FDA ATTY

CONTRACT IN-HOUSE COUNSEL & CONSULTANTS, LLC

February 18, 2016

Talia Lindheimer
Office of Food Additive Safety (HFS-200),
Center for Food Safety and Applied Nutrition,
Food and Drug Administration,
5100 Paint Branch Pkwy, College Park, MD 20740

Re: GRN 000581 Supplemental Response

Dear Ms. Lindheimer:

On behalf of World Foods thank you again for the time today coordinating on refining the response to GRN 581. Below is the statement clarifying the subject of the notice. As mentioned on the call the subject of the notice is pea protein, which in some cases is formed with enzymes into a protein proteolysate.

"Enzymes are used in the manufacturing of PURISPea protein only if required by the customer, If the customer does not require enzymes in the process enzymes are excluded from the process. To make the letter applicable to customers using un-hydrolyzed pea protein will it possible to change the subject of the notice to Pea Protein instead of Pea Protein Proteolysate

Also attached is a clean copy of the notice without any proprietary references. Please let me know if I can provide any additional information.

Kind Regards,

/s/

Marc C. Sanchez
Contract In-House Counsel
World Foods Processing

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I. Introduction

This notification is a self GRAS affirmation filed under the provisions of the Food and Drug Administration's regulations (proposed 21 CFR 170.36 (62 FR 18960; April 17, 1997)).

The pea proteins are intended for use as a food ingredient in foods where protein is used for functional or nutritional purposes such as bakery products, smoothies, snack foods, beverages (including nutritional beverages), soups, dairy products, dry instant milk shake mixes and protein drinks, instant powdered nutritional beverages, processed meat products, vegetarian food products/meat analogues, and meal replacement/nutritional bars.

The determination of GRAS status is based on scientific procedures, in accordance with 21 C.F.R. § 170.30(b) and conforms to the guidance issued in § 170.36.

We submit information in the following areas:

• Identity and specifications for the pea proteins;

• The production of the pea proteins;

• Intended uses and an estimation of consumption of pea proteins;

• Relevant safety data on pea proteins;

• External panel reviewers' evaluation and conclusion that the pea proteins are GRAS for their intended uses.

Furthermore pea protein products are highly purified protein products that do not have toxic properties.

II. Administrative info

A. **Claim regarding GRAS Status:** World Food Processing LLC. hereby notifies the agency of its determination that pea proteins derived from *Pisum Sativum* L. are GRAS based on scientific procedures (§ 170.30(b)) for use as a food ingredient in certain specific categories of food where proteins are commonly involved.

B. **Name and address of the Notifier:**

World Food Processing LLC.
Attn: Kushal Chandak
4301 World Food Ave
Oskaloosa
Iowa- 52577

C. **Common name of the Substance for which GRAS eligibility is sought:** The common name of the substance of this notification is Pea Protein. The trade name of this product is PURIS*Pea*.

D. **Foods in which the substance is to be used:** Pea protein (PURISPea) containing approximately 80 % protein (dry matter basis) is intended for use as a food ingredient in various finished conventional foods such as, smoothies, baked goods (gluten free baked goods, gluten to dry blend beverages (protein powder mixes), ready to drink beverages, containing baked goods), noodles, extruded products (Crips, Protein Bars).

E. **Basis for Determination for GRAS eligibility:** Through scientific procedure, data has been gathered indirectly from literature and common experience, and directly by physical and chemical analysis. Peas are an important part of the human diet in several countries and have been consumed since ancient time. Peas are high in protein, fiber, vitamins, minerals and lutein and are considered to be a nutrient rich food.

F. **Self-Limiting Levels of Use:** The use of the pea proteins (PURISPea) as food ingredients is limited by the level that can technically be added to a given food without jeopardizing its quality and consumer acceptability. The self-limiting level of use is independent of safety (toxicity, allergenic, etc.) concerns.

III. Product Identity and Specification

A. Pea Proteins (PURIS*Pea*) Detailed Information:

Pisum sativum L.

Plant Symbol = PISA6

Common Alternate Names: garden pea, field pea, spring pea, English pea, common pea, green pea (*Pisum sativum* L. ssp. *sativum*); Austrian winter pea (*Pisum sativum* L. ssp. *sativum var. arvense*)

Scientific Alternate Names: *Pisum arvense* L., *Pisum humile* Boiss. & Noe, *Pisum sativum* L. ssp. a*rvense* (L.)Poir., *Pisum sativum* L. var. *arvense*(L.) Poir., *Pisum sativum* L. var .*humile* Poir., *Pisum sativum* L. var. *macrocarpon* Ser., *Pisum sativum* L. ssp. *sativum*, and *Pisum sativum* L. ssp. *sativum* var. *arvense* (L.) Poir.

Pea protein is derived from the yellow pea, *Pisum sativum*, a plant that has been a source of food in ancient cultures dating back to 6000 BC. Yellow peas offer a well-balanced nutritional profile, with approximately 50% starch, 14% fiber and 23% protein. With such a high protein level, it is no surprise the yellow pea offers an attractive base for a concentrated protein ingredient. Pea proteins typically have a protein content of 80-85% and are produced using an environmentally friendly process, with no use of organic solvents, the family Leguminosae consists of 650 genera and more than 18000 species. Members of the family, often referred to as legumes or pulses, are the second most important food source in the world, after cereal grains. Food legumes are those species of the plant family Leguminosae that are consumed by human beings or domestic animals commonly as dry seeds, i.e. the grain legumes. The term “legumes” and pulses are used interchangeably because all pulses are considered legumes but not all legumes are considered pulses. More than 80 different pulse species are consumed by humans, including beans, lentils, lupins, peas, and peanuts. However, the FAO recognizes 11 primary pulses and Peas is one of them .Peas are a cool-season crop grown for their edible seed or seed pods (Brijesh K.T., Aoife G. and Irian M. 2011). Garden or green peas are harvested before the seed is mature for the fresh or fresh-pack market. Sugar snap peas and snow peas lack the inner pod fiber and are also harvested early for the fresh or fresh -pack market. Field peas, including fall-sown Austrian winter peas, are harvested when seeds are mature and dry, and are primarily blended with grains to fortify the protein content of livestock feed. Dried peas are also sold for human consumption as whole, split or ground peas. Peas are a nutritious legume, containing 15 to 35% protein, and

high concentrations of the essential amino acids lysine and tryptophan Peas and other legumes are desirable in crop rotations because they break up disease and pest cycles, provide nitrogen, improve soil microbe diversity and activity, improve soil aggregation, conserve soil water, and provide economic diversity (Pavek, P.L.S. 2012). Peas, more specