YN			
		0	0.5	2.5	5.0
Small right kidney	Variant	0	0	0	1
Small right eye	Major	1	0	0	0
Shortened palate and tongue, slight hydrocephalus	Major	0	0	0	1
Small foetus	Variant	2	3	0	0
Total number of foetuses		142	148	138	141
Dead foetus	Not examined	1	0	0	0

All findings are non-significant (P>0.05) when compared with control (Fisher's Exact Test).

Individual findings from the examination of the foetuses are shown in Appendix 11.

Appendix 1. Manufacturers certificate of analysis for diet batch No.9181 fed to the rats on study 1331/1

SDS
SPECIAL DIETS SERVICES

SPECIAL QUALITY CONTROL OF SMALL ANIMAL DIETS

CERTIFICATE OF ANALYSIS

PRODUCT: R/M 3(E) SQC F.G.

BATCH NO: 9181 PREMIX BATCH NO: 175

DATE OF MANUFACTURE: 29-APR-93

Nutrient	Found Analysis		Contaminant	Found Analysis		Limit of Detection
Moisture	8.4	%	Fluoride	25	mg/kg	1.0 mg/kg
Crude Fat	5.3	%	Nitrate as NaNO3	37	mg/kg	1.0 mg/kg
Crude Protein	23.0	%	Nitrite as NaNO2	3.1	mg/kg	1.0 mg/kg
Crude Fibre	3.1	%	Lead	0.50	mg/kg	0.25 mg/kg
Ash	6.6	%	Arsenic	0.32	mg/kg	0.2 mg/kg
Calcium	1.21	%	Cadmium	0.15	mg/kg	0.05 mg/kg
Phosphorus	0.81	%	Mercury	Non Detected	mg/kg	0.01 mg/kg
Sodium	0.39	%	Selenium	0.32	mg/kg	0.05 mg/kg
Chloride	0.61	%				
Potassium	0.96	%				
Magnesium	0.22	%	Total Aflatoxins	Non Detected	mcg/kg	1 mcg/kg each of B1,B2,G1,G2
Iron	249	mg/kg				
Copper	19	mg/kg	Total P.C.B	Non Detected	mcg/kg	10.0 mcg/kg
Manganese	77	mg/kg	Total D.D.T	Non Detected	mcg/kg	1.0 mcg/kg
Zinc	68	mg/kg	Dieldrin	Non Detected	mcg/kg	1.0 mcg/kg
			Lindane	Non Detected	mcg/kg	1.0 mcg/kg
			Heptachlor	Non Detected	mcg/kg	1.0 mcg/kg
			Malathion	69	mcg/kg	20.0 mcg/kg
Vitamin A	29.6	iu/g	Total Viable Organisms x 1000	Non Detected	per grm	1000/g
Vitamin E	166	mg/kg				
Vitamin C		mg/kg	Mesophilic Spores x 100	Non Detected	per grm	100/g
			Salmonellae Species	Non Detected	per grm	Absent in 20 grm
			Presumptive E.coli	Non Detected	per grm	Absent in 20 grm
			E.coli Type 1	Non Detected	per grm	Absent in 20 grm
			Fungal Units	150	per grm	Absent in 20 grm
			Antibiotic Activity	Non Detected		

Signed .....

Dated 19/5/93

Appendix 2. Stability and efficiency of mixing of Emulsifier YN in the diet and study diet analysis

Samples	Storage (days)	Nominal 5.0% diet		Nominal 2.5% diet		Nominal 0.5% diet		Control diet % w/w Found
		% w/w Found	% Nominal	% w/w Found	% Nominal	% w/w Found	% Nominal	
Mixing efficiency	0	4.87 ± 0.13 (CV = 2.6%)	97.4 ± 2.5	2.46 ± 0.11 (CV = 4.7%)	98.3 ± 4.6	0.49 ± 0.11 (CV = 23%)	98 ± 23	0.00 ± 0.05
Open food pots in animal room	1	4.93 ± 0.14	98.5 ± 2.7	2.54 ± 0.01	101.4 ± 0.2	0.55 ± 0.01	109 ± 1	0.00 ± 0.02
	3	5.14 ± 0.02	102.7 ± 0.3	2.39 ± 0.07	95.4 ± 2.6	0.51 ± 0.02	102 ± 4	-0.02 ± 0.10
	7	5.09 ± 0.03	101.7 ± 0.5	2.35 ± 0.08	93.8 ± 3.0	0.48 ± 0.06	95 ± 11	-0.03 ± 0.01
Closed containers at 4°C	7	4.89 ± 0.10	97.7 ± 1.9	2.64 ± 0.03	105.6 ± 1.2	0.47 ± 0.02	93 ± 3	0.00 ± 0.09
	14	4.82 ± 0.15	96.4 ± 3.0	2.33 ± 0.09	93.2 ± 3.6	0.52 ± 0.06	103 ± 11	0.15 ± 0.15
	21	4.88 ± 0.04	97.6 ± 0.8	2.25 ± 0.05	90.0 ± 2.0	0.39 ± 0.02	78 ± 4	0.00 ± 0.03
Study diets	Week 1	4.76 ± 0.00	95.2 ± 0.0	2.34 ± 0.03	93.6 ± 1.2	0.51 ± 0.05	101 ± 9	0.00 ± 0.00
	Week 3	4.82 ± 0.01	96.3 ± 0.1	2.46 ± 0.03	98.2 ± 1.0	0.44 ± 0.03	88 ± 6	0.00 ± 0.02

Data are mean results ± range (n=2) of analyses of duplicate samples of diet at each level except those for the mixing efficiency, 5.0%, 2.5% and 0.5% diets which are mean results ± standard deviation (n=6) of analyses of six diet samples at each level.
CV = coefficient of variance (n=6)
The variation in results from the control diets is a reflection of the high background of dietary interference subtracted from the test article absorbance to obtain the results.
All data reported are rounded from calculations performed to 4 figure accuracy. The accuracy and precision of the analytical method (± 0.1% w/w emulsifier YN in diet) does not justify reporting to more than 2 decimal places.

000149

Appendix 3. Temperature and relative humidity of the animal room used to conduct the teratology study with Emulsifier YN

Date 1993	Temperature °C		Relative humidity (%)
	Minimum	Maximum	
August			
10[1]	20.0	21.0	53
11	20.0	21.0	57
12	19.5	20.0	66
13	21.0	21.5	53
14	21.0	22.0	60
15	21.0	22.0	64
16[2]	21.0	22.0	64
17	21.0	22.0	60
18	21.0	22.5	64
19	21.0	22.5	54
20	21.0	22.0	57
21	21.0	22.0	54
22	20.5	21.0	63
23[3]	20.0	22.0	56
24	21.0	21.5	53
25	21.0	22.0	50
26	21.5	22.0	63
27	21.5	21.5	60
28	21.0	22.0	50
29	21.5	22.0	50
30	21.5	22.5	61
31	21.0	22.0	60

continued....

Appendix 3. continued

Date 1993	Temperature °C		Relative humidity (%)
	Minimum	Maximum	
September			
1[4]	21.0	21.5	57
2	20.5	21.0	61
3	21.0	22.5	60
4	21.5	22.0	60
5	21.0	22.0	56
6[5]	21.0	21.5	54
7	21.0	22.0	51
8	20.0	21.5	67
9	19.5	20.0	66
10	20.0	20.5	66
11	20.5	21.0	56
12	21.0	22.0	54
13	20.0	20.5	60
14	21.0	21.5	60
15	21.0	21.5	53
16	20.5	21.0	60
17	21.0	22.0	60
18	21.0	22.0	56
19	21.0	22.5	54
20	21.5	23.0	56
21	19.5	20.5	62
22	21.0	21.5	62
23	21.0	22.0	60
24	21.0	22.0	53

[1] Receipt of rats
[2] Start of mating (day -1)
[3] Start of treatment (day 6)
[4] End of treatment (day 15)
[5] Start of necropsy (day 20)

Appendix 4. Observations of condition and behaviour of rats during the teratology study with Emulsifier YN

Group	Treatment	Animal No.	Observation	Study day
			Females	
1	Control	1-10	No abnormality observed	0-20
		12-15	No abnormality observed	0-20
		17-25	No abnormality observed	0-20
2	0.5% Emulsifier YN	26-29	No abnormality observed	0-20
		31-35	No abnormality observed	0-20
		36	No abnormality observed	0-2
			Red staining around left eye	3-4
			Slight red staining around left eye	5-8
			Increased red staining around left eye	9-20
		37-41	No abnormality observed	0-20
		43-45	No abnormality observed	0-20
		47-50	No abnormality observed	0-20
3	2.5% Emulsifier YN	51-65	No abnormality observed	0-20
		66-72	No abnormality observed	0-20
		74	No abnormality observed	0-20
4	5.0% Emulsifier YN	77-93	No abnormality observed	0-20
		95-100	No abnormality observed	0-20
			Males	
5	Control	101-106	No abnormality observed	0-21
		107	No abnormality observed	0-13
			Slight red staining around nose and mouth	14-16
			No abnormality observed	17-21
		108-200	No abnormality observed	0-21

Appendix 5. Individual bodyweights (g) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	Animal number	Days of pregnancy 0	1	2	3	4	5	6	7	8	9	10
0% Control	1	181	189	185	183	185	210	221	226	228	238	240
0% Control	2	199	208	210	209	216	217	221	228	236	244	251
0% Control	3	192	197	208	212	221	221	228	231	241	248	255
0% Control	4	190	199	207	218	214	222	221	230	235	244	251
0% Control	5	183	187	195	205	203	211	217	219	221	230	238
0% Control	6	188	197	203	210	213	220	218	228	233	240	246
0% Control	7	189	183	192	203	207	204	213	216	221	226	230
0% Control	8	187	189	197	204	210	206	215	219	223	230	238
0% Control	9	202	205	211	216	218	221	223	225	229	235	244
0% Control	10	209	211	224	224	226	226	232	236	243	248	252
0% Control	11	NOT MATED										
0% Control	12	229	230	235	248	250	254	257	261	266	267	278
0% Control	13	196	200	204	209	217	219	223	226	232	238	241
0% Control	14	197	202	214	214	221	225	232	233	244	245	255
0% Control	15	178	185	192	202	201	205	210	215	219	220	228
0% Control	16	NOT MATED										
0% Control	17	181	189	195	203	205	206	214	218	220	225	232
0% Control	18	185	193	195	205	209	210	212	216	221	227	234
0% Control	19	186	192	200	205	199	207	210	215	219	225	231
0% Control	20	203	211	217	216	222	222	230	235	238	239	246
0% Control	21	187	191	202	206	207	213	221	221	231	236	243
0% Control	22	194	203	214	220	218	229	233	235	246	254	262
0% Control	23	184	191	196	204	209	214	216	219	226	232	237
0% Control	24	180	183	188	195	205	211	207	213	219	226	231
0% Control	25	221	223	230	233	239	242	242	253	254	258	265

000153

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 0	1	2	3	4	5	6	7	8	9	10
0.5% Emulsifier YN	26	189	195	206	212	211	219	224	225	229	236	244
0.5% Emulsifier YN	27	193	196	210	217	216	224	230	232	237	244	255
0.5% Emulsifier YN	28	187	192	201	207	212	215	220	225	229	230	240
0.5% Emulsifier YN	29	189	190	198	203	207	213	217	219	226	231	238
0.5% Emulsifier YN	30	NOT PREGNANT										
0.5% Emulsifier YN	31	180	187	191	201	198	204	213	212	218	227	235
0.5% Emulsifier YN	32	191	202	206	211	219	220	228	233	230	241	252
0.5% Emulsifier YN	33	194	197	204	211	213	220	227	226	231	236	244
0.5% Emulsifier YN	34	206	211	211	218	221	222	231	237	240	242	241
0.5% Emulsifier YN	35	184	187	196	201	198	206	211	213	217	228	232
0.5% Emulsifier YN	36	184	191	199	201	211	210	218	222	224	228	239
0.5% Emulsifier YN	37	199	203	210	217	225	221	228	235	237	241	250
0.5% Emulsifier YN	38	186	189	201	207	203	210	217	198	224	228	239
0.5% Emulsifier YN	39	202	206	220	218	224	231	237	240	245	251	262
0.5% Emulsifier YN	40	189	193	195	205	212	219	213	221	227	230	237
0.5% Emulsifier YN	41	192	199	207	204	213	217	218	224	228	237	241
0.5% Emulsifier YN	42	NOT PREGNANT										
0.5% Emulsifier YN	43	188	191	198	203	212	210	217	219	225	229	234
0.5% Emulsifier YN	44	188	193	201	209	218	215	221	227	229	234	246
0.5% Emulsifier YN	45	200	201	214	217	222	228	229	236	243	253	257
0.5% Emulsifier YN	46	NOT PREGNANT										
0.5% Emulsifier YN	47	192	195	205	213	209	215	221	225	230	236	244
0.5% Emulsifier YN	48	184	192	196	206	206	217	217	221	223	231	242
0.5% Emulsifier YN	49	197	202	204	210	212	220	223	226	228	238	246
0.5% Emulsifier YN	50	203	204	216	220	226	228	235	235	246	253	262

0001154

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 0	1	2	3	4	5	6	7	8	9	10
2.5% Emulsifier YN	51	181	190	193	202	203	208	212	213	219	225	232
2.5% Emulsifier YN	52	188	194	202	207	208	214	219	221	228	234	243
2.5% Emulsifier YN	53	176	180	189	192	198	196	202	208	208	214	222
2.5% Emulsifier YN	54	185	192	201	203	212	210	214	220	219	223	232
2.5% Emulsifier YN	55	193	202	204	212	213	218	225	225	228	238	242
2.5% Emulsifier YN	56	197	202	210	219	218	228	233	234	236	244	252
2.5% Emulsifier YN	57	196	202	202	209	210	216	218	220	225	233	234
2.5% Emulsifier YN	58	176	179	189	195	201	201	207	214	216	218	230
2.5% Emulsifier YN	59	181	183	190	194	201	201	202	208	209	214	221
2.5% Emulsifier YN	60	176	179	183	189	196	201	201	205	198	211	219
2.5% Emulsifier YN	61	192	193	197	202	211	207	212	219	220	223	231
2.5% Emulsifier YN	62	192	196	204	206	211	220	221	224	230	236	239
2.5% Emulsifier YN	63	193	203	201	208	216	217	218	229	234	236	238
2.5% Emulsifier YN	64	182	186	192	195	204	207	212	215	218	223	232
2.5% Emulsifier YN	65	190	193	199	206	214	218	217	228	230	235	242
2.5% Emulsifier YN	66	NOT PREGNANT										
2.5% Emulsifier YN	67	175	182	189	192	206	204	209	214	216	221	228
2.5% Emulsifier YN	68	198	202	207	212	218	221	224	234	240	243	244
2.5% Emulsifier YN	69	181	184	191	200	208	211	212	218	227	226	235
2.5% Emulsifier YN	70	200	201	205	214	218	225	228	230	239	248	251
2.5% Emulsifier YN	71	230	229	234	241	250	256	263	266	270	274	280
2.5% Emulsifier YN	72	184	193	199	206	203	211	214	215	222	230	235
2.5% Emulsifier YN	73	NOT PREGNANT										
2.5% Emulsifier YN	74	193	197	202	204	210	212	215	222	227	232	237
2.5% Emulsifier YN	75	NOT PREGNANT										

000155

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 0	1	2	3	4	5	6	7	8	9	10
5.0% Emulsifier YN	77	176	181	187	195	193	197	204	209	210	217	223
5.0% Emulsifier YN	78	188	192	198	202	208	213	214	220	225	233	235
5.0% Emulsifier YN	79	183	190	194	199	206	206	214	217	216	222	230
5.0% Emulsifier YN	80	216	220	226	232	235	241	245	246	254	251	257
5.0% Emulsifier YN	81	193	194	204	212	220	218	228	234	235	239	248
5.0% Emulsifier YN	82	181	183	192	196	204	203	207	217	218	219	228
5.0% Emulsifier YN	83	193	200	207	214	223	223	230	240	241	246	259
5.0% Emulsifier YN	84	190	199	208	206	215	218	225	228	237	242	246
5.0% Emulsifier YN	85	190	195	198	204	212	220	218	226	228	234	239
5.0% Emulsifier YN	86	187	191	199	204	212	210	218	223	229	231	240
5.0% Emulsifier YN	87	181	185	195	201	199	206	209	212	212	223	228
5.0% Emulsifier YN	88	191	196	201	205	205	210	215	218	219	229	237
5.0% Emulsifier YN	89	183	189	195	203	202	209	214	218	221	225	233
5.0% Emulsifier YN	90	185	190	197	203	211	216	212	221	225	228	238
5.0% Emulsifier YN	91	194	199	207	215	215	221	226	232	235	237	249
5.0% Emulsifier YN	92	171	174	181	184	185	188	192	192	199	205	207
5.0% Emulsifier YN	93	179	184	194	198	200	206	211	216	219	225	237
5.0% Emulsifier YN	94	NOT PREGNANT										
5.0% Emulsifier YN	95	190	198	205	212	218	220	224	231	233	238	246
5.0% Emulsifier YN	96	218	224	233	241	243	244	255	254	258	272	270
5.0% Emulsifier YN	97	209	214	224	226	232	238	245	249	256	264	273
5.0% Emulsifier YN	98	184	194	198	201	202	206	209	217	221	227	234
5.0% Emulsifier YN	99	190	194	201	209	215	218	219	228	235	242	239
5.0% Emulsifier YN	100	192	198	-	212	211	217	221	227	227	236	243

Missing value code:- '-' Value unobtainable.

000156

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 11	12	13	14	15	16	17	18	19	20
0% Control	1	245	246	257	264	274	292	305	317	339	355
0% Control	2	250	255	262	269	283	299	306	328	341	360
0% Control	3	261	265	273	284	292	305	318	341	355	371
0% Control	4	256	261	265	270	280	295	314	320	344	361
0% Control	5	245	247	253	257	262	274	289	290	305	319
0% Control	6	246	249	260	258	262	272	287	285	297	310
0% Control	7	237	242	241	250	256	265	280	294	301	320
0% Control	8	239	247	252	260	266	274	300	314	328	347
0% Control	9	246	249	256	257	268	276	297	315	336	355
0% Control	10	256	260	262	272	275	291	305	321	340	362
0% Control	11	NOT MATED									
0% Control	12	279	283	285	291	290	292	298	297	302	305
0% Control	13	252	255	262	262	273	279	290	307	322	335
0% Control	14	257	263	269	277	293	306	316	333	346	360
0% Control	15	235	237	241	251	254	267	282	294	310	327
0% Control	16	NOT MATED									
0% Control	17	242	245	246	251	257	265	282	297	305	328
0% Control	18	244	246	249	259	269	281	299	316	328	345
0% Control	19	231	235	242	245	253	269	283	292	311	325
0% Control	20	252	255	259	264	274	291	302	323	338	357
0% Control	21	248	252	262	268	277	290	303	320	334	358
0% Control	22	266	269	276	281	292	306	325	341	364	382
0% Control	23	242	246	253	259	267	283	296	316	329	347
0% Control	24	245	245	249	260	258	273	284	298	314	328
0% Control	25	271	275	283	286	304	315	329	349	365	380

0001157

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 11	12	13	14	15	16	17	18	19	20
0.5% Emulsifier YN	26	247	246	254	262	265	284	297	307	329	344
0.5% Emulsifier YN	27	259	261	264	274	285	298	320	332	354	375
0.5% Emulsifier YN	28	249	254	256	266	271	283	305	319	333	360
0.5% Emulsifier YN	29	241	245	248	257	268	281	296	313	336	353
0.5% Emulsifier YN	30	NOT PREGNANT									
0.5% Emulsifier YN	31	235	242	247	253	265	283	295	309	330	351
0.5% Emulsifier YN	32	260	262	268	279	287	297	320	336	344	368
0.5% Emulsifier YN	33	246	249	254	261	269	280	298	308	325	345
0.5% Emulsifier YN	34	251	254	262	263	274	282	302	313	327	344
0.5% Emulsifier YN	35	237	237	245	250	257	272	288	300	316	336
0.5% Emulsifier YN	36	242	244	250	259	262	274	287	301	319	340
0.5% Emulsifier YN	37	259	260	260	270	274	280	296	308	309	325
0.5% Emulsifier YN	38	243	238	250	253	259	279	293	304	326	344
0.5% Emulsifier YN	39	265	269	284	283	291	306	321	333	355	373
0.5% Emulsifier YN	40	245	251	255	260	273	284	300	322	338	358
0.5% Emulsifier YN	41	241	250	258	261	275	284	302	319	336	357
0.5% Emulsifier YN	42	NOT PREGNANT									
0.5% Emulsifier YN	43	245	250	253	257	266	276	290	310	321	346
0.5% Emulsifier YN	44	248	253	256	265	264	275	292	308	311	326
0.5% Emulsifier YN	45	268	273	273	281	292	309	322	339	356	374
0.5% Emulsifier YN	46	NOT PREGNANT									
0.5% Emulsifier YN	47	246	239	248	256	262	276	289	297	316	334
0.5% Emulsifier YN	48	246	251	254	258	269	277	296	310	332	346
0.5% Emulsifier YN	49	248	248	254	261	271	283	299	308	329	343
0.5% Emulsifier YN	50	260	265	273	280	290	300	308	325	339	356

000158

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 11	12	13	14	15	16	17	18	19	20
2.5% Emulsifier YN	51	231	233	244	251	259	278	296	311	333	347
2.5% Emulsifier YN	52	246	248	257	262	269	281	304	309	328	352
2.5% Emulsifier YN	53	228	230	234	240	250	260	275	294	297	322
2.5% Emulsifier YN	54	238	240	246	251	258	264	279	292	297	321
2.5% Emulsifier YN	55	250	251	256	259	268	274	289	298	316	326
2.5% Emulsifier YN	56	258	255	267	267	279	292	307	319	337	360
2.5% Emulsifier YN	57	239	241	243	249	260	269	279	295	316	328
2.5% Emulsifier YN	58	234	236	243	248	258	269	286	300	310	330
2.5% Emulsifier YN	59	227	227	233	238	242	255	270	285	297	316
2.5% Emulsifier YN	60	223	230	234	240	246	253	262	278	289	304
2.5% Emulsifier YN	61	236	240	242	250	258	266	282	297	303	321
2.5% Emulsifier YN	62	240	252	255	260	270	284	292	311	323	344
2.5% Emulsifier YN	63	245	247	252	265	269	278	293	304	317	333
2.5% Emulsifier YN	64	235	241	244	251	261	271	288	307	316	343
2.5% Emulsifier YN	65	251	257	260	266	279	293	306	323	342	357
2.5% Emulsifier YN	66	NOT PREGNANT									
2.5% Emulsifier YN	67	238	238	242	252	257	264	286	303	310	331
2.5% Emulsifier YN	68	250	253	259	269	280	290	300	322	340	357
2.5% Emulsifier YN	69	242	250	248	255	265	275	288	310	323	342
2.5% Emulsifier YN	70	258	261	267	269	276	287	296	305	318	330
2.5% Emulsifier YN	71	288	296	299	312	319	334	356	376	396	418
2.5% Emulsifier YN	72	242	242	247	249	258	274	290	302	323	339
2.5% Emulsifier YN	73	NOT PREGNANT									
2.5% Emulsifier YN	74	241	244	246	253	265	277	289	309	329	345
2.5% Emulsifier YN	75	NOT PREGNANT									

000159

Appendix 5. (Continued).

Group	Animal number	Days of pregnancy 11	12	13	14	15	16	17	18	19	20
5.0% Emulsifier YN	77	226	226	238	241	253	273	290	298	318	340
5.0% Emulsifier YN	78	239	247	244	252	264	276	278	299	302	318
5.0% Emulsifier YN	79	238	236	241	244	249	259	271	282	288	306
5.0% Emulsifier YN	80	260	269	273	283	288	303	319	340	358	377
5.0% Emulsifier YN	81	256	263	272	279	285	303	323	344	359	385
5.0% Emulsifier YN	82	236	239	246	253	254	262	275	288	294	310
5.0% Emulsifier YN	83	264	269	273	285	289	299	320	335	343	369
5.0% Emulsifier YN	84	250	252	259	264	279	286	294	311	323	336
5.0% Emulsifier YN	85	249	256	261	263	278	286	303	325	342	353
5.0% Emulsifier YN	86	247	254	259	263	270	283	300	319	330	357
5.0% Emulsifier YN	87	233	235	246	250	257	273	285	295	313	331
5.0% Emulsifier YN	88	237	240	244	253	260	273	293	299	314	337
5.0% Emulsifier YN	89	238	241	246	250	261	265	279	294	312	328
5.0% Emulsifier YN	90	249	249	257	264	276	289	306	330	336	357
5.0% Emulsifier YN	91	253	258	265	274	279	297	314	328	354	373
5.0% Emulsifier YN	92	212	215	222	220	227	238	257	265	276	297
5.0% Emulsifier YN	93	243	245	255	262	267	280	300	334	327	354
5.0% Emulsifier YN	94	NOT PREGNANT									
5.0% Emulsifier YN	95	256	260	262	271	279	289	300	319	328	347
5.0% Emulsifier YN	96	276	280	282	291	303	322	338	360	381	402
5.0% Emulsifier YN	97	280	290	294	305	316	326	344	366	387	410
5.0% Emulsifier YN	98	237	243	246	251	263	272	288	304	325	340
5.0% Emulsifier YN	99	245	249	255	265	275	283	299	314	331	349
5.0% Emulsifier YN	100	247	247	257	257	259	272	278	278	290	301

000160

Appendix 6. Individual food intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0% Control	1	20	15	15	24	20	21	22	24	20	21
0% Control	2	20	16	26	20	20	21	24	19	22	24
0% Control	3	17	25	30	24	22	23	27	24	25	25
0% Control	4	22	20	24	27	23	20	26	25	21	23
0% Control	5	22	17	23	27	23	21	23	23	20	24
0% Control	6	24	22	24	31	22	22	27	27	21	26
0% Control	7	13	19	21	19	21	24	23	22	27	20
0% Control	8	15	22	9	16	22	20	19	18	20	19
0% Control	9	16	21	22	28	21	18	20	21	22	20
0% Control	10	17	25	23	18	20	24	23	24	25	22
0% Control	11	NOT MATED									
0% Control	12	17	17	22	32	20	23	24	24	22	26
0% Control	13	19	18	20	19	21	28	20	22	23	21
0% Control	14	21	21	28	24	24	27	23	25	22	23
0% Control	15	21	21	20	18	27	22	21	24	21	21
0% Control	16	NOT MATED									
0% Control	17	21	22	21	20	30	22	23	23	24	23
0% Control	18	5	31	20	23	25	20	19	24	23	20
0% Control	19	21	20	21	23	20	21	23	19	21	22
0% Control	20	19	26	27	23	26	21	26	25	28	24
0% Control	21	20	19	20	28	18	24	23	26	19	25
0% Control	22	20	20	22	25	25	25	24	28	25	27
0% Control	23	20	16	22	25	20	21	23	25	21	23
0% Control	24	21	26	18	20	23	28	22	26	23	26
0% Control	25	23	30	21	25	29	20	26	26	24	23

000161

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0.5% Emulsifier YN	26	21	18	19	26	21	23	21	23	20	22
0.5% Emulsifier YN	27	22	23	21	26	23	23	23	25	21	26
0.5% Emulsifier YN	28	19	20	19	19	27	19	22	23	22	20
0.5% Emulsifier YN	29	23	22	24	34	21	26	27	24	26	29
0.5% Emulsifier YN	30	NOT PREGNANT									
0.5% Emulsifier YN	31	19	16	21	26	22	22	23	21	21	24
0.5% Emulsifier YN	32	23	16	18	19	28	23	22	17	24	23
0.5% Emulsifier YN	33	17	19	24	27	22	22	27	24	19	24
0.5% Emulsifier YN	34	18	21	17	17	15	22	17	19	23	20
0.5% Emulsifier YN	35	18	18	20	21	21	22	22	20	24	22
0.5% Emulsifier YN	36	19	23	9	31	29	21	24	25	25	22
0.5% Emulsifier YN	37	18	17	21	19	27	21	23	26	24	23
0.5% Emulsifier YN	38	20	20	19	26	19	24	16	21	19	25
0.5% Emulsifier YN	39	19	20	20	29	21	24	26	24	22	23
0.5% Emulsifier YN	40	20	19	22	19	20	24	22	22	23	22
0.5% Emulsifier YN	41	20	21	24	22	20	19	23	21	23	21
0.5% Emulsifier YN	42	NOT PREGNANT									
0.5% Emulsifier YN	43	21	18	17	20	25	20	23	24	23	19
0.5% Emulsifier YN	44	18	24	25	29	30	27	23	31	30	30
0.5% Emulsifier YN	45	18	23	31	23	23	26	27	24	27	24
0.5% Emulsifier YN	46	NOT PREGNANT									
0.5% Emulsifier YN	47	19	19	21	26	21	20	22	27	18	23
0.5% Emulsifier YN	48	21	16	20	27	21	17	24	23	16	21
0.5% Emulsifier YN	49	21	19	21	30	23	24	25	25	24	24
0.5% Emulsifier YN	50	14	22	28	24	18	27	25	25	26	25

000162

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2.5% Emulsifier YN	51	21	16	21	26	23	20	23	23	22	21
2.5% Emulsifier YN	52	22	19	22	29	25	24	24	25	23	28
2.5% Emulsifier YN	53	19	24	16	21	23	19	22	23	22	22
2.5% Emulsifier YN	54	19	21	18	21	26	20	22	23	22	21
2.5% Emulsifier YN	55	19	14	20	31	14	22	21	20	20	23
2.5% Emulsifier YN	56	20	21	22	31	24	25	21	25	24	24
2.5% Emulsifier YN	57	20	16	18	29	20	18	24	22	18	18
2.5% Emulsifier YN	58	18	23	17	17	26	21	24	20	24	20
2.5% Emulsifier YN	59	17	18	16	21	26	18	20	19	21	18
2.5% Emulsifier YN	60	19	19	21	18	20	25	19	10	25	23
2.5% Emulsifier YN	61	16	18	14	17	21	18	20	18	18	18
2.5% Emulsifier YN	62	20	22	28	23	25	25	25	22	23	24
2.5% Emulsifier YN	63	22	29	19	25	21	22	25	26	23	25
2.5% Emulsifier YN	64	18	18	14	21	27	17	20	21	24	19
2.5% Emulsifier YN	65	21	20	22	19	20	23	23	21	23	22
2.5% Emulsifier YN	66	NOT PREGNANT									
2.5% Emulsifier YN	67	19	19	17	22	25	20	22	24	24	20
2.5% Emulsifier YN	68	37	28	21	22	20	22	25	26	23	22
2.5% Emulsifier YN	69	24	23	23	21	23	31	25	25	29	28
2.5% Emulsifier YN	70	25	20	26	33	24	29	28	27	25	29
2.5% Emulsifier YN	71	22	23	23	22	26	25	27	26	25	25
2.5% Emulsifier YN	72	19	19	19	27	22	21	25	24	22	24
2.5% Emulsifier YN	73	NOT PREGNANT									
2.5% Emulsifier YN	74	18	21	30	19	20	25	24	20	23	19
2.5% Emulsifier YN	75	NOT PREGNANT									

000163

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
5.0% Emulsifier YN	77	18	16	19	22	18	21	20	20	19	20
5.0% Emulsifier YN	78	20	19	29	25	22	23	26	21	24	21
5.0% Emulsifier YN	79	19	22	15	18	23	20	19	22	21	17
5.0% Emulsifier YN	80	19	21	23	20	24	25	29	23	21	27
5.0% Emulsifier YN	81	21	23	21	24	28	25	27	25	25	24
5.0% Emulsifier YN	82	18	22	17	21	25	22	25	19	22	18
5.0% Emulsifier YN	83	11	27	19	20	30	17	22	23	25	23
5.0% Emulsifier YN	84	28	21	26	24	22	23	28	22	25	23
5.0% Emulsifier YN	85	18	21	23	21	22	27	23	22	24	27
5.0% Emulsifier YN	86	20	24	20	22	29	26	24	24	23	20
5.0% Emulsifier YN	87	19	20	20	25	19	20	21	19	20	20
5.0% Emulsifier YN	88	18	19	18	21	19	20	19	20	20	19
5.0% Emulsifier YN	89	22	16	20	24	20	20	24	23	20	21
5.0% Emulsifier YN	90	21	19	18	21	26	24	21	24	26	22
5.0% Emulsifier YN	91	24	10	32	25	21	22	22	22	18	23
5.0% Emulsifier YN	92	21	18	20	26	21	20	20	23	18	22
5.0% Emulsifier YN	93	19	22	21	22	27	24	22	20	25	21
5.0% Emulsifier YN	94	NOT PREGNANT									
5.0% Emulsifier YN	95	21	24	20	22	32	24	23	23	24	21
5.0% Emulsifier YN	96	26	20	26	24	25	25	27	24	25	24
5.0% Emulsifier YN	97	21	23	20	31	23	26	28	28	23	27
5.0% Emulsifier YN	98	22	20	20	30	19	25	25	24	21	25
5.0% Emulsifier YN	99	17	27	20	23	21	25	22	22	20	20
5.0% Emulsifier YN	100	27	39	27	21	20	5	24	21	20	24

0001164

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0% Control	1	22	27	27	28	21	23	24	30	25	24
0% Control	2	27	23	29	22	22	29	27	27	24	23
0% Control	3	30	24	33	22	21	28	14	44	29	24
0% Control	4	26	28	28	26	23	22	29	28	26	24
0% Control	5	25	28	24	28	19	20	28	27	23	22
0% Control	6	24	30	26	29	23	22	26	28	23	26
0% Control	7	25	25	25	24	28	21	24	26	26	22
0% Control	8	17	22	20	17	24	15	22	22	30	21
0% Control	9	22	22	23	18	21	26	25	24	28	25
0% Control	10	22	24	21	21	23	23	22	25	26	25
0% Control	11	NOT MATED									
0% Control	12	22	22	26	22	18	26	22	27	21	14
0% Control	13	21	26	24	23	23	26	26	21	24	24
0% Control	14	27	24	20	23	22	27	24	27	28	22
0% Control	15	26	22	28	25	20	25	22	24	30	21
0% Control	16	NOT MATED									
0% Control	17	25	23	27	21	20	21	22	25	24	24
0% Control	18	22	22	25	23	20	21	24	22	27	18
0% Control	19	18	27	24	18	24	22	27	26	25	21
0% Control	20	22	24	26	22	25	25	28	28	29	30
0% Control	21	25	32	24	22	29	25	22	30	23	25
0% Control	22	27	31	26	26	29	23	32	33	30	26
0% Control	23	22	28	24	22	24	20	25	33	21	24
0% Control	24	26	24	24	30	23	25	28	21	27	24
0% Control	25	23	19	26	31	24	26	25	29	31	26

000165

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0.5% Emulsifier YN	26	22	26	23	22	22	24	25	26	26	22
0.5% Emulsifier YN	27	24	27	23	20	30	22	30	30	27	25
0.5% Emulsifier YN	28	26	23	25	23	19	21	23	24	31	26
0.5% Emulsifier YN	29	25	29	25	30	29	25	27	32	27	23
0.5% Emulsifier YN	30	NOT PREGNANT									
0.5% Emulsifier YN	31	20	30	21	22	26	23	24	30	26	25
0.5% Emulsifier YN	32	25	23	30	23	24	20	25	26	32	27
0.5% Emulsifier YN	33	21	25	23	25	25	25	25	28	26	24
0.5% Emulsifier YN	34	20	21	20	13	23	19	24	16	19	18
0.5% Emulsifier YN	35	24	26	24	25	23	22	27	28	24	24
0.5% Emulsifier YN	36	24	21	26	25	23	22	24	26	30	23
0.5% Emulsifier YN	37	26	24	28	28	26	25	27	26	30	26
0.5% Emulsifier YN	38	18	25	23	20	19	23	26	33	28	27
0.5% Emulsifier YN	39	23	25	29	24	27	23	29	31	29	25
0.5% Emulsifier YN	40	22	22	21	24	24	23	26	27	26	28
0.5% Emulsifier YN	41	22	23	26	21	23	24	30	25	27	24
0.5% Emulsifier YN	42	NOT PREGNANT									
0.5% Emulsifier YN	43	24	24	25	22	19	23	22	24	29	24
0.5% Emulsifier YN	44	28	30	33	33	34	30	31	33	33	33
0.5% Emulsifier YN	45	31	25	29	27	21	27	30	26	26	25
0.5% Emulsifier YN	46	NOT PREGNANT									
0.5% Emulsifier YN	47	23	22	21	22	23	23	22	26	27	24
0.5% Emulsifier YN	48	26	28	18	19	20	19	22	21	25	19
0.5% Emulsifier YN	49	23	28	24	26	26	18	26	28	25	23
0.5% Emulsifier YN	50	27	25	26	26	21	24	29	25	24	26

000166

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
2.5% Emulsifier YN	51	19	23	22	21	22	21	25	29	23	18
2.5% Emulsifier YN	52	23	25	25	22	26	21	26	26	28	24
2.5% Emulsifier YN	53	23	22	23	22	24	26	24	27	25	21
2.5% Emulsifier YN	54	22	21	26	22	24	21	21	22	26	24
2.5% Emulsifier YN	55	23	25	22	18	23	17	17	19	23	17
2.5% Emulsifier YN	56	26	26	26	25	26	24	26	30	26	27
2.5% Emulsifier YN	57	21	25	19	19	22	15	21	24	25	21
2.5% Emulsifier YN	58	22	22	24	22	24	24	20	23	27	21
2.5% Emulsifier YN	59	20	20	22	19	23	22	22	25	28	21
2.5% Emulsifier YN	60	17	24	21	24	19	24	26	22	25	26
2.5% Emulsifier YN	61	19	20	23	20	21	22	23	23	26	22
2.5% Emulsifier YN	62	22	28	24	26	23	26	25	24	26	24
2.5% Emulsifier YN	63	24	24	28	21	24	27	32	28	22	20
2.5% Emulsifier YN	64	20	22	24	19	21	22	20	23	25	24
2.5% Emulsifier YN	65	21	27	23	26	27	26	28	24	28	27
2.5% Emulsifier YN	66	NOT PREGNANT									
2.5% Emulsifier YN	67	25	23	29	23	20	23	22	26	30	23
2.5% Emulsifier YN	68	24	20	25	20	25	27	24	28	25	27
2.5% Emulsifier YN	69	24	28	20	29	27	24	27	27	31	27
2.5% Emulsifier YN	70	29	30	29	28	27	24	24	31	27	24
2.5% Emulsifier YN	71	25	27	26	23	27	31	26	30	30	30
2.5% Emulsifier YN	72	23	26	22	20	24	25	25	27	29	21
2.5% Emulsifier YN	73	NOT PREGNANT									
2.5% Emulsifier YN	74	25	20	21	20	20	25	28	26	25	23
2.5% Emulsifier YN	75	NOT PREGNANT									

000167

Appendix 6. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
5.0% Emulsifier YN	77	19	22	21	19	24	25	28	26	26	23
5.0% Emulsifier YN	78	27	24	24	24	21	27	25	26	22	22
5.0% Emulsifier YN	79	22	20	25	19	22	23	21	25	28	24
5.0% Emulsifier YN	80	18	24	27	20	22	26	24	27	26	30
5.0% Emulsifier YN	81	25	25	36	27	27	26	28	29	33	28
5.0% Emulsifier YN	82	24	23	28	23	22	24	25	26	28	24
5.0% Emulsifier YN	83	23	26	27	24	23	16	21	26	28	21
5.0% Emulsifier YN	84	27	23	24	24	24	25	30	28	26	32
5.0% Emulsifier YN	85	25	27	24	25	28	23	27	29	27	25
5.0% Emulsifier YN	86	22	25	27	21	23	27	25	28	30	22
5.0% Emulsifier YN	87	21	24	24	20	21	24	24	26	25	23
5.0% Emulsifier YN	88	18	21	19	23	60	21	24	20	21	21
5.0% Emulsifier YN	89	22	25	20	21	24	24	18	29	25	32
5.0% Emulsifier YN	90	28	25	35	24	32	32	23	28	28	26
5.0% Emulsifier YN	91	20	23	21	23	22	23	23	27	27	22
5.0% Emulsifier YN	92	21	26	21	27	21	22	28	29	25	25
5.0% Emulsifier YN	93	21	22	28	20	21	24	25	23	31	24
5.0% Emulsifier YN	94	NOT PREGNANT									
5.0% Emulsifier YN	95	27	26	28	27	28	38	25	35	31	24
5.0% Emulsifier YN	96	26	24	26	23	26	29	29	29	32	30
5.0% Emulsifier YN	97	26	34	25	29	26	22	28	39	29	29
5.0% Emulsifier YN	98	-	-	21	24	23	19	26	30	23	42
5.0% Emulsifier YN	99	22	24	20	20	21	26	23	24	23	24
5.0% Emulsifier YN	100	21	24	26	24	22	22	25	27	24	26

Missing value code:- '-' Value unobtainable.

000168

Appendix 7. Individual water intakes (g/rat/day) of female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (Control), 0.5, 2.5 or 5.0% Emulsifier YN.

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0% Control	1	39	-	-	-	48	53	48	45	43	47
0% Control	2	74	44	50	40	42	41	45	39	45	46
0% Control	3	37	55	60	54	60	51	52	51	56	62
0% Control	4	47	44	52	56	51	48	53	52	50	56
0% Control	5	33	32	40	37	36	40	42	40	39	43
0% Control	6	30	27	35	40	36	31	42	36	37	42
0% Control	7	28	63	31	28	31	32	30	32	34	33
0% Control	8	36	-	-	37	38	34	33	44	49	46
0% Control	9	26	36	37	44	34	34	35	36	38	41
0% Control	10	22	38	36	30	-	-	-	33	-	34
0% Control	11	NOT MATED									
0% Control	12	32	36	49	52	38	44	42	45	41	52
0% Control	13	38	36	40	46	48	61	52	66	48	52
0% Control	14	34	42	48	43	42	56	55	57	58	71
0% Control	15	37	57	28	27	33	29	27	46	42	40
0% Control	16	NOT MATED									
0% Control	17	28	35	32	30	35	35	31	50	50	50
0% Control	18	30	34	42	49	52	48	60	40	38	41
0% Control	19	34	35	36	41	39	38	50	49	53	60
0% Control	20	35	48	50	54	47	51	49	48	47	49
0% Control	21	33	29	30	38	30	35	31	37	29	38
0% Control	22	46	40	47	51	54	65	43	51	47	54
0% Control	23	42	32	43	52	51	60	33	35	34	35
0% Control	24	25	31	35	38	40	43	43	57	45	44
0% Control	25	47	64	57	55	57	60	66	58	60	65

Missing value code:- '-' Value unobtainable.

0001169

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
0.5% Emulsifier YN	26	31	29	32	39	35	36	40	42	46	47
0.5% Emulsifier YN	27	44	36	46	49	50	65	42	39	37	49
0.5% Emulsifier YN	28	47	58	39	43	50	55	63	43	42	44
0.5% Emulsifier YN	29	30	28	31	39	31	32	33	31	36	37
0.5% Emulsifier YN	30	NOT PREGNANT									
0.5% Emulsifier YN	31	33	30	43	46	38	36	55	54	52	50
0.5% Emulsifier YN	32	38	48	46	53	60	67	64	50	53	52
0.5% Emulsifier YN	33	27	29	31	34	34	35	34	33	27	34
0.5% Emulsifier YN	34	32	41	38	36	40	42	36	37	41	41
0.5% Emulsifier YN	35	26	25	26	30	30	29	28	28	29	30
0.5% Emulsifier YN	36	39	59	30	37	38	35	33	35	39	39
0.5% Emulsifier YN	37	29	33	29	31	39	34	31	37	36	33
0.5% Emulsifier YN	38	31	31	36	44	37	36	12	42	29	38
0.5% Emulsifier YN	39	28	34	28	40	34	34	34	38	-	34
0.5% Emulsifier YN	40	26	31	36	34	36	39	43	44	34	38
0.5% Emulsifier YN	41	32	37	51	49	45	37	32	26	36	37
0.5% Emulsifier YN	42	NOT PREGNANT									
0.5% Emulsifier YN	43	49	64	42	41	40	41	38	49	54	47
0.5% Emulsifier YN	44	45	66	37	38	41	40	41	47	54	53
0.5% Emulsifier YN	45	36	46	53	54	53	60	52	43	51	61
0.5% Emulsifier YN	46	NOT PREGNANT									
0.5% Emulsifier YN	47	27	28	33	34	33	58	34	33	30	37
0.5% Emulsifier YN	48	29	25	39	40	37	33	45	42	39	43
0.5% Emulsifier YN	49	39	39	42	56	50	49	50	49	46	49
0.5% Emulsifier YN	50	30	48	53	52	55	45	39	37	41	43

Missing value code:- '-' Value unobtainable.

000170

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
2.5% Emulsifier YN	51	44	34	42	50	37	44	46	42	37	41
2.5% Emulsifier YN	52	33	31	36	41	36	33	12	64	32	42
2.5% Emulsifier YN	53	47	62	38	44	48	53	55	42	45	38
2.5% Emulsifier YN	54	32	38	34	38	45	40	41	63	56	58
2.5% Emulsifier YN	55	35	29	41	48	40	43	45	41	35	41
2.5% Emulsifier YN	56	32	34	40	46	44	38	40	40	40	43
2.5% Emulsifier YN	57	57	36	53	59	56	66	36	35	29	32
2.5% Emulsifier YN	58	29	40	36	34	39	35	37	51	47	52
2.5% Emulsifier YN	59	28	30	28	35	38	30	32	34	36	34
2.5% Emulsifier YN	60	33	39	42	39	38	53	76	-	47	41
2.5% Emulsifier YN	61	29	37	31	33	37	39	32	33	32	33
2.5% Emulsifier YN	62	30	35	44	39	41	37	40	35	42	40
2.5% Emulsifier YN	63	34	40	35	38	39	36	35	38	38	41
2.5% Emulsifier YN	64	37	44	35	43	48	36	38	36	45	38
2.5% Emulsifier YN	65	25	28	30	30	30	32	32	30	34	31
2.5% Emulsifier YN	66	NOT PREGNANT									
2.5% Emulsifier YN	67	34	38	38	50	49	45	49	38	39	37
2.5% Emulsifier YN	68	32	48	41	43	48	45	40	46	45	52
2.5% Emulsifier YN	69	38	43	-	37	35	47	40	39	54	54
2.5% Emulsifier YN	70	43	37	48	57	48	48	50	47	45	50
2.5% Emulsifier YN	71	25	34	39	32	39	40	42	37	41	44
2.5% Emulsifier YN	72	30	30	30	33	29	30	39	38	34	35
2.5% Emulsifier YN	73	NOT PREGNANT									
2.5% Emulsifier YN	74	26	33	51	47	37	44	39	35	40	41
2.5% Emulsifier YN	75	NOT PREGNANT									

Missing value code:- '-' Value unobtainable.

000171

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
5.0% Emulsifier YN	77	33	28	37	39	36	36	35	39	32	36
5.0% Emulsifier YN	78	24	32	39	35	34	38	39	31	35	41
5.0% Emulsifier YN	79	35	45	41	37	48	43	39	41	41	35
5.0% Emulsifier YN	80	29	43	55	47	52	58	38	33	30	42
5.0% Emulsifier YN	81	28	41	40	40	48	47	44	52	55	56
5.0% Emulsifier YN	82	36	43	39	42	53	53	54	46	40	33
5.0% Emulsifier YN	83	36	38	33	36	45	36	39	42	47	46
5.0% Emulsifier YN	84	36	41	48	37	41	38	41	40	41	50
5.0% Emulsifier YN	85	39	45	57	36	33	41	36	34	41	42
5.0% Emulsifier YN	86	32	42	46	48	58	65	56	44	37	36
5.0% Emulsifier YN	87	37	32	30	34	40	37	34	27	29	29
5.0% Emulsifier YN	88	31	30	35	42	38	42	50	49	46	49
5.0% Emulsifier YN	89	30	26	34	37	33	32	38	41	34	40
5.0% Emulsifier YN	90	47	59	40	45	53	41	47	47	45	38
5.0% Emulsifier YN	91	57	41	49	56	58	62	47	49	48	56
5.0% Emulsifier YN	92	28	29	27	32	31	29	41	40	37	38
5.0% Emulsifier YN	93	37	57	32	31	40	39	38	32	31	33
5.0% Emulsifier YN	94	NOT PREGNANT									
5.0% Emulsifier YN	95	41	47	43	50	63	58	61	45	43	39
5.0% Emulsifier YN	96	36	39	44	42	43	45	33	44	42	39
5.0% Emulsifier YN	97	37	47	44	53	40	49	45	48	48	51
5.0% Emulsifier YN	98	33	-	-	-	-	34	38	33	29	34
5.0% Emulsifier YN	99	32	43	38	37	37	37	32	35	45	45
5.0% Emulsifier YN	100	63	-	-	67	62	68	56	52	45	47

Missing value code:- '-' Value unobtainable.

000172

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0% Control	1	52	79	77	95	80	58	58	67	69	65
0% Control	2	56	51	61	51	53	58	60	59	61	57
0% Control	3	60	54	78	65	47	53	65	63	66	62
0% Control	4	68	78	61	71	68	63	68	74	73	69
0% Control	5	47	55	44	50	42	45	52	56	51	53
0% Control	6	43	51	49	48	48	44	49	58	51	49
0% Control	7	38	38	41	37	39	33	38	40	43	36
0% Control	8	47	59	50	51	50	43	45	48	53	48
0% Control	9	49	48	48	40	47	50	58	69	60	51
0% Control	10	33	35	-	35	-	38	41	41	38	38
0% Control	11	NOT MATED									
0% Control	12	74	49	58	63	50	57	59	59	67	56
0% Control	13	58	66	67	57	52	52	62	53	59	53
0% Control	14	56	47	48	53	53	55	59	60	60	48
0% Control	15	50	51	35	46	50	52	41	44	52	51
0% Control	16	NOT MATED									
0% Control	17	54	60	57	47	61	58	53	56	61	69
0% Control	18	48	49	57	49	46	58	53	60	60	60
0% Control	19	54	63	55	64	63	49	54	56	56	53
0% Control	20	56	51	94	63	56	64	72	81	86	76
0% Control	21	38	46	37	34	42	34	42	43	34	42
0% Control	22	62	59	45	40	52	43	54	59	52	47
0% Control	23	41	46	44	53	52	47	47	60	46	55
0% Control	24	50	48	55	55	43	59	60	47	56	60
0% Control	25	75	74	74	73	73	84	77	77	72	69

Missing value code:- '-' Value unobtainable.

000173

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
0.5% Emulsifier YN	26	50	44	40	40	41	43	43	46	46	43
0.5% Emulsifier YN	27	51	45	59	63	71	48	61	56	56	39
0.5% Emulsifier YN	28	55	57	64	56	56	61	58	58	68	65
0.5% Emulsifier YN	29	40	55	45	59	58	44	45	56	52	49
0.5% Emulsifier YN	30	NOT PREGNANT									
0.5% Emulsifier YN	31	63	41	45	49	54	53	53	63	59	55
0.5% Emulsifier YN	32	56	63	76	69	82	82	66	64	76	70
0.5% Emulsifier YN	33	39	44	40	38	38	37	43	44	43	41
0.5% Emulsifier YN	34	52	47	58	33	47	49	55	51	51	47
0.5% Emulsifier YN	35	37	32	35	34	38	39	39	44	38	41
0.5% Emulsifier YN	36	41	45	42	61	52	43	41	41	56	45
0.5% Emulsifier YN	37	45	48	51	49	42	44	46	48	53	45
0.5% Emulsifier YN	38	40	44	44	53	55	47	51	63	64	57
0.5% Emulsifier YN	39	33	38	40	30	40	36	41	46	47	44
0.5% Emulsifier YN	40	36	40	38	41	39	40	42	45	43	48
0.5% Emulsifier YN	41	51	52	63	50	47	45	58	58	61	56
0.5% Emulsifier YN	42	NOT PREGNANT									
0.5% Emulsifier YN	43	60	66	59	48	53	56	46	61	61	55
0.5% Emulsifier YN	44	54	60	59	55	64	64	58	60	59	67
0.5% Emulsifier YN	45	66	55	69	69	52	59	63	62	56	56
0.5% Emulsifier YN	46	NOT PREGNANT									
0.5% Emulsifier YN	47	38	42	38	42	41	39	44	50	55	46
0.5% Emulsifier YN	48	53	49	47	51	49	40	56	64	55	49
0.5% Emulsifier YN	49	56	54	47	54	58	49	55	65	63	58
0.5% Emulsifier YN	50	64	55	71	68	52	56	69	72	69	61

000174

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
2.5% Emulsifier YN	51	52	52	45	43	47	52	49	55	51	44
2.5% Emulsifier YN	52	43	49	43	41	47	45	50	49	51	46
2.5% Emulsifier YN	53	45	51	50	44	48	51	51	56	55	54
2.5% Emulsifier YN	54	60	70	48	43	42	39	46	42	47	51
2.5% Emulsifier YN	55	49	48	42	45	49	39	53	58	60	45
2.5% Emulsifier YN	56	51	47	49	40	47	46	47	53	51	50
2.5% Emulsifier YN	57	43	48	40	39	43	32	41	50	91	67
2.5% Emulsifier YN	58	52	59	46	43	45	48	43	48	45	46
2.5% Emulsifier YN	59	41	41	40	35	38	43	48	34	47	41
2.5% Emulsifier YN	60	35	48	57	52	45	50	54	50	52	58
2.5% Emulsifier YN	61	38	43	46	41	42	46	48	45	47	48
2.5% Emulsifier YN	62	51	47	46	48	44	54	52	55	49	48
2.5% Emulsifier YN	63	38	42	51	47	45	54	48	54	52	47
2.5% Emulsifier YN	64	42	53	50	39	39	48	46	49	52	54
2.5% Emulsifier YN	65	36	39	41	42	42	49	48	42	46	47
2.5% Emulsifier YN	66	NOT PREGNANT									
2.5% Emulsifier YN	67	49	50	47	46	46	54	51	56	61	55
2.5% Emulsifier YN	68	54	54	55	49	53	57	58	63	60	59
2.5% Emulsifier YN	69	55	63	63	59	60	68	77	58	66	71
2.5% Emulsifier YN	70	64	60	52	55	56	52	54	63	72	62
2.5% Emulsifier YN	71	45	48	49	48	47	56	53	54	52	54
2.5% Emulsifier YN	72	39	41	41	36	42	44	48	48	47	42
2.5% Emulsifier YN	73	NOT PREGNANT									
2.5% Emulsifier YN	74	52	44	45	46	40	50	53	52	55	43
2.5% Emulsifier YN	75	NOT PREGNANT									

000175

Appendix 7. (Continued).

Group	Animal number	Days of pregnancy 10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
5.0% Emulsifier YN	77	39	44	44	40	49	48	48	52	52	48
5.0% Emulsifier YN	78	48	40	43	43	38	46	47	47	35	37
5.0% Emulsifier YN	79	44	54	65	58	70	78	57	71	75	81
5.0% Emulsifier YN	80	33	45	48	39	37	53	48	47	48	47
5.0% Emulsifier YN	81	68	71	76	68	70	77	64	72	83	83
5.0% Emulsifier YN	82	44	45	48	43	40	57	58	61	62	57
5.0% Emulsifier YN	83	49	52	55	49	53	59	52	55	61	67
5.0% Emulsifier YN	84	62	50	53	50	50	58	78	72	66	63
5.0% Emulsifier YN	85	42	47	47	52	51	60	65	54	53	58
5.0% Emulsifier YN	86	48	47	50	43	44	55	49	56	55	52
5.0% Emulsifier YN	87	34	46	45	43	48	40	38	45	47	42
5.0% Emulsifier YN	88	57	55	47	48	50	49	52	46	52	53
5.0% Emulsifier YN	89	50	45	39	39	42	36	46	53	43	44
5.0% Emulsifier YN	90	50	53	54	45	47	60	54	63	69	59
5.0% Emulsifier YN	91	58	51	48	45	44	50	54	61	63	59
5.0% Emulsifier YN	92	44	40	32	26	28	31	43	45	41	43
5.0% Emulsifier YN	93	35	33	48	44	50	58	50	45	55	60
5.0% Emulsifier YN	94	NOT PREGNANT									
5.0% Emulsifier YN	95	47	51	36	48	48	65	49	60	62	54
5.0% Emulsifier YN	96	47	42	40	51	46	54	52	56	60	55
5.0% Emulsifier YN	97	57	66	48	52	56	51	66	76	68	67
5.0% Emulsifier YN	98	40	48	39	43	47	40	46	57	51	42
5.0% Emulsifier YN	99	39	44	43	38	46	51	50	53	57	48
5.0% Emulsifier YN	100	61	72	66	64	62	66	64	77	76	67

000176

Appendix 8. Mating record

Dam No.	Male No.	Temporary female No.	Sperm in vaginal smear	Plug	Date found 1993 (day 0)	Pregnancy status	Treatment level
1	145	100		+ve	19/8	P	0% (Control)
2	119	49		+ve	20/8	P	"
3	137	86		+ve	20/8	P	"
4	125	95		+ve	19/8	P	"
5	132	19		+ve	19/8	P	"
6	200	80		+ve	19/8	P	"
7	115	67		+ve	18/8	P	"
8	176	6		+ve	18/8	P	"
9	128	94		+ve	2/9	P	"
10	117	26		+ve	3/9	P	"
11	144	90		NF		NM	"
12	148	75		+ve	2/9	*	"
13	192	52	+ve	+ve	17/8	P	"
14	187	78		+ve	20/8	P	"
15	158	44		+ve	18/8	P	"
16	130	92		NF		NM	"
17	174	33		+ve	18/8	P	"
18	134	35		+ve	18/8	P	"
19	140	5		+ve	19/8	P	"
20	169	60		+ve	3/9	P	"
21	175	37		+ve	19/8	P	"
22	108	3		+ve	19/8	P	"
23	107	18		+ve	19/8	P	"
24	159	30		+ve	17/8	P	"
25	160	41		+ve	4/9	P	"
26	199	93	+ve	+ve	19/8	P	0.5% Emulsifier YN
27	167	1		+ve	19/8	P	"
28	143	11		+ve	18/8	P	"
29	135	76		+ve	19/8	P	"
30	156	88		+ve	17/8	NP	"
31	165	34		+ve	19/8	P	"
32	155	24		+ve	18/8	P	"
33	103	61		+ve	19/8	P	"

continued....

Appendix 8. continued

Dam No.	Male No.	Temporary female No.	Sperm in vaginal smear	Plug	Date found 1993 (day 0)	Pregnancy status	Treatment level
34	116	36		+ve	21/8	P	0.5% Emulsifier YN
35	114	15		+ve	19/8	P	"
36	168	43		+ve	18/8	P	"
37	131	57		+ve	18/8	P	"
38	185	99		+ve	19/8	P	"
39	178	64		+ve	19/8	P	"
40	188	7		+ve	17/8	P	"
41	153	63		+ve	20/8	P	"
42	172	10	+ve	+ve	20/8	NP	"
43	186	46		+ve	18/8	P	"
44	150	58		+ve	18/8	P	"
45	166	38	+ve	+ve	20/8	P	"
46	189	25		+ve	17/8	NP	"
47	120	48		+ve	19/8	P	"
48	177	8		+ve	19/8	P	"
49	123	4		+ve	19/8	P	"
50	129	79		+ve	20/8	P	"
51	126	50		+ve	19/8	P	2.5% Emulsifier YN
52	198	77		+ve	19/8	P	"
53	106	45		+ve	18/8	P	"
54	105	83		+ve	18/8	P	"
55	194	98		+ve	19/8	P	"
56	171	42	+ve	+ve	19/8	P	"
57	111	54		+ve	19/8	P	"
58	157	72	+ve	+ve	18/8	P	"
59	110	82		+ve	18/8	P	"
60	133	53	+ve	+ve	17/8	P	"
61	197	47		+ve	18/8	P	"
62	104	84		+ve	20/8	P	"
63	164	40		+ve	21/8	P	"
64	146	70		+ve	18/8	P	"

continued....

Appendix 8. continued

Dam No.	Male No.	Temporary female No.	Sperm in vaginal smear	Plug	Date found 1993 (day 0)	Pregnancy status	Treatment level
65	182	2		+ve	17/8	P	2.5% Emulsifier YN
66	113	29	+ve	+ve	24/8	NP	"
67	184	87	+ve	+ve	18/8	P	"
68	139	66		+ve	21/8	P	"
69	112	14		+ve	17/8	P	"
70	152	59		+ve	19/8	P	"
71	109	17	+ve	+ve	24/8	P	"
72	180	96		+ve	19/8	P	"
73	127	91	+ve	+ve	18/8	NP	"
74	102	23	+ve	+ve	20/8	P	"
75	190	13		+ve	17/8	NP	"
76	193	68			N/F	S	5.0% Emulsifier YN
77	101	31		+ve	19/8	P	"
78	173	27		+ve	20/8	P	"
79	183	16		+ve	18/8	P	"
80	162	51		+ve	24/8	P	"
81	136	81		+ve	18/8	P	"
82	138	69		+ve	18/8	P	"
83	151	65		+ve	18/8	P	"
84	122	28		+ve	20/8	P	"
85	191	97		+ve	17/8	P	"
86	121	32		+ve	18/8	P	"
87	170	9		+ve	19/8	P	"
88	154	71		+ve	19/8	P	"
89	142	62		+ve	19/8	P	"
90	147	12		+ve	18/8	P	"
91	149	20		+ve	19/8	P	"
92	124	55		+ve	19/8	P	"
93	161	21		+ve	18/8	P	"
94	118	39	+ve	+ve	20/8	NP	"
95	181	74	+ve	+ve	18/8	P	"
96	141	22		+ve	26/8	P	"

continued....

Appendix 8. continued

Dam No.	Male No.	Temporary female No.	Sperm in vaginal smear	Plug	Date found 1993 (day 0)	Pregnancy status	Treatment level
97	163	89	..	+ve	19/8	P	5.0% Emulsifier YN
98	179	73		+ve	19/8	P	"
99	196	85	+ve	+ve	21/8	P	"
100	195	56		+ve	19/8	P	"

NM = Did not mate
S = Sacrificed
NF = Not found
+ve = Present
P = Pregnant
NP = Not pregnant } From necropsy observations
* = All foetuses early or late resorptions }

NOTE: Vaginal smears were only examined for presence of sperm if a vaginal plug was absent, but plugs were noticed on the paper under the cage.

Appendix 9. Individual litter data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (control), 0.5, 2.5 or 5.0% Emulsifier YN.

Dam number	Number of foetuses	Number of males	Number of females	Ratio Males/Females	Litter weight (g)	Mean foetal weight (g)	Mean foetal weight (males) (g)	Mean foetal weight (females) (g)	Uterine weight (g)
0% Control									
1	14	9	5	1.80	55.170	3.941	3.962	3.902	85.69
2	15	7	8	0.88	58.030	3.869	3.921	3.822	88.50
3	14	10	4	2.50	57.250	4.089	4.175	3.875	85.06
4	15	10	5	2.00	55.850	3.723	3.698	3.774	87.75
5	10	3	7	0.43	35.840	3.584	3.570	3.590	59.33
6	6	2	4	0.50	25.400	4.233	4.155	4.273	40.22
7	11	7	4	1.75	39.070	3.552	3.624	3.425	65.92
8	14	9	5	1.80	50.220	3.587	3.674	3.430	80.76
9	15	8	7	1.14	58.120	3.875	3.971	3.764	86.80
10	16	8	8	1.00	58.610	3.663	3.688	3.639	91.88
12	0*	-	-	-	-	-	-	-	-
13	12	6	6	1.00	46.185	3.849	3.957	3.740	71.33
14	12	5	7	0.71	47.460	3.955	4.024	3.906	82.50
15	12	7	5	1.40	47.980	3.998	4.081	3.882	73.71
17	10	6	4	1.50	37.300	3.730	3.905	3.467	58.37
18	16	6	10	0.60	66.550	4.159	4.382	4.026	93.81
19	11	5	6	0.83	46.810	4.255	4.328	4.195	74.71
20	16	6	10	0.60	55.140	3.446	3.547	3.386	85.70
21	17	5	12	0.42	62.770	3.692	3.690	3.693	98.35
22	17	8	9	0.89	67.860	3.992	4.054	3.937	97.66
23	14	8	6	1.33	60.950	4.354	4.516	4.137	88.92
24	12	7	5	1.40	43.279	3.607	3.611	3.601	69.03
25	16	9	7	1.29	61.030	3.814	3.891	3.716	94.39

* All early or late resorptions - no dead or alive foetuses.
Missing value code:- '-' Value unobtainable.

000181

Appendix 9. (Continued).

Dam number	Number of foetuses	Number of males	Number of females	Ratio Males/Females	Litter weight (g)	Mean foetal weight (g)	Mean foetal weight (males) (g)	Mean foetal weight (females) (g)	Uterine weight (g)
0.5% Emulsifier YN									
26	14	4	10	0.40	52.150	3.725	3.878	3.664	82.00
27	16	8	8	1.00	64.380	4.024	4.153	3.895	99.31
28	15	8	7	1.14	54.580	3.639	3.786	3.470	85.12
29	17	10	7	1.43	65.060	3.827	3.935	3.673	98.20
30	NOT PREGNANT								
31	16	9	7	1.29	63.380	3.961	4.034	3.867	93.00
32	14	10	4	2.50	57.170	4.084	3.987	4.325	86.81
33	14	11	3	3.67	54.370	3.884	3.926	3.727	81.75
34	15	9	6	1.50	49.750	3.317	3.362	3.248	81.02
35	14	11	3	3.67	56.940	4.067	4.065	4.073	87.91
36	13	8	5	1.60	49.400	3.800	3.787	3.820	78.03
37	6	2	4	0.50	25.380	4.230	4.435	4.128	38.84
38	12	8	4	2.00	51.690	4.308	4.418	4.088	79.10
39	14	7	7	1.00	49.610	3.544	3.666	3.421	80.77
40	15	7	8	0.88	56.680	3.779	3.851	3.715	84.72
41	17	10	7	1.43	63.070	3.710	3.841	3.523	98.41
42	NOT PREGNANT								
43	14	10	4	2.50	50.040	3.574	3.717	3.217	80.31
44	11	5	6	0.83	41.260	3.751	3.760	3.743	54.20
45	15	9	6	1.50	58.920	3.928	4.119	3.642	88.90
46	NOT PREGNANT								
47	12	5	7	0.71	45.580	3.798	3.846	3.764	71.62
48	14	5	9	0.56	50.700	3.621	3.730	3.561	81.51
49	13	7	6	1.17	51.690	3.976	4.030	3.913	77.08
50	12	5	7	0.71	43.070	3.589	3.604	3.579	67.62

000182

Appendix 9. (Continued).

Dam number	Number of foetuses	Number of males	Number of females	Ratio Males/Females	Litter weight (g)	Mean foetal weight (g)	Mean foetal weight (males) (g)	Mean foetal weight (females) (g)	Uterine weight (g)
2.5% Emulsifier YN									
51	16	8	8	1.00	68.320	4.270	4.314	4.226	97.78
52	15	8	7	1.14	61.120	4.075	4.086	4.061	88.73
53	13	8	5	1.60	51.000	3.923	4.003	3.796	76.92
54	10	5	5	1.00	39.880	3.988	4.008	3.968	61.94
55	12	5	7	0.71	43.920	3.660	3.964	3.443	70.68
56	13	7	6	1.17	56.140	4.318	4.399	4.225	81.88
57	14	8	6	1.33	54.040	3.860	3.918	3.783	82.36
58	14	4	10	0.40	54.620	3.901	4.035	3.848	84.42
59	11	6	5	1.20	44.020	4.002	4.150	3.824	62.93
60	11	7	4	1.75	39.990	3.635	3.676	3.565	62.43
61	10	7	3	2.33	42.670	4.267	4.289	4.217	64.61
62	14	7	7	1.00	50.750	3.625	3.754	3.496	78.51
63	11	4	7	0.57	40.860	3.715	3.810	3.660	64.40
64	15	4	11	0.36	56.590	3.773	3.845	3.746	88.73
65	13	8	5	1.60	53.820	4.140	4.270	3.932	78.92
66	NOT PREGNANT								
67	12	7	5	1.40	50.260	4.188	4.344	3.970	73.72
68	15	8	7	1.14	56.470	3.765	3.871	3.643	85.30
69	13	9	4	2.25	53.110	4.085	4.094	4.065	81.21
70	8	5	3	1.67	32.460	4.057	4.110	3.970	-
71	18	9	9	1.00	69.310	3.851	3.957	3.744	105.02
72	14	2	12	0.17	57.230	4.088	4.090	4.088	84.73
73	NOT PREGNANT								
74	15	6	9	0.67	54.910	3.661	3.828	3.549	85.58
75	NOT PREGNANT								

Missing value code:- '-' Value unobtainable.

000183

Appendix 9. (Continued).

Dam number	Number of foetuses	Number of males	Number of females	Ratio Males/Females	Litter weight (g)	Mean foetal weight (g)	Mean foetal weight (males) (g)	Mean foetal weight (females) (g)	Uterine weight (g)
5.0% Emulsifier YN									
77	15	10	5	2.00	54.330	3.622	3.739	3.388	85.55
78	10	5	5	1.00	38.530	3.853	4.064	3.642	60.68
79	5	4	1	4.00	15.200	3.040	3.040	3.040	34.40
80	16	9	7	1.29	63.180	3.949	4.039	3.833	96.82
81	17	10	7	1.43	68.960	4.056	4.126	3.957	105.30
82	8	6	2	3.00	33.110	4.139	4.243	3.825	51.10
83	15	6	9	0.67	56.160	3.744	4.013	3.564	89.62
84	10	5	5	1.00	38.780	3.878	3.858	3.898	56.08
85	12	5	7	0.71	53.900	4.492	4.640	4.386	85.34
86	14	6	8	0.75	51.050	3.646	3.760	3.561	81.48
87	12	6	6	1.00	48.550	4.046	4.140	3.952	73.49
88	14	9	5	1.80	52.880	3.777	3.839	3.666	82.51
89	12	5	7	0.71	50.290	4.191	4.172	4.204	77.26
90	15	7	8	0.88	63.210	4.214	4.390	4.060	94.18
91	16	5	11	0.45	59.830	3.739	3.784	3.719	90.35
92	9	5	4	1.25	38.750	4.306	4.400	4.187	58.71
93	15	6	9	0.67	59.460	3.964	4.095	3.877	88.26
94	NOT PREGNANT								
95	11	9	2	4.50	41.770	3.797	3.872	3.460	67.33
96	19	11	8	1.38	75.300	3.963	4.056	3.835	108.55
97	16	8	8	1.00	64.560	4.035	4.089	3.981	99.12
98	14	8	6	1.33	54.860	3.919	3.969	3.852	82.97
99	17	7	10	0.70	58.550	3.444	3.531	3.383	90.75
100	2	1	1	1.00	9.470	4.735	4.820	4.650	16.96

000184

Appendix 10. Individual uterine data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0 (control), 0.5, 2.5 or 5.0% Emulsifier YN.

Dam number	Number of Corpora Lutea		Number of Implantations		Number of Pre-Implantation Losses	Number of resorptions Early		Number of resorptions Late		Number of Post-Implantation Losses	Live Foetuses Number		Live Foetuses % of Implantations
	Left	Right	Left	Right		Left	Right	Left	Right		Left	Right	
0% Control													
1	7	7	7	7	0	0	0	0	0	0	7	7	100.0
2	6	7	6	9	-	0	0	0	0	0	6	9	100.0
3	7	7	7	7	0	0	0	0	0	0	7	7	100.0
4	8	8	8	7	1	0	0	0	0	0	8	7	100.0
5	11	7	10	7	1	0	0	4	3	7	6	4	58.8
6	9	6	1	5	9	0	0	0	0	0	1	5	100.0
7	7	8	7	7	1	2	1	0	0	3	5	6	78.6
8	7	8	7	8	0	1	0	0	0	1	6	8	93.3
9	12	6	11	6	1	2	0	0	0	2	9	6	88.2
10	7	8	7	9	-	0	0	0	0	0	7	9	100.0
12	12	10	4	6	12	3	6	1	0	10	0*	0*	0.0*
13	4	8	4	8	0	0	0	0	0	0	4	8	100.0
14	7	11	6	11	1	0	0	1	3	4	5	7	70.6
15	7	6	7	6	0	0	0	1	0	1	6	6	92.3
17	5	7	4	7	1	1	0	0	0	1	3	7	90.9
18	6	11	5	11	1	0	0	0	0	0	5	11	100.0
19	6	5	6	5	0	0	0	0	0	0	6	5	100.0
20	6	11	5	11	1	0	0	0	0	0	5	11	100.0
21	12	6	11	6	1	0	0	0	0	0	11	6	100.0
22	6	11	6	11	0	0	0	0	0	0	6	11	100.0
23	6	8	6	8	0	0	0	0	0	0	6	8	100.0
24	9	5	9	5	0	0	0	1	1	2	8	4	85.7
25	12	7	12	7	0	3	0	0	0	3	9	7	84.2

* All early or late resorptions - no dead or alive foetuses.
Missing value code:- '-' Value unobtainable.

000185

Appendix 10. (Continued).

Dam number	Number of Corpora Lutea		Number of Implantations		Number of Pre-Implantation Losses	Number of resorptions Early		Number of resorptions Late		Number of Post-Implantation Losses	Live Foetuses Number		Live Foetuses % of Implantations
	Left	Right	Left	Right		Left	Right	Left	Right		Left	Right	
0.5% Emulsifier YN													
26	7	13	7	7	6	0	0	0	0	0	7	7	100.0
27	12	5	12	5	0	1	0	0	0	1	11	5	94.1
28	11	6	10	6	1	0	1	0	0	1	10	5	93.8
29	11	8	11	7	1	0	1	0	0	1	11	6	94.4
30	NOT PREGNANT												
31	10	7	9	7	1	0	0	0	0	0	9	7	100.0
32	4	14	5	11	-	0	0	0	2	2	5	9	87.5
33	6	9	4	10	-	0	0	0	0	0	4	10	100.0
34	8	7	8	7	0	0	0	0	0	0	8	7	100.0
35	8	9	5	9	3	0	0	0	0	0	5	9	100.0
36	8	7	8	5	2	0	0	0	0	0	8	5	100.0
37	6	5	6	2	3	1	1	0	0	2	5	1	75.0
38	12	5	8	4	5	0	0	0	0	0	8	4	100.0
39	9	6	9	6	0	0	1	0	0	1	9	5	93.3
40	6	10	6	10	0	0	1	0	0	1	6	9	93.8
41	6	7	8	10	-	0	0	0	1	1	8	9	94.4
42	NOT PREGNANT												
43	8	6	8	6	0	0	0	0	0	0	8	6	100.0
44	7	4	7	4	0	0	0	0	0	0	7	4	100.0
45	10	6	9	6	1	0	0	0	0	0	9	6	100.0
46	NOT PREGNANT												
47	10	5	9	4	2	0	0	1	0	1	8	4	92.3
48	7	13	6	8	6	0	0	0	0	0	6	8	100.0
49	7	8	7	6	2	0	0	0	0	0	7	6	100.0
50	7	8	4	8	3	0	0	0	0	0	4	8	100.0

Missing value code:- '-' Value unobtainable.

000186

Appendix 10. (Continued).

Dam number	Number of Corpora Lutea		Number of Implantations		Number of Pre-Implantation Losses	Number of resorptions Early		Number of resorptions Late		Number of Post-Implantation Losses	Live Foetuses Number		Live Foetuses % of Implantations
	Left	Right	Left	Right		Left	Right	Left	Right		Left	Right	
2.5% Emulsifier YN													
51	8	8	8	8	0	0	0	0	0	0	8	8	100.0
52	12	3	12	3	0	0	0	0	0	0	12	3	100.0
53	9	5	9	4	1	0	0	0	0	0	9	4	100.0
54	7	3	7	3	0	0	0	0	0	0	7	3	100.0
55	10	4	10	2	2	0	0	0	0	0	10	2	100.0
56	7	8	7	6	2	0	0	0	0	0	7	6	100.0
57	5	10	5	9	1	0	0	0	0	0	5	9	100.0
58	7	7	7	7	0	0	0	0	0	0	7	7	100.0
59	7	5	7	5	0	1	0	0	0	1	6	5	91.7
60	7	4	7	4	0	0	0	0	0	0	7	4	100.0
61	2	6	5	5	-	0	0	0	0	0	5	5	100.0
62	6	10	5	10	1	1	0	0	0	1	4	10	93.3
63	3	5	3	8	-	0	0	0	0	0	3	8	100.0
64	4	12	4	11	1	0	0	0	0	0	4	11	100.0
65	8	5	8	5	0	0	0	0	0	0	8	5	100.0
66	NOT PREGNANT												
67	5	8	5	7	1	0	0	0	0	0	5	7	100.0
68	9	7	8	7	1	0	0	0	0	0	8	7	100.0
69	9	6	7	6	2	0	0	0	0	0	7	6	100.0
70	5	7	4	5	3	0	0	0	0	0	4	4	88.9
71	9	9	9	9	0	0	0	0	0	0	9	9	100.0
72	8	8	8	6	2	0	0	0	0	0	8	6	100.0
73	NOT PREGNANT												
74	6	6	9	7	-	1	0	0	0	1	8	7	93.8
75	NOT PREGNANT												

Missing value code:- '-' Value unobtainable.

0001187

Appendix 10. (Continued).

Dam number	Number of Corpora Lutea		Number of Implantations		Number of Pre-Implantation Losses	Number of resorptions Early		Number of resorptions Late		Number of Post-Implantation Losses	Live Foetuses Number		Live Foetuses % of Implantations
	Left	Right	Left	Right		Left	Right	Left	Right		Left	Right	
5.0% Emulsifier YN													
77	3	10	4	11	-	0	0	0	0	0	4	11	100.0
78	6	7	4	8	1	1	0	0	1	2	3	7	83.3
79	8	6	3	2	9	0	0	0	0	0	3	2	100.0
80	9	7	9	7	0	0	0	0	0	0	9	7	100.0
81	10	7	10	7	0	0	0	0	0	0	10	7	100.0
82	6	9	7	5	-	3	1	0	0	4	4	4	66.7
83	8	8	7	8	1	0	0	0	0	0	7	8	100.0
84	3	8	3	7	1	0	0	0	0	0	3	7	100.0
85	8	4	8	4	0	0	0	0	0	0	8	4	100.0
86	8	6	9	6	-	0	1	0	0	1	9	5	93.3
87	4	8	3	9	-	0	0	0	0	0	3	9	100.0
88	9	6	9	5	1	0	0	0	0	0	9	5	100.0
89	5	8	5	8	0	1	0	0	0	1	4	8	92.3
90	8	9	9	6	-	0	0	0	0	0	9	6	100.0
91	9	10	7	9	3	0	0	0	0	0	7	9	100.0
92	4	5	4	5	0	0	0	0	0	0	4	5	100.0
93	6	6	11	4	-	0	0	0	0	0	11	4	100.0
94	NOT PREGNANT												
95	5	10	2	10	3	1	0	0	0	1	1	10	91.7
96	10	10	9	10	1	0	0	0	0	0	9	10	100.0
97	10	8	10	6	2	0	0	0	0	0	10	6	100.0
98	9	8	6	8	3	0	0	0	0	0	6	8	100.0
99	10	9	9	8	2	0	0	0	0	0	9	8	100.0
100	6	6	0	2	10	0	0	0	0	0	0	2	100.0

Missing value code:- '-' Value unobtainable.

0001188

Appendix 11. Individual foetal data from female rats fed from days 6-15 of pregnancy (inclusive) with diets containing 0(control), 0.5, 2.5 or 5.0% Emulsifier YN

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control					
1	L1	4.19	M	F_{MN}	NAD
	L2	3.92	M		NAD
	L3	3.82	F	S_S, S_D, F_{MN}, F_{PP}	NAD
	L4	4.24	F		NAD
	L5	4.01	F	S_D, VCe/C, F_{MN}	NAD
	L6	3.86	M		NAD
	L7	4.18	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R1	3.67	M	NAD	NAD
	R2	3.89	F		NAD
	R3	3.87	M	RB_R, VCe/C, VAr/C, F_{MN}	NAD
	R4	3.55	F		NAD
	R5	3.79	M	RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	R6	3.97	M		NAD
	R7	4.21	M	VCe/C, F_{MN}, F_{PP}	NAD
2	L1	3.96	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.43	F		NAD
	L3	3.79	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	L4	3.72	M		NAD
	L5	4.00	F	S_S, S_D, VCe/C, MI	NAD
	L6	4.10	F		NAD
	R1	3.72	M	S_S, VCe/C, F_{MN}, F_{PP}, MI	NAD
	R2	3.97	M		NAD
	R3	4.11	F	VCe/C, VAr/C, MI	NAD
	R4	4.03	M		NAD
	R5	3.76	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R6	3.58	F		NAD
	R7	3.72	F	F_{MN}, F_{PP}	NAD
	R8	3.88	F		NAD
	R9	4.26	M	S_S, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}, H_{MN}	NAD
3	L1	4.18	M	VCe/C, F_{MN}, F_{PP}, MI	NAD
	L2	4.32	M		NAD
	L3	4.00	M	S_S, MI	NAD
	L4	3.86	F		NAD
	L5	4.48	M	F_{MN}, F_{PP}	NAD
	L6	4.02	M		NAD
	L7	3.89	F	NAD	NAD
	R1	3.89	M		NAD
	R2	4.04	F	VCe/C, F_{MN}	NAD
	R3	4.27	M		NAD
	R4	4.17	M	MI	NAD
	R5	3.71	F		NAD
	R6	4.42	M	X_{IO}, S_S, S_D, VCe/C, F_{MN}, F_{PP}	NAD
	R7	4.00	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
4	L1	3.39	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.03	M		NAD
	L3	3.92	M	VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.85	M		NAD
	L5	4.06	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	3.80	F		NAD
	L7	4.08	M	S_S, VCe/C, MI	NAD
	L8	4.18	M		NAD
	R1	3.52	M	S_S, RB_L, VCe/C, F_{MN}, MI	NAD
	R2	3.69	F		NAD
	R3	3.93	F	VCe/C, F_{MN}, F_{PP}, MI	NAD
	R4	3.80	M		NAD
	R5	4.09	M	VCe/C, F_{MN}, F_{PP}	NAD
	R6	4.06	M		NAD
	R7	4.15	M	S_S, VCeC, F_{MN}, F_{PP}	NAD
5	L1	3.46	F	VCe/C, MI	NAD
	L2	LR			
	L3	LR			
	L4	3.61	M		NAD
	L5	3.58	F	S_S, S_X, MI	NAD
	L6	LR			
	L7	3.53	F		NAD
	L8	3.63	F	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L9	LR			
	L10	3.61	F		NAD
	R1	3.40	M	VCe/C, F_{MN}, F_{PP}, MI	NAD
	R2	LR			
	R3	LR			
	R4	LR			
	R5	3.80	F		NAD
	R6	3.70	M	S_A, S_S, R_{NO}, VCe/C, F_{MN}, H_{MN}	NAD
	R7	3.52	F		NAD
6	L1	3.88	M	S_S, VCe/C, MI	NAD
	R1	4.20	F	S_A, VCe/C, MI	NAD
	R2	4.43	M		NAD
	R3	4.58	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	4.32	F		NAD
	R5	3.99	F	S_S, MI	NAD
7	L1	3.47	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	ER			
	L3	3.21	M		NAD
	L4	3.54	M	S_S, F_{MN}	NAD
	L5	ER			
	L6	3.67	M		NAD
	L7	4.16	M	S_S, VCe/C, F_{MN}	NAD
	R1	3.24	M		NAD
	R2	3.21	F	S_S, F_{MN}	NAD
	R3	3.36	F		NAD
	R4	3.30	F	F_{MN}	NAD
	R5	4.08	M		NAD
	R6	3.83	F	VCe/C, F_{MN}	NAD
	R7	ER			

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
8	L1	3.80	M	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L2	ER			
	L3	3.74	M		NAD
	L4	3.56	F	S_X	NAD
	L5	3.94	M		NAD
	L6	3.43	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L7	3.67	M		NAD
	R1	3.63	M	VCe/C, F_{MN}	NAD
	R2	3.22	F		NAD
	R3	3.45	M	S_S, S_D, RB_L, RB_R, VCe/C, VAr/C, F_{MN}	NAD
	R4	3.56	F		NAD
	R5	3.47	F	H_{MN}	NAD
	R6	3.65	M		NAD
	R7	3.34	F	S_S, VCe/C, F_{MN}	NAD
	R8	3.76	M		NAD
9	L1	3.67	F	S_S, S_D, VCe/C, F_{MN}	NAD
	L2	3.98	M		NAD
	L3	4.11	F	F_{MN}, F_{PP}	NAD
	L4	4.00	M		NAD
	L5	3.50	F	VCe/C, F_{MN}, F_{PP}	NAD
	L6	4.14	M		NAD
	L7	ER			
	L8	3.94	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L9	ER			
	L10	3.44	F		NAD
	L11	3.67	M	X_X, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	3.76	F		NAD
	R2	3.87	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R3	4.19	M		NAD
	R4	3.96	F	RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	R5	3.98	M		NAD
	R6	3.91	F	S_S, F_{MN}	NAD
10	L1	3.50	F	S_S, VCe/C, VAr/C	NAD
	L2	3.63	M		NAD
	L3	3.50	M	X_{IO}, S_S, S_D	NAD
	L4	3.88	M		NAD
	L5	3.46	M	S_S, VCe/C, VAr/C	NAD
	L6	3.81	M		NAD
	L7	3.80	M	F_{MN}, F_{PP}, H_{PP}	NAD
	R1	3.49	M		NAD
	R2	3.71	F	S_X, F_{MN}, F_{PP}, H_{PP}	NAD
	R3	3.50	F		NAD
	R4	3.55	F	X_{IO}, S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R5	3.68	F		NAD
	R6	3.93	M	S_X, X_X	NAD
	R7	3.62	F		NAD
	R8	3.71	F	S_S, X_{IO}	NAD
	R9	3.84	F		NAD
12	L1	LR			
	L2	ER			
	L3	ER			
	L4	ER			
	R1	ER			
	R2	ER			
	R3	ER			
	R4	ER			
	R5	ER			
	R6	ER			

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
13	L1	3.59	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.01	M		NAD
	L3	3.84	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.04	M		NAD
	R1	3.68	F	VCe/C, F_{MN}	NAD
	R2	3.80	F		NAD
	R3	3.52	F	S_S, F_{MN}, F_{PP}	NAD
	R4	3.96	M		NAD
	R5	3.78	M	S_S, F_{MN}, F_{PP}	NAD
	R6	3.92	M		NAD
	R7	4.03	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R8	4.01	F		NAD
14	L1	3.83	M		NAD
	L2	LR			
	L3	4.24	M		NAD
	L4	3.82	F	VCe/C, VAr/C, F_{MN}, F_{PP}, H_{PP}	NAD
	L5	4.10	M		NAD
	L6	3.74	F	S_B, S_S, S_X, X_X, R_{NO}, VAr/C, F_{MN}, F_{DP}, H_{MN}, H_{DP}, VCe/C, VCe/TH, VCe/LUM, VCe/SAC, VAr/SAC, PG/P, PG/IS, PG/IL, F_{LB}, H_{LB}, SK/FN_{IO}, SK/P_{IO}, SK/I_{IO}, SK/S_X, SC_{IO}, C_{IO}	NAD
	R1	DF			
	R2	3.73	F	S_S, S_D, VAr/C, H_{MN}, F_{MN}	NAD
	R3	3.55	F		NAD
	R4	3.85	F	S_S, S_D, F_{MN}, F_{PP}	NAD
	R5	LR			
	R6	4.14	F		NAD
	R7	4.51	F	S_D, VCe/C, F_{MN}, F_{PP}	NAD
	R8	LR			
	R9	4.20	M		NAD
	R10	LR			
	R11	3.75	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
15	L1	3.95	M	R_BL, R_BR, VCe/C, F_{MN}	NAD
	L2	3.83	F		NAD
	L3	4.24	M	S_S, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.03	M		NAD
	L5	LR			
	L6	4.19	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L7	4.09	M		NAD
	R1	4.05	M	VCe/C, F_{MN}, F_{PP}	NAD
	R2	4.11	F		NAD
	R3	3.65	F	S_S, F_{MN}, VCe/TD	NAD
	R4	3.70	F		NAD
	R5	4.12	F	VCe/C, F_{MN}, F_{PP}	NAD
	R6	4.02	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
17	L1	4.18	M	R_BL, VCe/C, F_{MN}, F_{PP}	NAD
	L2	2.79	F		Small right eye (50% of normal), SF (73%)
	L3	ER			
	L4	3.63	M	S_S, VCe/C, F_{MN}	NAD
	R1	3.82	M	S_D, R_BR, VCe/C, VAr/C, F_{MN}	NAD
	R2	4.00	M		NAD
	R3	3.83	M	VCe/C, F_{MN}	NAD
	R4	3.63	F		NAD
	R5	3.51	F	VCe/C, F_{MN}	NAD
	R6	3.94	F		NAD
	R7	3.97	M	VCe/C	NAD
18	L1	4.16	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.07	M		NAD
	L3	4.46	F	R_BR, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.04	F		NAD
	L5	4.58	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	4.49	M		NAD
	R2	4.07	F	VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.99	F		NAD
	R4	3.70	F	F_{MN}	NAD
	R5	4.26	M		NAD
	R6	4.35	F	S_S, VCe/C, F_{MN}	NAD
	R7	3.26	F		NAD
	R8	4.23	F	S_X, X_{IO}	NAD
	R9	4.45	M		NAD
	R10	4.00	F	VCe/C, F_{MN}, F_{PP}	NAD
	R11	4.44	M		NAD
19	L1	3.80	M	VCeC, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.94	F		NAD
	L3	4.00	F	VCe/C, MI	NAD
	L4	4.32	F		NAD
	L5	4.61	M	RB_R, VCe/C, VCe/TD, MI	NAD
	L6	4.63	M		NAD
	R1	4.37	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	4.47	F		NAD
	R3	4.18	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	4.23	M		NAD
	R5	4.26	F	S_S, RB_L, MI	NAD
20	L1	3.64	M	S_S, F_{MN}, F_{PP}	NAD
	L2	3.58	F		NAD
	L3	3.32	M	S_S, S_D, X_{IO}, VAr/C	NAD
	L4	3.40	F		NAD
	L5	3.54	F	NAD	NAD
	R1	3.12	F		NAD
	R2	3.58	F	S_S, S_D, F_{MN}, F_{PP}	NAD
	R3	3.53	M		NAD
	R4	3.37	F	F_{MN}, F_{PP}	NAD
	R5	3.28	F		NAD
	R6	3.64	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R7	3.16	F		NAD
	R8	3.45	M	X_X, F_{MN}, F_{PP}	NAD
	R9	3.52	F		NAD
	R10	3.31	F	X_{IO}, S_S, F_{MN}, F_{PP}	NAD
	R11	3.70	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
21	L1	3.30	M	S_S, S_D, F_{MN}, F_{PP}	NAD
	L2	3.22	F		NAD
	L3	3.28	F	X_{IO}, S_X, F_{MN}	NAD
	L4	3.66	F		NAD
	L5	3.33	F	$X_{IO}, S_S, RB_R, F_{MN}, F_{PP}$	NAD
	L6	3.78	F		NAD
	L7	3.67	F	S_S, VCe/C, F_{MN}, F_{PP}, MI	NAD
	L8	3.72	F		NAD
	L9	3.97	M	S_S, VCe/C, F_{MN}, F_{DP}, MI	NAD
	L10	3.55	F		NAD
	L11	3.24	M	S_S, X_{IO}, VAr/C, F_{MN}, F_{DP}, H_{MN}, H_{DP}	NAD
	R1	3.83	F		NAD
	R2	4.03	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R3	4.10	F		NAD
	R4	4.15	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R5	4.20	M		NAD
	R6	3.74	M	S_S, VCe/C, MI	NAD
22	L1	4.17	F	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L2	3.99	F		NAD
	L3	4.03	M	S_S, S_D, S_X, VCe/C, F_{MN}, MI	NAD
	L4	3.85	M		NAD
	L5	3.34	F	S_S, VCe/C, F_{MN}, F_{PP}, H_{MN}	NAD
	L6	3.76	F		NAD
	R1	3.74	M	VCe/C, MI	NAD
	R2	3.73	M		NAD
	R3	4.01	F	S_S, F_{MN}, F_{PP}, MI	NAD
	R4	3.58	F		NAD
	R5	4.41	M	VCe/C, MI	NAD
	R6	4.01	F		NAD
	R7	4.04	M	VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R8	4.18	F	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R9	4.35	M		NAD
	R10	4.39	F	S_S, MI	NAD
	R11	4.28	M		NAD
23	L1	4.30	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.57	M		NAD
	L3	4.32	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.17	F		NAD
	L5	4.36	M	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	4.19	F		NAD
	R1	4.74	M	VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R2	4.75	F		NAD
	R3	3.92	F	VCe/C, VAr/C, F_{PP}, MI	NAD
	R4	4.64	M		NAD
	R5	4.70	M	S_X, VCe/C, VAr/C, MI	NAD
	R6	4.50	M		NAD
	R7	3.68	F	VCe/C, VAr/C, F_{MN}, MI	NAD
	R8	4.11	F		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
Control continued					
24	L1	3.66	M	VAr/C, F_{MN}	NAD
	L2	3.34	M		NAD
	L3	3.78	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.93	M		NAD
	L5	LR			
	L6	3.48	F	RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L7	2.62	M		SF (73%)
	L8	3.21	F	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L9	3.86	F		NAD
	R1	3.70	M	S_S, F_{MN}, F_{PP}	NAD
	R2	3.98	M		NAD
	R3	LR			
	R4	3.68	F	F_{MN}, F_{PP}	NAD
	R5	4.06	M		NAD
25	L1	3.89	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	3.71	F		NAD
	L3	3.65	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}, H_{PP}	NAD
	L4	3.60	F		NAD
	L5	3.78	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}, H_{PP}	NAD
	L6	4.11	M		NAD
	L7	ER			
	L8	ER			
	L9	3.81	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L10	3.74	M		NAD
	L11	ER			
	L12	3.91	M	F_{MN}, F_{PP}	NAD
	R1	3.85	M	F_{MN}, F_{PP}	NAD
	R2	3.94	F		NAD
	R3	3.88	M		NAD
	R4	3.52	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}, H_{PP}	NAD
	R5	3.86	M		NAD
	R6	4.00	M	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R7	3.78	F		NAD
0.5% Emulsifier YN					
26	L1	3.70	F	VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.01	M		NAD
	L3	3.76	F	VAr/C	NAD
	L4	3.80	M		NAD
	L5	3.78	F	S_S, VAr/C, F_{MN}	NAD
	L6	3.48	F		NAD
	L7	4.04	F	S_D, VCe/C, F_{MN}, F_{PP}	NAD
	R1	3.76	F		NAD
	R2	3.49	F	VCe/C	NAD
	R3	3.71	M		NAD
	R4	3.46	F	S_S, X_{IO}	NAD
	R5	3.71	F		NAD
	R6	3.46	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R7	3.99	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
27	L1	ER			
	L2	3.70	F	VCe/C	NAD
	L3	3.27	F		NAD
	L4	3.91	F	S_S, RB_R, VCe/C, VAr/C, F_{PP}, MI	NAD
	L5	4.34	M		NAD
	L6	4.20	F	RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L7	3.86	M		NAD
	L8	4.11	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	L9	4.06	F		NAD
	L10	3.88	F	R_{NO}, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L11	4.25	M		NAD
	L12	3.98	F	S_S, R_{NO}, VCe/C, VAr/C, F_{PP}, MI	NAD
	R1	4.35	M		NAD
	R2	4.16	F	S_S, VCe/C, VAr/C	NAD
	R3	3.97	M		NAD
	R4	4.30	M	VCe/C, H_{MN}	NAD
	R5	4.04	M		NAD
28	L1	3.68	M	S_S, VCe/C, VAr/C, F_{PP}, H_{PP}	NAD
	L2	3.57	F		NAD
	L3	3.91	M	NAD	NAD
	L4	3.77	M		NAD
	L5	4.08	M	RB_L, RB_R	NAD
	L6	3.47	F		NAD
	L7	3.51	F	S_S	NAD
	L8	3.46	M		NAD
	L9	3.42	F	RB_L, RB_R, F_{MN}	NAD
	L10	3.75	F		NAD
	R1	3.96	M	S_S, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	3.91	M		NAD
	R3	3.73	F	S_S, RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	
	R4	2.84	F		NAD
	R5	ER			
	R6	3.52	M	S_S, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
29	L1	3.94	M	VCe/C, VAr/C, F_{MN}, F_{PP}, H_{MN}	NAD
	L2	3.63	F		NAD
	L3	3.67	F	S_A, S_S, S_D, F_{MN}, F_{PP}, MI	NAD
	L4	2.80	M		NAD
	L5	3.37	F	S_{IO}, S_S, VCe/C, F_{MN}, F_{PP}, MI	NAD
	L6	3.79	F		NAD
	L7	4.04	M	VCe/C, VAr/C, MI	NAD
	L8	3.94	M		NAD
	L9	4.15	M	VCe/C, MI	NAD
	L10	4.21	M		NAD
	L11	4.35	M	VCe/C, F_{PP}, SK/FN_{IO}, SK/P_{IO}, SK/I_{IO}, SK/S_{IO}, MI	NAD
	R1	3.80	M		NAD
	R2	ER			
	R3	3.95	F	VCe/C, F_{MN}, F_{DP}, MI	NAD
	R4	3.62	F		NAD
	R5	3.68	F	S_S, VCe/C, MI	NAD
	R6	4.25	M		NAD
	R7	3.87	M	VCe/C, MI	NAD
30				------- NOT PREGNANT ------	

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
31	L1	3.97	M		NAD
	L2	3.77	F	S_S, VCe/C, MI	NAD
	L3	4.20	M		NAD
	L4	3.99	F	S_S, VCe/C, F_{MN}, H_{MN}	NAD
	L5	3.82	F		NAD
	L6	4.06	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L7	4.05	M		NAD
	L8	3.93	M	S_X, VCe/C, F_{MN}, F_{PP}, MI	NAD
	L9	3.77	F		NAD
	R1	3.71	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R2	4.01	M		NAD
	R3	3.96	M	VCe/C, F_{MN}, F_{PP}, MI	NAD
	R4	3.84	M		NAD
	R5	4.29	M	F_{MN}, F_{PP}	NAD
	R6	4.03	F		NAD
	R7	3.98	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
32	L1	3.81	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.18	M		NAD
	L3	3.68	F	VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.98	M		NAD
	L5	4.28	M	F_{MN}	NAD
	R1	3.57	M		NAD
	R2	3.64	M	S_S, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.94	F		NAD
	R4	4.06	M	S_S, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R5	LR			
	R6	4.09	M		NAD
	R7	4.12	M	RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R8	4.98	F		NAD
	R9	4.70	F	S_S, S_X, X_X, VCe/C, F_{MN}, F_{PP}	NAD
	R10	LR			
	R11	4.14	M		NAD.
33	L1	3.94	M	VCe/C, MI	NAD
	L2	3.94	F		NAD
	L3	3.71	M	F_{PP}, MI	NAD
	L4	4.04	M		NAD
	R1	3.86	M	S_{IO}, S_S, X_X, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R2	3.70	F		NAD
	R3	4.01	M	S_S, X_S, VCe/C, MI	NAD
	R4	3.61	M		NAD
	R5	3.90	M	S_S, VCe/C, F_{MN}, F_{PP}, MI	NAD
	R6	4.21	M		NAD
	R7	4.19	M	X_X, MI	NAD
	R8	3.97	M		NAD
	R9	3.75	M	S_S, VCe/C, MI	NAD
	R10	3.54	F		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
34	L1	3.33	F	S_S, S_D, F_{MN}	NAD
	L2	3.30	M		NAD
	L3	3.63	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.70	M		NAD
	L5	3.17	M	S_S, X_{IO}	NAD
	L6	3.10	M		NAD
	L7	3.39	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L8	2.51	F		NAD
	R1	3.53	M	$S_S, RB_L, F_{MN}, F_{PP}$	NAD
	R2	3.46	F		NAD
	R3	3.20	F	S_S, S_D, F_{MN}, F_{PP}	NAD
	R4	2.99	M		NAD
	R5	3.36	F	S_S, S_D, VCe/C, F_{MN}	NAD
	R6	3.44	M		NAD
	R7	3.64	M	$S_S, S_D, S_X, F_{MN}, F_{PP}$	NAD
35	L1	4.00	M	VCe/C, MI	NAD
	L2	4.21	M		NAD
	L3	4.20	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.14	M		NAD
	L5	3.81	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	3.94	M		NAD
	R2	4.34	F	F_{MN}	NAD
	R3	4.22	M		NAD
	R4	4.03	M	VCe/C, MI	NAD
	R5	4.02	M		NAD
	R6	3.91	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R7	4.06	M		NAD
	R8	4.07	F	S_S, RB_R, VCe/C, F_{MN}, F_{PP}, MI	NAD
	R9	3.99	M		NAD
36	L1	2.34	M	$S_{IO}, S_S, X_X, RB_L, RB_R$, VCe/C, VAr/C, H_{MN}, H_{DP}, PG/P	SF (60%)
	L2	4.13	M		NAD
	L3	3.80	F	R_{NO}, VCe/C, MI	NAD
	L4	3.90	M		NAD
	L5	4.08	M	VCe/C, F_{MN}	NAD
	L6	3.77	M		NAD
	L7	4.06	F	S_S, VCe/C, F_{MN}	NAD
	L8	4.02	M		NAD
	R1	3.66	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R2	4.24	M		NAD
	R3	3.53	F	S_S, VCe/C, F_{MN}	NAD
	R4	3.82	M		NAD
	R5	4.05	F	X_{IO}, VCe/C, F_{MN}, F_{PP}	NAD
37	L1	4.09	F	VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.61	M		NAD
	L3	4.26	M	VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.30	F		NAD
	L5	ER			
	L6	3.67	F	RB_L, VCe/C	NAD
	R1	ER			
	R2	4.45	F		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
38	L1	3.94	F	S_S, S_X, VCe/C, MI	NAD
	L2	4.04	M		NAD
	L3	4.18	M	S_S, S_D, F_{MN}, MI	NAD
	L4	4.03	F		NAD
	L5	4.55	M	S_S, VCe/C, VAr/C, MI	NAD
	L6	4.17	M		NAD
	L7	4.52	F	S_S, S_D, X_{IO}, VCe/C, VAr/C, F_{MN}	NAD
	L8	4.71	M		NAD
	R1	3.86	F	S_S, MI	NAD
	R2	4.49	M		NAD
	R3	4.70	M	S_S, S_D, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	4.50	M		NAD
39	L1	3.58	M	S_S, VCe/C	NAD
	L2	3.54	F		NAD
	L3	3.67	M	VCe/C, F_{MN}	NAD
	L4	3.77	M		NAD
	L5	3.19	F	F_{MN}, F_{PP}	NAD
	L6	3.73	M		NAD
	L7	3.39	F	NAD	NAD
	L8	3.45	F		NAD
	L9	3.26	M	S_S, S_X, X_{IO}	NAD
	R1	3.46	F		NAD
	R2	3.87	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.19	F		NAD
	R4	ER			
	R5	3.73	F	VCe/C, VAr/C	NAD
	R6	3.78	M		NAD
40	L1	3.95	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.95	F		NAD
	L3	3.63	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.67	F		NAD
	L5	3.84	F	F_{MN}, F_{PP}, H_{PP}	NAD
	L6	4.01	M		NAD
	R1	3.64	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	ER			
	R3	3.26	M		NAD
	R4	3.58	M	S_S, VCe/C, F_{MN}	NAD
	R5	3.61	F		NAD
	R6	4.04	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R7	3.96	M		NAD
	R8	3.87	F	VCe/C, VAr/C, F_{MN}, F_{PP}, H_{PP}	NAD
	R9	3.51	F		NAD
	R10	4.16	M	S_S, RB_L, VCe/C, VAr/C, F_{MN}, H_{MN}	NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
41	L1	3.48	F	S_{IO}, S_S, X_{IO}, VCe/C, F_{MN}	NAD
	L2	3.64	F		NAD
	L3	3.70	M	F_{MN}, F_{PP}	NAD
	L4	4.04	M		NAD
	L5	4.07	M	S_S, S_D, F_{MN}	NAD
	L6	3.91	M		NAD
	L7	3.83	M	F_{MN}, F_{PP}	NAD
	L8	3.59	F		NAD
	R1	3.53	F	F_{MN}	NAD
	R2	3.81	M		NAD
	R3	3.97	M	S_S, S_D, VCe/C, H_{MN}	NAD
	R4	3.50	F		NAD
	R5	3.72	M	S_S, VCe/C, MI	NAD
	R6	3.75	M		NAD
	R7	3.06	F	S_D, S_X, X_{IO}, F_{MN}	NAD
	R8	3.61	M		NAD
	R9	LR			
	R10	3.86	F	S_S, S_D, X_{IO}, VCe/C, F_{MN}, F_{PP}	NAD
42				------ NOT PREGNANT ------	
43	L1	2.28	F	S_S, S_D, S_X, X_X, VCe/C, VAr/C, H_{MN}, H_{DP}, PG/P	SF (62%)
	L2	3.77	M		NAD
	L3	3.64	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.78	M		NAD
	L5	3.79	M	VAr/C	NAD
	L6	3.40	F		NAD
	L7	3.92	M	S_S, RB_L, VCe/C	NAD
	L8	3.60	M		NAD
	R1	3.56	M	S_S, F_{PP}, X_{IO}	NAD
	R2	3.68	M		NAD
	R3	3.97	M	S_A, S_S, X_A, VCe/C, F_{MN}, F_{PP}	NAD
	R4	3.46	M		NAD
	R5	3.47	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R6	3.72	F		NAD
44	L1	3.90	M	VCe/C, F_{MN}, F_{PP}	NAD
	L2	3.87	F		NAD
	L3	4.00	F	VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.23	M		NAD
	L5	4.04	M	VCe/C, F_{MN}	NAD
	L6	2.49	M		SF (64%)
	L7	3.44	F	S_S, VCe/C, F_{MN}	NAD
	R1	3.50	F	S_S, VCe/C, VAr/C, F_{MN}	NAD
	R2	3.81	F		NAD
	R3	4.14	M	RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	R4	3.84	F		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
45	L1	3.74	F		NAD
	L2	3.86	F	S_S, S_X, MI	NAD
	L3	3.43	F		NAD
	L4	4.07	M	S_D, MI	NAD
	L5	3.92	M		NAD
	L6	4.19	M	S_S, S_D, MI	NAD
	L7	3.98	F		NAD
	L8	4.18	M	MI	NAD
	L9	4.27	M		NAD
	R1	4.13	M	S_S, F_{MN}, F_{PP}	NAD
	R2	3.33	F		NAD
	R3	3.89	M	S_S, F_{MN}	NAD
	R4	4.16	M		NAD
	R5	4.26	M	S_S, F_{MN}, F_{PP}	NAD
	R6	3.51	F		NAD
46				------ NOT PREGNANT ------	
47	L1	3.73	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.04	F		NAD
	L3	3.64	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	3.78	F		NAD
	L5	LR			
	L6	3.68	M	S_S, VCe/C, F_{MN}	NAD
	L7	4.07	M		NAD
	L8	3.86	F	VCe/C, F_{MN}, F_{PP}	NAD
	L9	3.87	F		NAD
	R1	3.80	M	VCe/C, F_{MN}	NAD
	R2	4.04	M		NAD
	R3	3.48	F	VCe/C, F_{MN}	NAD
	R4	3.59	F		NAD
48	L1	3.45	F	S_S, F_{MN}, F_{PP}, H_{PP}	NAD
	L2	3.58	F		NAD
	L3	3.55	F	S_S	NAD
	L4	3.37	F		NAD
	L5	3.66	F	NAD	NAD
	L6	3.91	M		NAD
	R1	3.60	M	S_S, RB_L, VAr/C, F_{MN}, F_{PP}	NAD
	R2	3.82	M		NAD
	R3	3.38	F	S_S, X_A, VCe/C, F_{MN}, F_{PP}	NAD
	R4	3.79	M		NAD
	R5	3.72	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R6	3.53	M		NAD
	R7	3.59	F	S_S	NAD
	R8	3.75	F		NAD
49	L1	4.14	F	S_S, VCe/C, F_{MN}	NAD
	L2	3.63	F		NAD
	L3	3.93	F	X_X, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.79	F		NAD
	L5	4.17	M	H_{MN}	NAD
	L6	4.05	M		NAD
	L7	4.44	F	VCe/C, F_{MN}, F_{PP}, H_{MN}	NAD
	R1	3.85	M		NAD
	R2	3.85	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R3	4.40	M		NAD
	R4	3.99	M	S_S, X_{IO}, VCe/C, MI	NAD
	R5	3.90	M		NAD
	R6	3.55	F	VCe/C, MI	NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
0.5% Emulsifier YN continued					
50	L1	3.62	F	S_S, S_D, VCe/C, MI	NAD
	L2	3.66	F		NAD
	L3	3.66	F	S_S, VCe/C, MI	NAD
	L4	3.70	M		NAD
	R1	3.63	F	VCe/C, F_{MN}	NAD
	R2	3.47	F		NAD
	R3	3.43	F	S_S, S_D, VCe/C, MI	NAD
	R4	3.29	M		NAD
	R5	3.72	M	S_S, VCe/C, MI	NAD
	R6	3.57	M		NAD
	R7	3.58	F	S_S, X_{IO}, VCe/C, MI	NAD
	R8	3.74	M		NAD
2.5% Emulsifier YN					
51	L1	4.02	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.27	M		NAD
	L3	4.39	F	VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.04	M		NAD
	L5	4.20	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	3.91	F		NAD
	L7	4.22	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L8	4.19	F		NAD
	R1	4.21	M	VCe/C, F_{MN}, F_{PP}	NAD
	R2	4.38	M		NAD
	R3	4.42	F	VCe/C, F_{MN}, F_{PP}	NAD
	R4	4.35	F		NAD
	R5	4.39	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R6	4.67	M		NAD
	R7	4.31	F	F_{MN}, H_{PP}, MI	NAD
	R8	4.35	M		NAD
52	L1	3.92	M	F_{MN}, F_{PP}	NAD
	L2	4.25	M		NAD
	L3	3.91	F	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	L4	4.03	M		NAD
	L5	4.01	M	S_S, R_{NO}, VCe/C, F_{MN}, F_{PP}	NAD
	L6	3.97	F		NAD
	L7	4.03	F	S_S, RB_L, RB_R, MI	NAD
	L8	4.06	M		NAD
	L9	4.45	F	S_S, X_S, VCe/C, MI	NAD
	L10	4.15	M		NAD
	L11	3.83	M	S_S, VCe/C, MI	NAD
	L12	3.60	F		NAD
	R1	4.05	F	S_S, VCe/C, VAr/C, MI	NAD
	R2	4.44	M		NAD
	R3	4.42	F	RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
53	L1	3.48	F	F_{MN}	NAD
	L2	3.94	M		NAD
	L3	3.87	F	F_{MN}, F_{PP}	NAD
	L4	3.70	M		NAD
	L5	4.07	M	F_{MN}, F_{PP}	NAD
	L6	3.83	M		NAD
	L7	3.68	F	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L8	3.77	M		NAD
	L9	4.09	M	VCe/C, F_{MN}, F_{PP}	NAD
	R1	3.85	F		NAD
	R2	4.34	M	VCe/C, F_{MN}, F_{PP}	NAD
	R3	4.10	F		NAD
	R4	4.28	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
2.5% Emulsifier YN continued					
54	L1	3.65	M	VCe/C, F_{MN}, F_{PP}	NAD
	L2	3.88	M		NAD
	L3	3.76	F	VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.01	M		NAD
	L5	3.98	F	VCe/C	NAD
	L6	3.40	F		NAD
	L7	4.11	M	VCe/C, F_{MN}, F_{PP}	NAD
	R1	4.39	M		NAD
	R2	4.20	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R3	4.50	F		NAD
55	L1	3.42	F	S_S, F_{MN}	NAD
	L2	3.14	F		NAD
	L3	3.74	M	S_S, MI	NAD
	L4	4.10	M		NAD
	L5	3.23	F	S_X, X_{IO}, MI,	NAD
	L6	4.17	M		NAD
	L7	3.53	F	S_{IO}, S_A, S_S, VCe/C, MI	NAD
	L8	3.83	M		NAD
	L9	3.28	F	S_S, MI	NAD
	L10	3.98	M		NAD
	R1	3.64	F	S_S, VCe/C, F_{MN}, H_{MN}	NAD
	R2	3.86	F		NAD
56	L1	4.52	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.38	M		NAD
	L3	4.29	M	S_A, S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.41	M		NAD
	L5	4.27	F	S_S, S_D, VCe/C, VAr/C, MI	NAD
	L6	4.23	F		NAD
	L7	4.32	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R1	4.18	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R2	4.08	F		NAD
	R3	4.12	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	4.53	M		NAD
	R5	4.33	F	S_S, VCe/C, VAr/C, F_{MN}	NAD
	R6	4.48	M		NAD
57	L1	3.62	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.88	M		NAD
	L3	3.82	M	S_S, VCe/C, VAr/C, F_{MN}	NAD
	L4	3.88	F		NAD
	L5	3.89	M	F_{MN}, F_{PP}, MI	NAD
	R1	3.90	F		NAD
	R2	3.60	F	S_S, S_D, VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.74	M		NAD
	R4	3.96	M	VCe/C, F_{MN}, F_{PP}	NAD
	R5	4.10	M		NAD
	R6	4.16	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R7	4.15	F		NAD
	R8	3.55	F	S_S, S_D, VCe/C, F_{MN}, F_{PP}	NAD
	R9	3.75	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
2.5% Emulsifier YN continued					
58	L1	3.99	M	$S_S, S_D, R_{NO}, VCe/C, F_{MN}, F_{PP}$	NAD
	L2	3.85	F		NAD
	L3	3.71	F	$S_S, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L4	3.81	F		NAD
	L5	4.14	M	$S_S, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L6	4.08	M		NAD
	L7	3.94	F	$S_S, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R1	3.78	F		NAD
	R2	3.81	F	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	R3	3.68	F		NAD
	R4	4.01	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R5	3.93	M		NAD
	R6	3.98	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$,	NAD
				VCe/TD	NAD
	R7	3.91	F		NAD
59	L1	4.23	M	$VCe/C, F_{MN}$	NAD
	L2	4.05	M		NAD
	L3	4.17	M	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L4	3.75	F		NAD
	L5	ER			
	L6	4.15	M	$RB_L, VCe/C, VAr/C, F_{MN}$	NAD
	L7	4.31	M		NAD
	R1	3.92	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R2	3.83	F		NAD
	R3	3.83	F	$VCe/C, F_{MN}$	NAD
	R4	3.79	F		NAD
	R5	3.99	M	$VCe/C, F_{MN}$	NAD
60	L1	3.39	F	S_A	NAD
	L2	3.52	M		NAD
	L3	3.74	M	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	L4	3.26	F		NAD
	L5	3.83	M	S_S, F_{MN}, F_{PP}	NAD
	L6	3.58	M		NAD
	L7	4.09	F	$VCe/C, F_{MN}$	NAD
	R1	3.48	M		NAD
	R2	3.73	M	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	R3	3.85	M		NAD
	R4	3.52	F	S_X, X_{IO}, F_{MN}	NAD
61	L1	4.05	M	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L2	4.42	M		NAD
	L3	4.19	F	$S_S, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L4	4.29	M		NAD
	L5	4.45	M	$VCe/C, F_{MN}, F_{PP}$	NAD
	R1	4.20	M		NAD
	R2	4.18	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R3	4.12	M		NAD
	R4	4.28	F	F_{MN}, F_{PP}, H_{PP}	NAD
	R5	4.49	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
2.5% Emulsifier YN continued					
62	L1	3.74	M		NAD
	L2	3.79	M	$S_S, RB_L, VCe/C, F_{MN}, F_{PP}$	NAD
	L3	3.82	F		NAD
	L4	ER			
	L5	3.62	F	F_{MN}	NAD
	R1	3.39	F		NAD
	R2	3.33	M	S_S, F_{MN}, MI	NAD
	R3	3.83	M		NAD
	R4	3.78	M	$S_S, VCe/C.MI$	NAD
	R5	3.74	F		NAD
	R6	3.69	F	$S_S, S_D, VCe/C, MI$	NAD
	R7	3.73	M		NAD
	R8	3.31	F	S_S, S_D, X_{IO}	NAD
	R9	2.90	F		NAD
	R10	4.08	M	$S_A, S_S, VCe/C, MI$	NAD
63	L1	3.53	F	$S_S, S_X, X_{IO}, F_{MN}, F_{PP}$	NAD
	L2	3.73	F		NAD
	L3	4.01	M	$VCe/C, F_{MN}$	NAD
	R1	3.57	F		NAD
	R2	3.76	M	$S_S, S_D, VCe/C, F_{MN}, F_{PP}$	NAD
	R3	3.54	F		NAD
	R4	3.83	M	F_{MN}, F_{PP}, H_{PP}	NAD
	R5	3.64	M		NAD
	R6	3.83	F	$S_A, VCe/C, F_{MN}, F_{PP}, H_{PP}$	NAD
	R7	3.54	F		NAD
	R8	3.88	F	$VCe/C, F_{MN}$	NAD
64	L1	3.68	M	$VCe/C, F_{MN}, F_{PP}$	NAD
	L2	3.94	M		NAD
	L3	3.97	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L4	3.37	F		NAD
	R1	3.52	F	$S_S, VCe/C, F_{MN}$	NAD
	R2	3.70	M		NAD
	R3	3.63	F	$S_S, RB_L, VCe/C, F_{MN}, F_{PP}$	NAD
	R4	4.06	M		NAD
	R5	3.75	F	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	R6	3.96	F		NAD
	R7	3.73	F	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	R8	3.70	F		NAD
	R9	4.04	F	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	R10	3.96	F		NAD
	R11	3.58	F	$VCe/CF_{MN}, F_{PP}$	NAD
65	L1	3.86	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L2	3.89	F		NAD
	L3	4.32	M	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L4	3.91	F		NAD
	L5	3.77	M	$S_S, VCe/C, F_{MN}, F_{PP}$	NAD
	L6	3.90	F		NAD
	L7	4.28	M	$S_S, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	L8	4.16	M		NAD
	R1	4.35	M	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R2	4.32	M		NAD
	R3	4.10	F	$VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
	R4	4.48	M		NAD
	R5	4.48	M	$RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}$	NAD
66				------ NOT PREGNANT ------	

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
2.5% Emulsifier YN continued					
67	L1	4.02	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.00	F		NAD
	L3	4.44	M	RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.41	M		NAD
	L5	4.00	F	VCe/C, F_{MN}, F_{PP}	NAD
	R1	3.60	F		NAD
	R2	4.12	M	VCe/C, F_{MN}, F_{PP}	NAD
	R3	4.36	M		NAD
	R4	4.35	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R5	4.23	F		NAD
	R6	4.44	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R7	4.29	M		NAD
68	L1	3.59	F	S_S, S_D, RB_L, F_{MN}, F_{PP}	NAD
	L2	3.78	M		NAD
	L3	3.74	M	S_S, F_{MN}, F_{PP}	NAD
	L4	3.91	M		NAD
	L5	3.92	M	S_S, VCe/C, MI	NAD
	L6	3.96	M		NAD
	L7	3.74	F	S_S, RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	L8	3.74	F		NAD
	R1	3.67	F	S_S, VCe/C, F_{MN}	NAD
	R2	4.10	M		NAD
	R3	3.50	F	F_{MN}	NAD
	R4	3.64	F		NAD
	R5	3.51	M	S_S, F_{MN}	NAD
	R6	3.62	F		NAD
	R7	4.05	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
69	L1	4.08	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.10	F		NAD
	L3	4.34	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.09	F		NAD
	L5	3.90	M	VCe/C, F_{MN}, F_{PP}	NAD
	L6	4.10	M		NAD
	L7	4.27	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	4.13	M		NAD
	R2	4.06	M	RB_L, RB_R, F_{MN}, F_{PP}	NAD
	R3	3.99	F		NAD
	R4	3.97	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R5	3.77	M		NAD
	R6	4.31	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
70	L1	3.93	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.20	M		NAD
	L3	4.10	M	VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.29	M		NAD
	R1	3.76	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	3.93	F		NAD
	R3	4.20	M	VCe/C, VAr/C, F_{MN}, F_{PP}, H_{DP}	NAD
	R4	4.05	F		NAD
	R5	DF			

continued....

BLANK PAGE(S) INSERTED FOR CORRECT PAGINATION

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
2.5% Emulsifier YN continued					
71	L1	3.12	F	S_S,VCe/C	NAD
	L2	4.07	M		NAD
	L3	4.16	M	S_S,VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	L4	3.90	F		NAD
	L5	3.98	F	S_S,VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	L6	4.21	F		NAD
	L7	4.19	M	S_S,VCe/C,F_{MN},F_{PP}	NAD
	L8	3.96	M		NAD
	L9	4.10	F	S_S,VCe/C,F_{MN},F_{PP}	NAD
	R1	4.05	M		NAD
	R2	4.07	M	S_S,VCe/C,F_{MN},F_{PP}	NAD
	R3	3.27	F		NAD
	R4	3.60	M	S_S,VCe/C,F_{MN}	NAD
	R5	3.42	M		NAD
	R6	3.32	F	S_{IO},S_A,S_S,VCe/C,VAr/C,MI	NAD
	R7	3.80	F		NAD
	R8	4.09	M	VCe/C,VAr/C,MI	NAD
	R9	4.00	F		NAD
72	L1	4.13	F	R_W,VCe/C,F_{MN}	NAD
	L2	3.76	F		NAD
	L3	4.42	F	S_S,VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	L4	4.10	F		NAD
	L5	4.13	M	RB_L,VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	L6	3.83	F		NAD
	L7	4.05	M	S_S,X_{IO},VCe/C,F_{MN},F_{PP},MI	NAD
	L8	4.27	F		NAD
	R1	3.57	F	S_S,VCe/C,H_{MN}	NAD
	R2	4.21	F		NAD
	R3	3.86	F	S_A,S_S,VCe/C,MI	NAD
	R4	3.92	F		NAD
	R5	4.97	F	VCe/C,F_{MN},F_{PP}	NAD
	R6	4.01	F		NAD.
73				------ NOT PREGNANT ------	
74	L1	ER			
	L2	3.28	F	S_S,RB_L,VCe/C,MI	NAD
	L3	3.47	M		NAD
	L4	3.88	M	RB_L,VCe/C,MI	NAD
	L5	3.45	F		NAD
	L6	3.04	F	S_S,S_D,X_{IO}	NAD
	L7	3.37	F		NAD
	L8	3.75	M	S_D,RB_R,VCe/C,F_{MN},F_{PP}	NAD
	L9	3.60	F		NAD
	R1	3.80	F	NAD	NAD
	R2	3.67	F		NAD
	R3	3.95	F	RB_L,VCe/C,MI	NAD
	R4	3.85	M		NAD
	R5	4.06	M	VCe/C,MI	NAD
	R6	3.78	F		NAD
	R7	3.96	M	VCe/C,VAr/C,H_{MN},MI	NAD
75				----- NOT PREGNANT ------	

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN					
77	L1	3.57	M	F_{MN}	NAD
	L2	3.83	M		NAD
	L3	3.95	M	VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.45	F		NAD
	R1	3.91	M	VCe/C, F_{MN}, F_{PP}	NAD
	R2	3.53	M		NAD
	R3	3.14	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R4	3.34	F		NAD
	R5	3.61	M	F_{MN}, F_{PP}	NAD
	R6	3.81	M		NAD
	R7	3.98	M	VCe/C, F_{MN}, F_{PP}	NAD
	R8	3.50	F		NAD
	R9	3.51	F	S_S, VCe/C, F_{MN}, MI	NAD
	R10	3.55	M		NAD
	R11	3.65	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
78	L1	3.55	F	S_S, RB_R, VCe/C, VAr/C	NAD
	L2	ER			
	L3	4.25	M		NAD
	L4	4.10	F	RB_L, RB_R, VCe/C, VAr/C, F_{MN}	NAD
	R1	3.85	M		NAD
	R2	3.55	F	S_S, RB_L, VCe/C, VAr/C, MI	NAD
	R3	3.50	F		NAD
	R4	3.51	F	RB_L, F_{MN}	NAD
	R5	LR			
	R6	3.89	M		NAD
	R7	4.10	M	VCe/C, VAr/C, MI	NAD
	R8	4.23	M		NAD
79	L1	2.70	M	S_B, S_S, S_D, S_X, X_X, VCe/C, H_{DP}, MI	NAD
	L2	3.54	M		NAD
	L3	2.87	M	S_{IO}, S_S, X_{IO}	NAD
	R1	3.05	M		NAD
	R2	3.04	F	S_S, S_X, X_{IO}, VCe/C, VAr/C, H_{DP}	NAD
80	L1	3.69	M	S_X, X_{IO}, F_{MN}, F_{PP}	NAD
	L2	3.81	M		NAD
	L3	4.07	M	S_S, RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.76	F		NAD
	L5	4.08	F	S_S, S_D, VCe/C, F_{MN}, F_{PP}	NAD
	L6	4.24	M		NAD
	L7	3.91	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L8	4.04	F		NAD
	L9	4.14	M	VCe/C, F_{MN}, F_{PP}	NAD
	R1	4.23	M		NAD
	R2	3.89	F	VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.61	F		NAD
	R4	3.54	F	S_S, S_D, VCe/C, F_{MN}	NAD
	R5	4.13	M		NAD
	R6	4.05	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R7	3.99	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN					
81	L1	4.20	M	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.89	F		NAD
	L3	4.38	M	RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	3.97	F		NAD
	L5	3.94	M	VCe/C, F_{MN}, F_{PP}	NAD
	L6	3.90	M		NAD
	L7	4.01	F	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L8	3.93	M		NAD
	L9	4.24	M	VCe/C, F_{MN}, F_{PP}	NAD
	L10	4.16	F		NAD
	R1	3.79	F	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	4.22	M		NAD
	R3	4.21	M	VCe/C, F_{MN}	NAD
	R4	3.80	F		NAD
	R5	4.00	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R6	4.08	F		NAD
	R7	4.24	M	S_S, RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
82	L1	3.92	M	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	ER			
	L3	3.92	M		NAD
	L4	4.40	M	VCe/C, F_{MN}, F_{PP}	NAD
	L5	4.28	M		NAD
	L6	ER			
	L7	ER			
	R1	3.56	F	S_S, VCe/C, F_{MN}, H_{DP}	NAD
	R2	4.29	M		NAD
	R3	4.09	F	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	ER			
	R5	4.65	M		NAD
83	L1	3.42	F	VCe/C, F_{MN}	NAD
	L2	3.68	F		NAD
	L3	3.94	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.60	F		NAD
	L5	3.70	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	3.89	M		NAD
	L7	3.44	F	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	R1	3.42	F		NAD
	R2	4.02	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R3	4.14	M		NAD
	R4	3.46	F	S_S, S_D, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R5	3.84	F		NAD
	R6	3.94	M	VCe/C, VAr/C, F_{MN}	NAD
	R7	3.52	F		NAD
	R8	4.15	M	VCe/C, F_{MN}, F_{PP}	NAD
84	L1	4.39	M	F_{MN}, F_{PP}	NAD
	L2	3.89	F		NAD
	L3	3.73	F	S_S	NAD
	R1	3.45	M		NAD
	R2	4.14	M	F_{MN}, F_{PP}, H_{PP}	NAD
	R3	3.81	F		NAD
	R4	3.88	F	S_S, VCe/C, MI	NAD
	R5	3.12	M		NAD
	R6	4.18	F	NAD	NAD
	R7	4.19	M		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN continued					
85	L1	4.49	M	VCe/C, F_{MN}, F_{PP}	NAD
	L2	4.26	F		NAD
	L3	4.44	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.40	F		NAD
	L5	4.85	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	4.49	F		NAD
	L7	4.18	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L8	4.85	M		NAD
	R1	4.35	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	4.60	F		NAD
	R3	4.57	M	S_S, RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	R4	4.42	F		NAD
86	L1	3.64	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L2	3.94	F		NAD
	L3	3.71	F	S_A, S_S, S_D, VCe/C, F_{MN}, F_{PP}	NAD
	L4	3.81	M		NAD
	L5	3.59	F	S_S, RB_L	NAD
	L6	3.73	M		Small right kidney
	L7	3.47	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	L8	3.15	F		NAD
	L9	3.67	F	S_X, F_{MN}	NAD
	R1	3.34	F		NAD
	R2	3.62	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R3	3.54	M		NAD
	R4	ER			
	R5	4.04	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R6	3.80	M		NAD
87	L1	4.22	F	R_{NO}, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.44	M		NAD
	L3	4.11	F	RB_R, MI	NAD
	R1	3.76	M		NAD
	R2	3.94	F	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	R3	4.05	M		NAD
	R4	4.25	M	RB_R, VCe/C, VAr/C, MI	NAD
	R5	4.21	M		NAD
	R6	3.66	F	S_S, VCe/C, F_{MN}, F_{PP}	NAD
	R7	4.13	M		NAD
	R8	3.96	F	S_S, RB_L, VCe/C, F_{MN}, F_{PP}, MI	NAD
	R9	3.82	F		NAD
88	L1	3.87	M	S_D, VCe/C, MI	NAD
	L2	3.65	F		NAD
	L3	3.71	F	S_S, MI	NAD
	L4	3.72	M		NAD
	L5	3.90	M	S_S, VCe/C, MI	NAD
	L6	3.76	F		NAD
	L7	4.14	M	S_S, VCe/C, MI	NAD
	L8	3.80	M		NAD
	L9	3.63	F	F_{MN}, F_{PP}, MI	NAD
	R1	3.90	M		NAD
	R2	3.40	M	S_S, S_D, X_{IO}, VCe/C, VAr/C, MI	NAD
	R3	3.81	M		NAD
	R4	4.01	M	S_S, VCe/C, MI	NAD
	R5	3.58	F		NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN continued					
89	L1	4.21	M	S_A, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}, MI	NAD
	L2	4.05	F		NAD
	L3	4.25	F	VCe/C, VAr/C, MI	NAD
	L4	ER			
	L5	4.40	F		NAD
	R1	4.14	F	S_S, VCe/C, MI	NAD
	R2	4.11	M		NAD
	R3	4.08	F	F_{MN}, F_{PP}	NAD
	R4	4.09	F		NAD
	R5	4.42	F	VCe/C, F_{MN}, F_{PP}, MI	NAD
	R6	4.14	M		NAD
	R7	4.18	M	S_S, VCe/C, VAr/C, F_{MN}, MI	NAD
	R8	4.22	M		NAD
90	L1	4.03	M	RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.27	M		NAD
	L3	4.44	F	RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.23	F		NAD
	L5	3.85	F	VCe/C, F_{MN}	NAD
	L6	4.64	M		NAD
	L7	3.71	F	NAD	NAD
	L8	4.56	M		NAD
	L9	3.93	F	F_{MN}	NAD
	R1	3.79	F		NAD
	R2	4.43	M	VCe/C, F_{MN}, F_{PP}	NAD
	R3	4.46	M		NAD
	R4	4.34	F	S_S, RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	R5	4.34	M		NAD
	R6	4.19	F	VCe/C, F_{MN}, F_{PP}	NAD
91	L1	3.59	F	VCe/C, F_{MN}, MI	NAD
	L2	3.72	M		NAD
	L3	3.80	M	S_A, S_S, RB_L, RB_R, VCe/C, VAr/C, MI	NAD
	L4	3.50	M		NAD
	L5	3.82	M	S_D, VCe/C, VCe/TD, MI	NAD
	L6	3.75	F		NAD
	L7	3.92	F	S_S, VCe/C, F_{PP}	NAD
	R1	3.83	F	S_S, S_D, RB_L	NAD
	R2	3.52	F		NAD
	R3	3.61	F	S_S, RB_L, VCe/C, MI	NAD
	R4	3.56	F		NAD
	R5	3.83	F	S_A, S_S, VCe/C	NAD
	R6	3.83	F		NAD
	R7	3.66	F	VCe/C, F_{PP}, MI	NAD
	R8	4.08	M		NAD
	R9	3.81	F	F_{MN}, MI	NAD
92	L1	4.40	M	S_S, S_D, VCe/C, F_{PP}, F_{MN}	NAD
	L2	4.47	M		NAD
	L3	4.51	M	RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.45	M		NAD
	R1	4.34	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R2	4.17	M		NAD
	R3	4.38	F	RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R4	4.45	F		NAD
	R5	3.58	F	S_S, S_D, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN continued					
93	L1	3.87	F	S_S, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	4.23	M		NAD
	L3	4.05	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L4	4.07	M		NAD
	L5	3.84	F	RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	L6	3.72	F		NAD
	L7	3.93	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L8	4.05	M		NAD
	L9	3.87	F	S_S, F_{MN}, F_{PP}	NAD
	L10	4.08	F		NAD
	L11	3.95	F	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	3.86	F		NAD
	R2	3.77	F	S_X, VCe/C, F_{MN}	NAD
	R3	4.16	M		NAD
	R4	4.01	M	S_S, VCe/C, F_{MN}, F_{PP}	NAD
94				------ NOT PREGNANT ------	
95	L1	3.10	M	S_S, F_{MN}, F_{PP}	NAD
	L2	ER			
	R1	3.76	M		NAD
	R2	3.27	M	S_S, S_D	NAD
	R3	4.18	M		NAD
	R4	4.18	M	VCe/C, F_{MN}, F_{PP}	NAD
	R5	4.36	M		NAD
	R6	4.00	M	VCe/C, F_{MN}, F_{PP}	NAD
	R7	4.08	M		NAD
	R8	3.91	F	RB_L, VCe/C, F_{MN}, F_{PP}	NAD
	R9	3.92	M		NAD
	R10	3.01	F	VCe/C, F_{MN}, F_{PP}	NAD
96	L1	4.15	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L2	3.99	M		NAD
	L3	3.89	F	S_S, RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	L4	4.19	M		NAD
	L5	4.06	F	RB_L, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	L6	4.21	M		NAD
	L7	4.18	M	RB_L, RB_R, VCe/C, F_{MN}, F_{PP}	NAD
	L8	3.76	F		NAD
	L9	3.99	M	S_S, S_D, RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R1	3.73	M		NAD
	R2	4.15	M	S_S, S_D, F_{MN}, F_{PP}	NAD
	R3	4.02	F		NAD
	R4	3.78	F	VCe/C, F_{MN}	NAD
	R5	3.89	M		NAD
	R6	4.10	M	VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R7	3.48	F		NAD
	R8	4.13	M	RB_L, RB_R, VCe/C, VAr/C, F_{MN}, F_{PP}	NAD
	R9	3.94	F		NAD
	R10	3.75	F	VCe/C, F_{MN}, F_{PP}	NAD

continued....

Appendix 11. continued.

Dam No.	Foetal parameters			Findings	
	Position	Weight	Sex	Skeletal	Visceral
5.0% Emulsifier YN continued					
97	L1	4.09	M	VCe/C,MI	NAD
	L2	3.91	M		NAD
	L3	4.34	M	VCe/C,F_{MN},F_{PP},H_{MN}	NAD
	L4	4.49	F		NAD
	L5	4.46	F	S_S,VCe/C,F_{MN},F_{PP}	NAD
	L6	3.09	F		NAD
	L7	3.03	M	S_S,S_D	NAD
	L8	4.29	M		NAD
	L9	3.78	F	S_S,F_{MN}	NAD
	L10	4.04	F		NAD
	R1	3.93	F	S_A,S_S,VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	R2	4.05	F		NAD
	R3	4.28	M	VCe/C,VAr/C,F_{MN},F_{PP}	NAD
	R4	4.22	M		NAD
	R5	4.01	F	S_S,F_{MN}	NAD
	R6	4.55	M		NAD
98	L1	4.03	M	S_S,VCe/C,VAr/C,MI	NAD
	L2	3.95	F		Shortened palate and tongue, slight hydrocephalus
	L3	4.09	M	R_{NO},VCe/C,VAr/C,MI	NAD
	L4	4.05	F		NAD
	L5	3.75	F	S_S,RB_L,VCe/C,MI	NAD
	L6	4.11	M		NAD
	R1	3.88	F	S_A,S_S,VCe/C,F_{MN},F_{PP},MI	NAD
	R2	3.70	M		NAD
	R3	3.87	F	S_S,VCe/C,F_{MN},F_{PP}	NAD
	R4	4.12	M		NAD
	R5	3.83	M	S_S,VCe/C,F_{MN},F_{PP}	NAD
	R6	3.89	M		NAD
	R7	3.61	F	S_S,VCe/C,MI	NAD
	R8	3.98	M		NAD
99	L1	2.98	F	VCe/C	NAD
	L2	3.36	M		NAD
	L3	3.16	F	S_S,MI	NAD
	L4	3.37	M		NAD
	L5	3.36	F	S_S	NAD
	L6	3.59	M		NAD
	L7	3.60	F	S_S,MI	NAD
	L8	3.48	M		NAD
	L9	3.40	F	S_S,MI	NAD
	R1	3.55	M		NAD
	R2	3.51	F	S_X,X_X,F_{MN}	NAD
	R3	3.75	M		NAD
	R4	3.61	F	S_D,VCe/C,F_{MN},F_{PP}	NAD
	R5	3.40	F		NAD
	R6	3.62	M	S_S,F_{MN}	NAD
	R7	3.33	F		NAD
	R8	3.48	F	S_S,S_D	NAD
100	R1	4.82	M	VCe/C,VAr/C,F_{MN},F_{PP},VCe/TD	NAD
	R2	4.65	F		NAD

continued....

Appendix 11. continued.

KEY:

L	=	left
R	=	right
ER	=	early resorption
LR	=	late resorption
M	=	male
F	=	female
DF	=	dead foetus
SF	=	small foetus (% of mean foetus weight)

Sternebrae

S_{IO}	=	incompletely ossified
S_B	=	bilateral
S_A	=	asymmetrical
S_S	=	small
S_D	=	dumbbell shaped
S_X	=	absent

Xiphisternum

X_{IO}	=	incompletely ossified
X_S	=	small
X_X	=	absent
X_A	=	asymmetrical

Ribs

R_{NO}	=	number
R_W	=	wavy

Scapula and clavicle

SC_{IO}	=	scapula, incompletely ossified
C_{IO}	=	clavicle, incompletely ossified

Rib base

RB_L	=	rib base on left side present
RB_R	=	rib base on right side present

Vertebrae centrae

VCe/C	=	caudal, number
VCe/SAC	=	sacral, absent
VCe/TH	=	thoracic, abnormal
VCe/TD	=	thoracic, dumbbell
VCe/LUM	=	lumbar, abnormal

Vertebrae arches

VAr/C	=	caudal, number
VAr/SAC	=	sacral, abnormal

Forelimbs

F_{MN}	=	metacarpals, number
F_{PP}	=	proximal phalanges, present
F_{DP}	=	distal phalanges, absent
F_{LB}	=	long bone, abnormal

Hindlimb

H_{MN}	=	metacarpals, number
H_{PP}	=	proximal phalanges, present
H_{DP}	=	distal phalanges, absent
H_{LB}	=	long bone, abnormal

Skull

SK/FN_{IO}	=	frontal and nasal bones, incompletely ossified
SK/P_{IO}	=	parietals, incompletely ossified
SK/S_{IO}	=	supra occipital, incompletely ossified
SK/I_{IO}	=	intra parietals, incompletely ossified
SK/S_X	=	supra occipital, absent

Pelvic girdle

PG/P	=	pubis, abnormal
PG/IS	=	ischium, abnormal
PG/IL	=	ilium, abnormal

MI	=	Missing parts (due to processing error)
NAD	=	No abnormality detected

Where a finding was recorded more than once in a particular foetus, the finding has only been reported once in the appendix, i.e. as an incidence

GR

9.9.1967

Acute toxicity of Emulsifier YN in rats mice and rabbits

J. Colley and I.F. Gaunt

000216

INTRODUCTION

Frazer (1954) showed that the maximum tolerated acute oral dose of Emulsifier YN was greater than 5 g/kg in rats, rabbits and dogs and by the intramuscular route greater than 2 g/kg to rats and guinea-pigs. The no-effect level after 90 days feeding in rats was greater than 6% of the diet and metabolic studies with Emulsifier YN labelled with ^{32}P showed that up to 87% of the dose was excreted in the faeces within 16 days, the some inorganic phosphate was liberated in the intestine and this was disposed of along physiological pathways (BIBRA Research Report 5/1966).

Further acute studies have been carried out by the oral and intraperitoneal routes in rats, mice and rabbits.

METHODS

Animals and diet

The animals employed in these studies were rats of the CFE strain, Charles River mice and New Zealand White rabbits. These were allowed free access to food and water. The diets used were Spillers Laboratory small animal diets for rats, Oxoid pasteurized breeding diet for mice and Dixon's R.G.P. pellets for rabbits.

Materials

The Emulsifier YN was supplied by Cadbury Brothers Ltd., Bournville, Birmingham, England, and was from the same batch as that used in previous investigations in these laboratories (BIBRA Research Report 5/1966).

Experimental

The sample was prepared for administration as a 50% suspension in corn oil. This was administered by stomach tube or by intraperitoneal injection into groups of five animals of each sex in the case of rats and mice and four of each sex in rabbits. At the highest level (20 g/kg) in rats and mice the dose was divided into two given with a six hr interval between. This was necessary as it was found that the volumes involved at doses above 10 g/kg

were too large to be administered as a single dose. A group of five rats was given an oral dose of oil at 20 ml/kg, a volume equivalent to the largest single dose of YN suspension (10 g/kg). The animals were observed for 10 days after treatment and an autopsy conducted on all animals at the end of this period.

RESULTS

The dose levels employed are summarised in the table. There were no deaths with any of the treatments used. Higher dosage levels were not possible due to the large volumes involved.

The signs seen were similar in all three species. After treatment by the oral route there was a slight lethargy in the form of reduced spontaneous and exploratory behaviour for the first six to eight hours and a severe diarrhoea for the first 24 hours. The faeces were liquid and white but the consistency and appearance of the faeces was normal after 48 and 72 hours. The animals ate very little food for the first 24 hours after which behaviour in this respect was normal. After intraperitoneal treatment the only sign was a slight lethargy for the first few hours after treatment. After treatment of rats with oil alone there was diarrhoea of a similar duration to that seen in the test animals but the faeces were not white coloured. A period of anorexia was also seen but no lethargy.

At autopsy no macroscopic abnormalities were seen after oral treatment. After intraperitoneal dosing large quantities of the administered dose was still present as a creamy white emulsion coating the organs. This could be easily removed and the organs

were normal in appearance and there was no evidence of peritonitis or adhesions.

DISCUSSION

These studies have shown that Emulsifier YN is non-toxic in large acute doses. The maximum tolerated acute oral dose of Emulsifier YN is in excess of 20 g/kg in rats and mice and 15 g/kg in rabbits. The diarrhoea seen was probably due to the large volumes of oil given, as a similar effect was seen after the administration of oil alone. The white colour of the faeces indicates that much of the dose is not absorbed from the intestine. This is in accordance with the findings of Feuer (BIBRA Research Report 5/1966) who found that when ^{32}P labelled YN was given to rats most of the dose was excreted in the faeces. By the intraperitoneal route the maximum tolerated dose is in excess of 10 g/kg in all three species. Clearance from the peritoneal cavity was slow. The upper limits of dosing in all cases were determined by the volume of YN suspension in oil which could be administered to the animals.

REFERENCES

Gaunt, I.F., Farmer, Madge, Grasso, P. & Gangolli, S.D. (1966). Studies on Emulsifier YN. BIBRA Research Report No. 5/1966.

Frazer, A.C. (1954). The Biological Properties of a Lecithin Substitute. Unpublished report dated July 1954.

Table 1. Dose levels of Emulsifier YN used in acute studies

Species	Body weight (g)	Route	Dose levels (g/kg)
Rat	Males 135-170	Oral	5, 10 and 20*
	Females 110-130	Intraperitoneal	5 and 10
Mouse	Males 25-35	Oral	10 and 20*
	Females 15-25	Intraperitoneal	5 and 10
Rabbit	Males and Females 1500-2500	Oral	5, 10 and 15
		Intraperitoneal	5 and 10

There were no deaths with any of these levels of treatment.

* Dose divided into 2 of 10 g/kg given with a six hr interval.

Pages 0000225 - 000231 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000232 - 000236 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000237 - 000250 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000251 - 000265 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000266 - 000273 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

7

EVALUATION ON SAFE INTAKE OF AMMONIUM PHOSPHATIDE IN THE UNITED STATES OF AMERICA.

Conclusion:
In order to establish an acceptable dosage level of Ammonium Phosphatide in chocolate and vegetable fat coatings, the ADI value of this emulsifier has been compared with the typical intake of chocolate-type confectionery by US consumers in 2005.
With a dosage of 0.70% Ammonium Phosphatide in chocolate-type confectionery an average consumer will intake 107 mg per day. For a child with a body weight on 25kg it correlates to a daily intake on 4.3 mg/kg body weight/day. (ADI value for Ammonium Phosphatide is set to 0-30 mg/kg body weight/day). The same child can consume almost 7 times the average amount of chocolate-type confectionery without exceeding the ADI value.

Consumption of Chocolate in the U.S.:
(Source: U.S.Census Bureau July 2006 – attached).

In 2005 the US Manufacturers' shipments of chocolate-type confectionery was 3,529,387,000 lbs (1,602,341,698 kg).
The exports was in the same period was 119,773,000 kg and the imports 173,775,000 kg.
The total consumption was 1,656,344,000 kg.

The annual population estimate for 2005 is: 296,639,497 (U.S.Census Bureau, Population Division)

The average consumption of chocolate-type confectionery can be calculated to 5.58 kg per year (12.3 lbs).

ADI Value of Ammonium Phosphatide:

Established by JECFA (FAO/WHO): 0-30 mg/kg body weight/day

Calculation on typical intakes of Ammonium Phosphatide:

Dosage of Ammonium Phosphatide in the chocolate: 0.70 % (7000 mg per kg)

Yearly consumption (kg)	Intake of Ammonium Phosphatide per day (mg)	Child (25 kg body weight) Daily intake/kg body weight/day (mg)	Adult (60 kg body weight) Daily intake/kg body weight/day (mg)
Average: 5.58kg	107	4.3	1.8
3 x Average: 16.74 kg	321	12.8	5.4
6 x Average: 33.48 kg	642	25.7	10.7

BEST ORIGINAL COPY

Confectionery: 2005

Issued July 2006

MA311D(05)-1

Current Industrial Reports

U S C E N S U S B U R E A U

Helping You Make Informed Decisions

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

000276

Table 1a. Summary of Manufacturers' Shipments of Confectionery Products: 1998 to 2005
[Quantity in millions of pounds. Value in millions of dollars]

Year	Quantity	Value	Per capita consumption 1/ (pounds)	Per capita consumption 1/ (dollars)
2005	6,493	16,880	25.7	61.5
2004	6,208	16,465	24.8	60.5
2003	6,247	15,615	24.6	57.6
2002	6,244	15,062	24.0	55.1
2001	6,313	15,143	23.6	54.7
2000	6,665	14,969	25.1	54.8
1999	6,614	14,447	26.0	55.0
1998	6,952	14,894	26.8	56.6

1/Source, Table 4, shipments plus imports minus exports divided by population, including armed forces abroad, as of July 1, 2005.

Source of population data: U.S. Census Bureau, Population Division, Table NA-EST2005-01 - Annual population estimates for the United States, including armed forces abroad, as of July 2005 and July 2004. July 2005 population was 296,639,497 and July 2004 population was 293,906,517.

Note: See Table 4 for information on U.S. imports and exports of confectionery products.

Table 1b. Summary of Manufacturers' Shipments of Confectionery Products (Excluding Chewing Gum, Bubble Gum, and Chewing Gum Base): 1998 to 2005
[Quantity in millions of pounds. Value in millions of dollars]

Year	Quantity	Value	Per capita consumption 1/ (pounds)	Per capita consumption 1/ (dollars)
2005	6,111	15,264	24.1	55.8
2004	5,780	14,636	23.0	53.9
2003	5,799	13,885	22.8	51.2
2002	5,810	13,355	22.2	48.9
2001	5,882	13,458	21.8	48.5
2000	6,258	13,503	23.4	49.3
1999	6,221	13,082	24.3	49.8
1998	6,546	13,569	25.3	51.6

1/Source, Table 4, shipments plus imports minus exports divided by population, including armed forces abroad, as of July 1, 2005.

Source of population data: U.S. Census Bureau, Population Division, Table NA-EST2005-01 - Annual population estimates for the United States, including armed forces abroad, as of July 2005 and July 2004. July 2005 population was 296,639,497 and July 2004 population was 293,906,517.

Note: See Table 4 for information on U.S. imports and exports of confectionery products.

Table 2a. Quantity and Value of Shipments of Confectionery Products: 2005 and 2004
[Quantity in thousands of pounds. Value in thousands of dollars]

Product description	2005		2004	
	Quantity	Value	Quantity	Value
Shipments	6,493,573	16,880,338	6,208,003	16,465,387
Chocolate and chocolate-type confectionery	3,529,387	9,982,793	3,321,509	9,637,758
Solid	557,171	1,380,880	515,558	1,324,781
Solid with inclusions	226,685	695,998	232,100	717,137
Enrobed or molded with candy, fruit, nut or granola center	1,373,626	3,780,645	1,314,552	3,748,341
Enrobed or molded with bakery product center	318,904	920,831	291,074	825,854
Panned	627,028	1,584,268	572,468	1,477,856
Assortments and other	425,973	1,620,171	395,757	1,543,789
Chocolate type, n.s.k.	-	-	-	-
Nonchocolate-type confectionery	2,375,779	4,782,775	2,260,636	4,508,332
Hard candy	581,815	1,341,513	568,283	1,247,816
Chewy candy, including granola bars	662,395	1,534,055	585,572	1,336,842
Soft candy	553,105	865,636	558,409	895,279
Iced/coated	6,898	34,495	(D)	(D)
Panned	392,094	764,620	370,594	746,049
Licorice and licorice type	179,472	242,456	(D)	(D)
Nonchocolate type, n.s.k.	-	-	-	-
Chewing gum, bubble gum, and chewing gum base	382,258	1,616,032	427,674	1,829,463
Confectionery, n.s.k. 1/	206,149	498,738	198,184	489,834

- Represents zero. D Withheld to avoid disclosing data for individual companies. N.s.k. Not specified by kind.

1/Represents estimated data for small companies, typically those with fewer than five employees, that were not included on the mailing panel.

Table 2b. Quantity and Value of Shipments of Nonconfectionery Products: 2005 and 2004
[Quantity in thousands of pounds. Value in thousands of dollars]

Product description	2005			2004		
	Quantity	Value		Quantity		Value
Shipments	1,908,364	2,154,035		1,790,441		2,114,798
Chocolate products other than confectionery:						
Baking chocolate (bars or blocks)	20,200	27,086	r/	20,157	r/	29,970
Chocolate coatings (blocks, wafers, liquid)	(S)	(S)		(S)		(S)
Chocolate liquor	(D)	(D)		(D)		(D)
Cocoa butter	(D)	(D)		(D)		(D)
Compound coatings (blocks, wafers, liquid)	261,258	215,849	r/	252,047	r/	217,539
Chocolate chips and baking pieces	696,396	982,012	r/	654,291	r/	892,954
Cocoa powder, syrup/toppings, and other	524,421	507,577		479,084		534,379
Nonconfectionery chocolate n.s.k.	-	-		-		-

- Represents zero. D Withheld to avoid disclosing data for individual companies. N.s.k. Not specified by kind. r/Revised by 5 or more percent from previously published data. S Does not meet publication standards.

Table 3. Consumption of Selected Ingredients by the U.S. Confectionery Industry: 2005 and 2004
[Quantity in thousands of pounds. Value in thousands of dollars]

Materials	2005		2004	
	Quantity	Value	Quantity	Value
Materials consumed	(X)	4,131,733	(X)	3,963,981
Sugar (cane-beet)	2,404,237	663,189	2,367,551	658,321
Cocoa beans	697,169	603,160	729,265	571,046
Corn syrup including HFCS and dextrose	1,402,857	172,264	1,363,482	162,671
Chocolate liquor, imported	(D)	(D)	(S)	(S)
Chocolate liquor, domestic	(D)	(D)	13,070	17,603
Cocoa powder composition coatings	(S)	(S)	(S)	(S)
Cocoa cake or powder	127,185	84,114	130,340	90,882
Cocoa butter	241,620	435,780	247,822	393,380
Chocolate coatings, milk	216,288	203,350	237,847	227,348
Chocolate coatings, other than milk	111,047	100,913	114,889	106,991
Fats and oils	228,785	112,547	221,772	102,107
Gum base	(D)	(D)	66,934	62,565
Milk and milk products	1,083,423	517,852	1,052,761	481,863
Peanuts, shelled basis	327,843	158,983	326,548	150,387
Almond kernels	53,731	105,141	50,675	81,024
Other nuts and nut meats (kernels)	35,104	100,366	38,421	97,970
Coconut meat	5,601	5,322	5,511	5,192
Other edible materials 1/	501,978	728,999	493,913	710,371
Materials, n.s.k.	(X)	2,133	(X)	2,048

D Withheld to avoid disclosing data for individual companies. N.s.k. Not specified by kind.
S Does not meet publication standards. X Not applicable.

1/Includes corn starch, essential oils, eggs and egg products, fruits, jams, and other materials on which specific data were not collected.

Note: Materials such as parts, containers, etc., consumed in the manufacturing process are not reported in this survey. This information is available in the 2002 Economic Census report for industries 311320, 311330, and 311340. Specifically excluded in this report are freight charges and other direct charges incurred by the establishment, fuels consumed, parts, containers, scrap, electric energy purchases, work done by others on materials or parts furnished by other establishments (contract work), and cost of products bought and resold in the same condition.

Table 4. Shipments, Exports, Imports, and Apparent Consumption of Confectionery Products: 2005 and 2004
[Quantity in thousands of kilograms. Value in thousands of dollars]

Product code 1/	Product description	Year	Manufacturers' shipments Quantity	Manufacturers' shipments Value	Exports of domestic merchandise 2/ Quantity	Exports of domestic merchandise 2/ Value	Percent exports to manufacturers' shipments Quantity	Percent exports to manufacturers' shipments Value
	Confectionery:							
3113301	Chocolate-type confectionery	2005	1,600,919	9,982,793	119,773	453,060	7.5	4.5
		2004	1,506,627	9,637,758	119,461	416,890	7.9	4.3
3113401	Nonchocolate-type confectionery	2005	1,077,646	4,782,775	86,832	222,977	8.1	4.7
		2004	1,025,418	4,508,332	85,138	220,567	8.3	4.9
3113404	Chewing gum, sugar and nonsugar	2005	173,391	1,616,032	18,354	56,633	10.6	3.5
		2004	193,992	1,829,463	14,844	49,886	7.7	2.7
	Nonconfectionery:							
3113201241	Cocoa butter	2005	(D)	(D)	14,860	64,688	(D)	(D)
		2004	(D)	(D)	13,728	57,443	(D)	(D)
31132014A1, 15C1	Chocolate coatings (blocks, wafers, liquid) and compound coatings (blocks, wafers, liquid)	2005	248,677	504,145	5,016	9,497	2.0	1.9
		2004	241,716	541,177	6,512	9,607	2.7	1.8
3113207471, 1231, 75G1, 76H1	Other chocolate and cocoa products	2005	(D)	(D)	82,042	187,037	(D)	(D)
		2004	(D)	(D)	84,509	203,851	(D)	(D)

Product code 1/	Product description	Year	Imports for consumption 3/ Quantity	Imports for consumption 3/ Value 4/	Apparent consumption 5/ Quantity	Apparent consumption 5/ Value	Percent imports to apparent consumption Quantity	Percent imports to apparent consumption Value
	Confectionery:							
3113301	Chocolate-type confectionery	2005	173,775	765,870	1,654,921	10,295,603	10.5	7.4
		2004	174,702	751,809	1,561,868	9,972,677	11.2	7.5
3113401	Nonchocolate-type confectionery	2005	507,219	1,198,754	1,498,033	5,758,552	33.9	20.8
		2004	477,697	1,093,974	1,417,977	5,381,739	33.7	20.3
3113404	Chewing gum, sugar and nonsugar	2005	55,652	138,972	210,689	1,698,371	26.4	8.2
		2004	55,262	159,172	234,410	1,938,749	23.6	8.2
	Nonconfectionery:							
3113201241	Cocoa butter	2005	96,876	402,427	(D)	(D)	(D)	(D)
		2004	94,890	306,883	(D)	(D)	(D)	(D)
31132014A1, 15C1	Chocolate coatings (blocks, wafers, liquid) and compound coatings (blocks, wafers, liquid)	2005	22,619	28,516	266,280	523,164	8.5	5.5
		2004	23,826	28,164	259,030	559,734	9.2	5.0
3113207471, 1231, 75G1, 76H1	Other chocolate and cocoa products	2005	436,554	757,077	(D)	(D)	(D)	(D)
		2004	421,348	784,932	(D)	(D)	(D)	(D)

D Withheld to avoid disclosing data for individual companies.

1/For comparison of North American Industry Classification System (NAICS)-based product codes (domestic output), Schedule B export codes, and HTSUSA import codes, see Table 5.
2/Source: Census Bureau report EM 545, U.S. Exports.
3/Source: Census Bureau report IM 146, U.S. Imports for Consumption.
4/This dollar value represents the c.i.f. (cost, insurance, and freight) value at first port of entry in the United States.
5/Apparent consumption is derived by subtracting exports from the total manufacturers' shipments plus imports.

Note: "Confectionery n.s.k." is excluded from this table.

Table 5. Comparison of North American Industry Classification System (NAICS)-Based Product Codes With Schedule B Export Codes, and HTSUSA Import Codes: 2005

Product code	Product description	Export code 1/	Import code 2/
3113301, 3000	Total, chocolate and chocolate-type confectionery products and nonconfectionery chocolate products	1806.31.0040 1806.31.0080 1806.32.1000 1806.32.3550 1806.90.0063 1806.90.0073 1806.90.0083 1806.90.0093	1806.31.0041 1806.31.0049 1806.31.0080 1806.32.0100 1806.32.0400 1806.32.0600 1806.32.0800 1806.32.1400 1806.32.1600 1806.32.1800 1806.32.3000 1806.32.5500 1806.32.6000 1806.32.7000 1806.32.8000 1806.32.9000 1806.90.0100 1806.90.0500 1806.90.0800 1806.90.1000 1806.90.1500 1806.90.1800 1806.90.2000 1806.90.2500 1806.90.2800 1806.90.3000 1806.90.3500 1806.90.3900 1806.90.4500 1806.90.4900 1806.90.5500 1806.90.5900 1806.90.9011 1806.90.9019 1806.90.9090
3113401	Total, nonchocolate confectionery products	1704.90.3000 1704.90.7000	1704.90.3520 1704.90.3550 1704.90.3590 2106.90.9985
3113404	Chewing gum, sugar and nonsugar	1704.10.0000	1704.10.0000
3113201241	Cocoa butter	1804.00.0000	1804.00.0000
31132014A1, 15C1	Chocolate coatings (blocks, wafers, liquid) and compound coatings (blocks, wafers, liquid)	1806.20.6000	1806.20.6000 1803.10.0000 1803.20.0000 1805.00.0000 1806.10.0500 1806.10.1000 1806.10.1500 1806.10.2200 1806.10.2400 1806.10.2800 1806.10.3400 1806.10.3800

Table 5. Comparison of North American Industry Classification System (NAICS)-Based Product Codes With Schedule B Export Codes, and HTSUSA Import Codes: 2005

Product code	Product description	Export code 1/	Import code 2/
31132014A1, 15C1	Chocolate coatings (blocks, wafers, liquid) and compound coatings (blocks, wafers, liquid) (continued).....		1806.10.4300
			1806.10.4500
			1806.10.5500
			1806.10.6500
			1806.10.7500
			1806.20.2010
			1806.20.2090
			1806.20.2200
			1806.20.2400
			1806.20.2600
3113201231, 3113207471, 31132075G1, 31132076H1	Chocolate liquor and Baking chocolate (bars and blocks) and Chocolate chips and baking pieces and Cocoa powder (sweetened and unsweetened), syrup, toppings, and other.....	1803.10.0000	1806.20.2800
		1803.20.0000	1806.20.3400
		1805.00.0000	1806.20.3600
		1806.10.0000	1806.20.3800
		1806.20.9000	1806.20.5000
			1806.20.6700
			1806.20.7100
			1806.20.7300
			1806.20.7500
			1806.20.7700
			1806.20.7800
			1806.20.7900
			1806.20.8100
			1806.20.8200
			1806.20.8700
			1806.20.8900
			1806.20.9100
			1806.20.9400
			1806.20.9500
			1806.20.9800
			1806.20.9900

1/Source: 2005 edition, Harmonized System-Based Schedule B, Statistical Classification of Domestic and Foreign Commodities Exported from the United States.

2/Source: Harmonized Tariff Schedule of the United States, Annotated (2005).

Appendix.
General CIR Survey Information, Explanation of General Terms and Historical Note

GENERAL

The CIR program has been providing monthly, quarterly, and annual measures of industrial activity for many years. Since 1904, with its cotton and fats and oils surveys, the CIR program has formed an essential part of an integrated statistical system involving the quinquennial economic census, manufacturing sector, and the annual survey of manufactures. The CIR surveys, however, provide current statistics at a more detailed product level than either of the other two statistical programs.

The primary objective of the CIR program is to produce timely, accurate data on production and shipments of selected products. The data are used to satisfy economic policy needs and for market analysis, forecasting, and decision making in the private sector. The product-level data generated by these surveys are used extensively by individual firms, trade associations, and market analysts in planning or recommending marketing and legislative strategies, particularly if their industry is significantly affected by foreign trade. Although production and shipments information are the two most common data items collected, the CIR program collects other measures also such as inventories, orders, and consumption. These surveys measure manufacturing activity in important commodity areas such as textiles and apparel, chemicals, primary metals, computer and electronic components, industrial equipment, aerospace equipment, and consumer goods.

The CIR program uses a unified data collection, processing, and publication system. The U.S. Census Bureau updates the survey panels for most reports annually and reconciles the estimates to the results of the broader-based annual survey of manufactures and the economic census, manufacturing sector. The manufacturing sector provides a complete list of all producers of the products covered by the CIR program and serves as the primary source for CIR sampling. Where a small number of producers exist, CIR surveys cover all known producers of a product. However, when the number of producers is too large, cutoff and random sampling techniques are used. Surveys are continually reviewed and modified to provide the most up-to-date information on products produced. The CIR program includes a group of mandatory and voluntary surveys. Typically the monthly and quarterly surveys are conducted on a voluntary basis. Those companies that choose not to respond to the voluntary surveys are required to submit a mandatory annual counterpart corresponding to the more frequent survey.

NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS), 1997

The adoption of the North American Industry Classification System (NAICS) in the 1997 Economic Census has had a major impact on the comparability of current and historic data. Approximately half of the industries in the manufacturing sector of NAICS do not have comparable industries in the Standard Industrial Classification (SIC) system that was used in the past.

While most of the change affecting the manufacturing sector was change within the sector, some industries left manufacturing and others came into manufacturing. Prominent among those that left manufacturing are logging and portions of publishing. Prominent among the industries that came into the manufacturing sector are bakeries, candy stores where candy is made on the premises, custom tailors, makers of custom draperies, and tire retreading. The net effect of the classification changes are such that if the 1997 value of shipments data for all manufacturers were tabulated on an SIC basis, it would be approximately 3 percent higher.

Listed below are the NAICS sectors:

21 Mining
22 Utilities
23 Construction
31-33 Manufacturing
42 Wholesale Trade
44-45 Retail Trade
48-49 Transportation and Warehousing
51 Information
52 Finance and Insurance
53 Real Estate and Rental and Leasing
54 Professional, Scientific, and Technical Services
55 Management of Companies and Enterprises
56 Administrative and Support and Waste Management and Remediation Services
61 Educational Services
62 Health Care and Social Assistance
71 Arts, Entertainment, and Recreation
72 Accommodation and Foodservices
81 Other Services (except Public Administration)

(Not listed above are the Agriculture, Forestry, Fishing, and Hunting sector (NAICS 11), partially covered by the census of agriculture conducted by the U.S. Department of Agriculture, and the Public Administration sector (NAICS 92), covered by the census of governments conducted by the Census Bureau.)

000285

The 20 NAICS sectors are subdivided into 96 subsectors (three-digit codes), 313 industry groups (four-digit codes), and, as implemented in the United States, 1170 industries (five- and six-digit codes).

FUNDING

The Census Bureau funds most of the surveys. However, a number of surveys are paid for either fully or partially by other Federal Government agencies or private trade associations. A few surveys are mandated, but all are authorized by Title 13 of the United States Code.

RELIABILITY OF DATA

Survey error may result from several sources including the inability to obtain information about all cases in the survey, response errors, definitional difficulties, differences in the interpretation of questions, mistakes in recording or coding the reported data, and other errors of collection, response, coverage, and estimation. These nonsampling errors also occur in complete censuses. Although no direct measurement of the biases due to these nonsampling errors has been obtained, precautionary steps were taken in all phases of the collection, processing, and tabulation of the data in an effort to minimize their influence.

A major source of bias in the published estimates is the imputing of data for nonrespondents, for late reporters, and for data that fail logic edits. Missing figures are imputed based on period-to-period movements shown by reporting firms. A figure is considered to be an impute if the value was not directly reported on the questionnaire, directly derived from other reported items, directly available from supplemental sources, or obtained from the respondent during the analytical review phase. Imputation generally is limited to a maximum of 10 percent for any one data cell. Figures with imputation rates greater than 10 percent are suppressed or footnoted. The imputation rate is not an explicit indicator of the potential error in published figures due to nonresponse, because the actual yearly movements for nonrespondents may or may not closely agree with the imputed movements. The range of difference between the actual and imputed figures is assumed to be small. The degree of uncertainty regarding the accuracy of the published data increases as the percentage of imputation increases. Figures with imputation rates above 10 percent should be used with caution.

DATA REVISIONS

Statistics for previous years may be revised as the result of corrected figures from respondents, late reports for which imputations were originally made, or other corrections. Data that have been revised by more than 5percent from previously published data are indicated by footnotes.

DISCLOSURE

The Census Bureau collects the CIR data under the authority of Title 13, United States Code, which specifies that the information can only be used for statistical purposes and cannot be published or released in any manner that would identify a person, household, or establishment. "D" indicates that data in the cell have been suppressed to avoid disclosure of information pertaining to individual companies.

EXPLANATION OF GENERAL TERMS

Capacity. The maximum quantity of a product that can be produced in a plant in 1 day if operating for 24 hours. Includes the capacity of idle plants until the plant is reported to be destroyed, dismantled, or abandoned.

Consumption. Materials used in producing or processing a product or otherwise removing the product from the inventory.

Exports. Includes all types of products shipped to foreign countries, or to agents or exporters for reshipment to foreign countries.

Gross shipments. The quantity or value of physical shipments from domestic establishments of all products sold, transferred to other establishments of the same company, or shipped on consignment, whether for domestic or export sale or use. Shipments of products purchased for resale are omitted. Shipments of products made under toll arrangements are included.

Interplant transfers. Shipments to other domestic plants within a company for further assembly, fabrication, or manufacture.

Inventories. The quantity or value of finished goods, work in progress, and materials on hand.

Machinery in place. The number of machines of a particular type in place as of a particular date whether the machinery was used for production, prototype, or sampling, or was idle. Machinery in place includes all machinery set up in operating positions.

Net receipts. Derived by subtracting the materials held at the end of the previous month from the sum of materials used during the current month.

Production. The total volume of products produced, including: products sold; products transferred or added to inventory after adjustments for breakage, shrinkage, and obsolescence, plus any other inventory adjustment; and products that undergo further manufacture at the same establishment.

Quantities produced and consumed. Quantities of each type of product produced by a company for internal consumption within that same company.

Quantity and value of new orders. The sales value of orders received during the current reporting period for products and services to be delivered immediately or at some future date. Also represents the net sales value of contract change documents that increase or decrease the sales value of the orders to which they are related, when the parties concerned are in substantial agreement as to the amount involved. Included as orders are only those that are supported by binding legal documents such as signed contracts or letter contracts.

Quantity and value of shipments. The figures on quantity and value of shipments represent physical shipments of all products sold, transferred to other establishments of the same company, or shipped on consignment, whether for domestic or export sale. The value represents the net sales price, f.o.b. plant, to the customer or branch to which the products are shipped, net of discounts, allowances, freight charges, and returns. Shipments to a company's own branches are assigned the same value as comparable appropriate allocation of company overhead and profit. Products bought and resold without further manufacture are excluded.

Stocks. Total quantity of ending finished inventory.

Unfilled orders (backlog). Calculated by adding net new orders and subtracting net sales from the backlog at the end of the preceding year.

HISTORICAL NOTE

Data on confectionery products have been collected by the Census Bureau since1926. In 1989, data tables showing the quantity and value of shipments of chocolate and nonchocolate-type confectionery, by type of product and package, were discontinued. Also discontinued in 1989 were data showing the sales and resales of confectionery by type of customer.

Starting with the 1990 report, data showing the quantity and value of shipments by type of product of other chocolate products (nonconfectionery) were added. Starting with the 1993 report, data for chewing gum were added.

Historical data may be obtained from Current Industrial Reports (called Facts for Industry before 1959) available at your local Federal Depository Library.

000287

8

Analysis.

Phosphorus analysis by ICP method

Nitrogen, determination of nitrogen in ammonium phosphatide

pH- measure in ammonium phosphatide

Water determination on Metrohm with autosampler

Hexane insoluble matter

Total bacterial count: Petrifilm

Determination of yeast and mould

Determination of Enterobacteria: Petrifilm

Determination of Salmonella- 100 grams

Sensory

Control of viscosity of ammonium phosphatide

Phosphorus analysis by ICP

Apparatus: *PE Opitma 2000 dualview*
PC with winlab32 analyst
Neslab CFT-75 refrigerated bath
Multiwave 3000 from Anton Paar

Procedure:

The sample is being prepared for ICP analysis by digestion in a Multiwave 2000 from Anton Paar.
200 – 300 mg of sample is weighed into the tubes for the multiwave. 5 ml of Nitric Acid and 1 ml of Hydrogen Peroxide is added. The sample is the digested in the microwave..

The digested sample is quantitative transferred into at 100 ml conical flask flushing with distilled Water. The sample is now ready for measuring in the ICP

As blank and solvent a blend of 5% HNO_3 and 1% H_2O_2 is used. The method of phosphorus is opened and in order for the instrument to temperate the plasma has to be switched on for at least 60 min. before the first analysis.. Phosphorus is measured at least two wavelengths.

Weigh out an adequate quantity of KH_2PO_4 (normally 100 mg/100 ml) for *calibrating* purposes. The KH_2PO_4 must have been kept in desiccator.

Enter the concentrations of the standards (in mg) into the method . Enter the ID of the samples, weight in mg, and volume of the flask (100 mL). The third trial of the queue is a blind test.
The Sample info file is saved

For the analysis of ammoniumphosphatide, a standard P 30000 SCP SCIENCE is used.
It has at phosphorus content of 3.000 %. The standard is measured every day, to avoid various results.

Calculation: The result appears from the report in the wanted size. An average of the double determinations and possible spectrum lines is taken.

Theory

In ICP (inductive coupled plasma) part of the argon gas form is held by means of radio frequencies. The plasma is approx. 8,000° C – 10,000° C. All moleculars pass to atomic form (plasma form) when the dissolved trial is introduced to the plasma. A great part of the atoms are *exsiccated* to different levels of electron shells. When they decay to normal condition a light with a wavelength depending on type of atom and state of excitation (spectrum lines) is sent out.

In ICP the spectrum lines are therefore measured, being the most relevant for the element the determination of which you are interested. The intensity of the measured spectrum line is directly proportional to the concentration of the element.

Method P-4444:
Read delay time (sec): 60

Element	Wavelength (nm)	Plasma L/min.	Aux L/min.	Neb L/min.	Power Watts	Wiev Dist	Plasma View
P	213,617	15	1,0	1,0	1300	15,0	Radial
P	214,914	15	1,0	1,0	1300	15,0	Radial

Determination of Nitrogen in Ammoniumphosphatide

Apparatus: 2200 Kjeltec Auto Distillation, Foss Tecator
Mettler Toledo DL53 Titrator

Reagents
0.1 N HCl
NaOH, 33% technical
4% boric acid with indicator

Control of Analysis
Standard: Ammoniumphosphatide and Ammonium sulphate $(NH_4)_2SO_4$
Every day: Double determination of the standard.
The result of the standard sample is saved.
If the average of the double determinations differs from the allowed interval, the analysis of the standard is repeated after control of the reagents. If the result is now within the allowed interval, the analysis of the trials is repeated and the results hereof are handed over. If the result still differs, however, the result must not be handed over. The responsible person of the laboratory is the one who is considering further steps.

Procedure
The analysis is to be carried out as double determination.
Blind value must be made every day. An empty Kjeldahl tube is treated like the trials.

0.12 – 0.15 g Ammoniumsulphate is weighed out in a Kjeldahl tube (control of the distillation).

1.5-2.0 g (4 decimals) sample is weighed out in a Kjeldahl tube. The standard ammoniumphosphatide is weighed out and treated like the samples.

The samples are distilled on Kjeltec. See the instructions.

The receiving flask beaker is removed from the distillation apparatus and the content is titrated with 0.1 N HCl on Mettler Toledo autotitrator.
The blind values are determined. The standards and samples are determined

Calculation
The result is read from the print.
The allowed maximum difference between the double determinations is 0.1.

Literature

FAO FOOD and NUTRITION PAPER, vol. 4; p. 247 (modificated)

pH-measure in Ammoniumphosphatide

Apparatus
Mettler Toledo MP 225 pH Meter

Reagents
Decoct Osmosis water

Procedure

5.00 g per sample is weighed out into a 100 ml beaker.

45 g (or ml) decoct Osmosis water warmed to 65-75 degrees Celsius is added.

This blend is stirred with a glass spatula to extract the acid-base components into the water phase.

Cool down the blend to room temperature – possibly by using a water bath – to skill out the fat phase. Avoid stirring (to avoid sucking of CO_2 from the air into the water phase).

With a 10 ml disposable pipette, collect sample from the water transfer to a 30 ml plastic beaker; totally approx. 20 ml water phase are transferred.

A little magnet is fixed to this beaker and it is put on a magnet stirrer. Avoid mixing air into the solution when stirred.

The electrode is dipped into the water phase and the pH appears from the pH-meter.

Frequently control that 7.0 is measured in buffer 7.0!

At first clean the electrode by washing in osmosis water, hereafter with ***iso propanol***, and finally with osmosis water.

Control of analysis

Before the **first** measure of the day:
Control that the electrode is filled up with **Elektrolyte** and that the electrode of the **Elektrolyte** contains crystals.
Calibrate by 2 buffers (pH 7.0 and pH 4.0).
Enter into enclosure 050 that this control has been made.

Water Determinations on Metrohm with Autosampler

Apparatus
Metrohm 720 KFS Titrino
Metrohm 703 Ti Stand
Metrohm 774 Oven Sample Processor

Reagens:
Hydranal Titrant 5
Hydranal Solvent

Control of analysis
Every day a determination of the standard trial is made.
The result of the standard trial has to be entered to enclosure 053 Metrohm. If the result differs from the allowed interval stated in enclosure 053 Metrohm, the analysis of the standard is repeated or control of the reagents.. If the result is now within the allowed interval, the analysis of the trials is repeated and the results hereof handed over. If the result is still differing itt must not be delivered. The laboratory responsible takes the decision of further steps.

Procedure
All determinations are made as double determinations.

The maximum allowed difference between the double determinations is described in the following scheme:

% water	Max. difference
< 0.5	0.02
0.5-1.0	0.1
> 1.0	0.2

Weighing and driving temperatures appear from enclosure 1100A (Instructions for weighing out of the samples for Karl Fisher – Metrohm) situated by side of the scale.

All weightings shall be stated to 4 decimal places.

If no information of the quantity has been given, the below instructive values are used:

% water	Weighing in grams
< 0.1	2
0.1-1	0.5
1-7	0.2-0.3
7-15	0.05-0.1
> 15	< 0.05

Hexane-insoluble matter(4448)
(and inorganic hexane-undissolvable)

Definition
Determination of Hexane-insoluble matter.

Apparatus
Glass-filter-crucible Type G2, dried and weighed (105° C for 1 hour; 600°C for 3 hours if inorganic hexane-insoluble is to be determined, too).

Reagents
Hexane

Control of Analysis
Besides, double-determination of the standard-trial is made every day.
The result of the standard-trial is entered into enclosure 047. If the average of the double-determination differs from the allowed interval entered into enclosure 047 the analysis of the standard is repeated after control of the reagents. If the result is now within the allowed interval, the analysis of the trials is repeated and the results hereof can be delivered. However, if the result is still differing, the result must not be delivered. The responsible person of the laboratory considers further steps.

Procedure
All determinations are made as double-determinations.

The sample is heated to max. 60° C and stirred carefully.

Hexan-insoluble
Weigh out 5 grams (3 decimals) trial (A grams) in a 250 ml *Erlenmeyer* flask. Add 100 ml petrol and shake carefully. The flask stands for ½-1 hour while it is frequently shaken, to ensure the solution of as much stuff as possible. Heat to the boiling point. To soluble the trial place the flask in a bath of ultra-sound for 1 minute . Decant through a dried and weighed (B grams) glass-filter-crucible Type G2, in order for a great deal of the sediment to remain in the flask.
Add further 100 ml petrol and shake carefully. Heat to the boiling point. Place the flask in a bath of ultra-sound for 1 minute and decant through the glass-filter-crucible.
Add further 100 ml petrol and shake carefully. Heat to the boiling point. Place the flask in a bath of ultra-sound for 1 minute and decant through the glass-filter-crucible in order for the last sediment to come into the crucible.
Wash the flask in 2 x 25 ml petrol which is also poured through the glass-filter-crucible.
Now the glass-filter-crucible is dried in the incubator for 1 hour at 105° C, cooled down for half an hour in a desiccator, and weighed (C grams).

Inorganic Hexane-insoluble

The weighed glass-filter-crucible from the hexan-insoluble is put into a muffle oven at 600°C for 24 hours. After cooling for 1 hour in a desiccator the filter-crucible is weighed (D grams).

Calculation

$$\% \text{ hexane - insoluble matter} = \frac{(C - B) \cdot 100}{A} \%$$

Uncertainty

Reference 4444 Hexane-insoluble = 1.99 +/- 0.4

Literature

A.O.C.S. Yes 3-87. Re-approved 1997

Total Bacterial Count: Petrifilm: -1.

Definition: The quantity of total germs in 1 g trial.

Apparatus
All weighings on Dilumat
Stomacher blender
Sterile Stomacher bag
Pipettes: 1 ml measuring pipettes

Reagents
Substrate Petri film; 3M; article No. 6400.
Sterile diluent A

Dissolving of trial
20 grams trial is weighed into a Stomacher bag. From a bottle of sterile diluent the quantity of liquid is automatically weighed out in the proportion 1:9 with the accuracy of 2 decimals (use a singed and cooled spoon).
Put the bag into the Stomacher and "box" for 2 x 30 sec. at maximum speed.
This dispersion is diluted solution -1.

Dilution and Seed
From the diluted solution -1 1.0 ml is pipetized into a dilution tube containing 9.0 ml sterile diluent., diluted solution -2 as well as 1.0 ml on Petrifilm (marked -1).
From diluted solution -2 1.0 ml is pipetized into a dilution tube containing 9.0 ml sterile diluent, diluted solution -3.
From the diluted solution – 2 1.0 ml. is put on a Petrifilm (to be marked -2) and hereafter 1.0 ml diluted solution -3 on a Petrifilm (to be marked -3).

Incubation: The Petri films are incubated – with the bright side upwards – at 30° C +/- 1° C for 72 hours.

Reading
Evaluate the row of dilutions and count the solution with the greatest accuracy. More dilutions may be counted.
Count all red points s colonies, irrespective size and colour intensity..
The result is stated as number of germs/gram trial.

If e.g. 27 colonies of – 3 and 240 of -2 are read,

the results is $\frac{(27 \cdot 10^3) + (240 \cdot 10^2)}{2} = \frac{51{,}000}{2} = 26{,}000$ germs/gram

Waste
After counting, the Petri films are autoclaved in an autoclave bag at 121°C for 15 minutes.

Literature: AOAC 17.2.06

Determination of Yeast and Mould; -V

Definition: The quantity of yeast and mould in 1 g trial

Apparatus
All weightings on Dilumat
Stomacher blender
Sterile Stomacher bag
Pipettes: 1 mL measuring pipettes

Reagents
DK18. PO5088A from Oxoid
Sterile diluent A

Solution of the Trial
20 grams trial are weighed into a sterile Stomacher bag. From a bottle of sterile diluent the quantity of liquid is automatically weighed out in the proportion 1:9, with an accuracy of 2 decimals. (Use a singed and cooled spoon). If the product is not foaming too much the bag is put into the Stomacher "Box" for 2 x 30 sec. with maximum speed. If the product is foaming, the bags are hand shaken.
This dispersion is diluted solution -1

Dilution and Seed
From the dilution -1 2 x 0.1 ml is pipetized in two pre-casted DK18 Petri bowls *(to be marked 0.1)*.

Incubation
The Petri bowls are incubated with the bottom downwards at 25° C for 72 and 120 hours.

Reading
YEAST: The "slimy" or "smooth" colonies are counted yeast.
MOULD: The "woollen" colonies are counted mould.
The results from both plates are added and multiplied by 50.
With no growth on the plates the result is < 50.
The results are stated as yeast/gram and mould/gram trial.

Waste
After counting, the plates are autoclaved in an autoclave bag at 121° C for 15 minutes.

Literature
NMKL No. 98, 2005. modified as regards diluent.

Determination of Enterobacteria: Petrifilm; -1

Definition: The quantity of enterobacteria in 1 g trial

Apparatus
Sartorius scale
Stomacher blender
Sterile Stomacher bag
Pipettes: 5 x 1-ml measuring pipettes

Reagents
Substrate: Petri film; 3M Enterobacteraceae Count Plate; Product No. 6420.
Sterile diluent A

Solution of the Trial
10 grams trial are weighed into a sterile Stomacher bag. From a bottle of sterile diluent the quantity of liquid is automatically weighed out in the proportion 1:4, with an accuracy of 2 decimals. (Use a singed and cooled spoon).
The bag is put into the Stomacher and "boxed" for 2 x 30 sec. with maximum speed. This dispersion is diluted solution -1

Dilution and Seed
From the dilution of trial – 5 x 1 ml are transferred to 5 Petri films.

Incubation
The Petri films are incubated with the bright side upwards at 37° C +/- 1° C for 24 hours.

Reading
Enterobacteria are red colonies with yellow zone and/or red colonies with air bubbles with or without yellow zones. Colonies without air or yellow zone are not counted enterobacteria.

The result is read as the sum of colonies on the 5 Petri films and is stated as number of germs/gram-trial.

If no colonies are seen on the Petri films the result is stated as < 1 germ/gram.

Waste
After counting the Petrifilms are autoclaved in an autoclave bag at 121° C for 15 minutes.

Literature
3M Petri film Enterobacteriacea Count Plate manual, 1999.

Determination of Salmonella – 100 grams

Definition: Salmonella present in the sample

Apparatus
Technical scale
1000 ml Pyrex bottle

Reagents
SRTEM, Salmonella Rapid Test Elective Medium
Buffered Peptone Water.

Solution of the Trial
100 g trial, stored at 37° C for a couple of hours is weighed down into a 1000 ml Pyrex bottle containing 900 ml buffered peptone water.
The bottle is shaken carefully in order to disperse the trial.

Pre-incubating
The bottle containing the dispersed trial is incubated at 37° C for 18-24 hours.
The bottle is frequently shaken in this period to keep the trial dispersed.

Procedure

1. A culture glass (Salmonella Rapid Test) is packed out. Tapping it lightly to loosen medium that might have fastened in the tubes and remove the lid from the glass.

2. Add sterile water up to the lowest mark on the glass (1) (approx. 27 ml).
   Control, that the bottom of tube 1 as well as 2 are in the liquid.

3. Without removing the protective cover the hypodermic needle is fixed to the syringe. Remove the protection cover and push the hypodermic needle through the blue cork (tube A).
   Slowly (for totally 5 seconds) liquid is sucked into the syringe until the liquid level in the tube is at the mark (3).
   Pull the hypodermic needle through the cork. (Be careful that the tube is not lifted out of the glass.

4. Repeat point 3 for tube B with the red cork.

5. Put the lid on the glass. The glass with the 2 tubes is now heavily shaken on the Vortemixer for approx. 5 sec. Hereafter standing for approx. 5 min.
   Now the glass can wait for up to 4 hours before going on to point 6.

6. The lid is cautiously removed from the glass.
   Add sterile, cooled SRTEM up to the upper mark of the glass (2).

7. Put an aseptic 1 Novobiocin-plate on the glass.

IMPORTANT: During the following the glass **MUST** be kept upright.

8. By the key the red and blue cork in the tubes are now removed.
   Avoid touching of the tubes as well as of the inside of the glass by the fingers.
   Destroy the corks.

9. Put the lid on the glass being now ready for use:

   - The pre-incubated trial is shaken and is now standing until the coarse particles settle.
     State the identification on the glass.
   - Remove the lid from the glass and add 1.0 ml of the pre-incubated trial.
   - Put the lid on the glass.
   - Incubate the glass at 41° C (+/- 0.5° C) for 24 hours. The glass must be kept upright all the time.

Reading

Do **NOT** remove the lid from the glass after the incubation.

The **upper** part of the tubes is examined for colour changes.
Disregard possible black coloured lower part of the tubes.

POSITIVE: Tube A – Any black colouring
Tube B – Any red or black colouring
NEGATIVE: Tube A – No black colouring
Tube B – No red or black colouring

Waste
After reading, the glasses are autoclaved in an autoclave bag at 121° C for 15 minutes.

Literature: OXOID Salmonella RAPID TEST; (X4977, May 1997)

CONTROL OF VISCOSITY OF 4448

Preparation of Trial

Weigh out 99,98 – 100.02 g 4448 standard chocolate in a 150 ml beaker for each 4448-trial and reference trial. These are standing in an incubator at 50°C for at least 4 hours. The chocolate is kept in airtight aluminium bags in a refrigerated room at the chocolate laboratory. After opening the chocolatecontainer is kept in desiccator at room temperature.

Trial Handling

The trial handling must be executed as quickly as possible without interruptions.

The PV1 system consists of ***Spindel*** Z38 and measuring beaker (always to be kept in a Heater at 50°C.)

For test of the effect of 4448 on the viscosity of chocolate, 0,600 – 0,610 g standard or trial is weighed into preheated chocolate. With a strong spatula the emulsifier is stirred carefully into the chocolate (at least 2 min. stirring) whereupon the chocolate is purred into the measuring beaker until covering the upper graduation. By tapping the side of the measuring beaker the ***air bubbles*** of the chocolate will be removed.

The measuring beaker is put in RV1 and pressed to the bottom. Turn the screw closely (if not water comes overall). The ***Spindel*** is put on. When the PC programme is started the Spindel moves down into the beaker.

Treatment of the Results

When the measuring has been finished, the ***Spindel*** moves from the beaker, and the beaker can now be removed. The curve with the calculated viscosity is printed automatically. The viscosity appears from the text section on the figure with the viscosity curve on it.

The measured viscosity is put in proportion to the reference measuring and is stated as an index-value:

$$\text{Viscosity index} = \frac{\text{Measured viscosity}}{\text{Viscosity reference}} \cdot 100$$

SENSORY

A approved member of the sensory panel validates the sample at room-temperature by visual appearance and taste.

The sample will be compared with an approved an standard sample at room temperature.

The sample will be marked OK or NOT OK

9

Pages 000305 - 000307 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000308 - 000317 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

Pages 000318 - 000319 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

10

Pages 000321 - 000329 have been removed in accordance with copyright laws. Please see appended bibliography list of the references that have been removed from this request.

SUBMISSION END

Reference List for Industry Submission, GRN 000219

Pages	*Author*	*Title*	*Publish Date*	*Publisher*	*BIB_Info*
000019	Joint FAO/WHO Expert Committee	Ammonium Salts of Phosphatidic Acid	NA	Joint FAO/WHO Epert Committee on Food Additives	NA
000020 - 000024	Joint FAO/WHO Expert Committee on Food Additives	Evaluation of Certain Food Additives	1974	World Health Organization Technical Report Series; FAO Nutrition Meetings Report Series	Series Number 557, pgs 21, 33 - 35; Number 54
000025 - 000027	Joint FAO/WHO Expert Committee on Food Additives	Compendium of food additive specifications: Principles governing the establishment and revision of specifications	June 2000	FAO Food and Nutrition Paper	52, Addendum 8, pgs 203-4
000028 - 000030	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Some Food Additives: Ammonium Salts of Phosphatidic Acid	1975	FAO Nutrition Meetings Report Series	Number 54A, pgs 161- 163
000031 - 000034	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Some Food Colours, Enzymes, Flavour Enhancers, Thickening Agents, And Certain Food Additives: Ammonium Salts of Phosphatdic Acid	1975	WHO Food Additive Series	Number 6
000035 - 000039	Joint FAO/WHO Expert Committee on Food Additives	Compendium of Food Additive Specifications: Ammonium Salts of Phosphatidic Acid	June 2000	FAO Food and Nutrition Paper	Number 52, Addendum 8, pgs 1-4
000036 - 000039	Joint FAO/WHO Expert Committee on Food Additives	Ammonium Salts of Phosphatidic Acid	2000	FNP	52nd Series, Addendum 8, pgs 1 - 4
000040 - 000045	Joint FAO/WHO Expert Committee on Food Additives	Specifications for Identity and Purity of Thickening Agents, Anticaking Agents, Antimicrobials, Antioxidants and Emulsifiers: Ammonium Salts of Phosphatidic Acid	1978	FAO Food and Nutrition Paper	pgs 245 - 249

NA- Not applicable

Pages	Author	Title	Publish Date	Publisher	BIB_Info
000040 - 000045	Joint FAO/WHO Expert Committee on Food Additives	Specifications for Identity and Purity of Thickening Agents, Anticaking Agents, Antimicrobials, Antioxidants and Emulsifiers: Ammonium Salts of Phosphatidic Acid	1978	FAO Food and Nutrition Paper	pgs 245 - 249
000046 - 000050	Joint FAO/WHO Expert Committee on Food Additives	Compendium of Food Additive Specifications: Ammonium Salts of Phosphatidic Acid	NA	FAO Food and Nutritiion Paper	Volume 52, Number 1, pgs 91- 94
000051 - 000056	Joint FAO/WHO Expert Committee on Food Additives	Combined Compendium of Food Additive Specifications: Ammonium Salts of Phosphatidic Acid	2005	FAO JECFA Monographs	pgs 71-75
000057 - 000064	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Certain Food Additves with a Review of General Principles and of Specifications	1974	World Health Organization Technical Report Series/FAO Nutrition Meetings Report Series	Number 539/Number 53, pgs 19, 36 - 40
000065 - 000067	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Some Food Additives: Ammonium Salts of Phosphatidic Acids	1974	FAO Nutrition Meetings Report Series	Number 53A, pgs 214-217
000068 - 000070	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Some Food Additives Including Anticaking Agents, Antimicrobials, Antioxidants, Emulsifiers and Thickening Agents: Ammonium Salts of Phosphatidic Acids	1974	WHO Food Additives Series	Number 5
000071 - 000073	Joint FAO/WHO Expert Committee on Food Additives	Specifications For The Identity And Purity Of Food Additives And Their Toxicological Evaluation	1970	World Health Organization Technical Report Series, FAO Nutrition Meetings Report Series	Number 445, Number 46
000074 - 000078	Joint FAO/WHO Expert Committee on Food Additives	Specifications For The Identity and Purity of Some Food Colours, Emulsifiers, Stabilizers, Anti-Caking Agents and Certain Other Food Additives: Ammonium Salts of Phosphatidic Acids	1970	FAO Nutrition Meetings Report Series	Number. 46.B WHO/Food Add./70.37, pgs 72-79

NA- Not applicable

Pages	Author	Title	Publish Date	Publisher	BIB_Info
000079 - 000081	Joint FAO/WHO Expert Committee on Food Additives	Toxicological Evaluation of Some Food Colours, Emulsifiers, Stabilizers, Anti-Caking Agents and Certain Other Substances: Ammonium Salts of Phosphatidic Acids	NA	FAO Nutrition Meetings Report Series	Number 46A, WHO/FOOD Addendum 70.36
000225 - 000231	Gaunt I.F.; Grasso, P.; Gangolli, S.D.	Short-term Toxicity Study of Emulsifier YN in Rats	1967	Fd Cosmet. Toxicol.	Volume 5, pgs 623-629
000232 - 000236	Gaunt, I.F.; Butterworth, K.R.; Grasso, P.; Ginocchio, A.V.	Long-Term Toxicity Study Of Emulsifier YN In The Mouse	1977	Fd. Cosmet. Toxicol.	Volume 15, pgs 1-5
000237 - 000250	Feuer, G.	Metabolic Fate of 32P-Labelled Emulsifier YN in Rats	1967	Fd Cosmet. Toxicol.	Volume 5, pgs 631-643
000251 - 000265	Brantom, P.G.; Gaunt, I.F.; Hardy, Joan; Grasso, P.; Gangollli, S.D.	Long-term Feeding and Reproduction Studies on Emulsifer YN in Rats	1973	Fd Cosmet. Toxicol.	Volume 11, pgs 755-769
000266 - 000273	Phillips, J.C.; Gaunt, I.F.; Gangolli, S.D.	Studies on the Metabolic Fate of 32P-Labelled Emulsifier YN In the Mouse, Guinea-Pig and Ferret	1975	Fd Cosmet. Toxical.	Volume 13, pgs 23-30
000305 - 000307	Dieffenbacher, A.; Pocklington, W.D.	Determination of phosphorus	NA	Standard Methods for the Analysis of Oils, Fats and Derivatives	1st Supplement to the 7th Revised and Enlarged Edition, pgs 183-184
000308 - 000317	Dick, R.; Miserez, A.	Gas chromatographic detection and determination of foodstuffs emulsifiers	1976	Mitt. Gebiete Lebensm.Hyg.	Volume 67, pgs. 472-487
000318 - 000319	NA	AOAC Official Method 963.15: Fat in Cacao Products, Soxhlet Extraction Method	NA	AOAC Official Methods Of Analysis	Chapter 31, p.10
000321 - 000329	NA	Codex Standard For Chocolate: Codex Stan 87-1981	1987	Codex Stan 87	pgs 1-9

NA- Not applicable

Pages	*Author*	*Title*	*Publish Date*	*Publisher*	*BIB_Info*
NA	Quentin, Fabienne; Chambrey, Regine; trinh-Trang-tan, Marie Marcelle; Fysekidis, Marinos; Cambillau, Michele; Paillard, Michel; Aronson, Peter S.; Eladari, Dominique	NA	2004	Am J Physiol Renal Physiol	Volume 287, pgs 1179-1188

NA- Not applicable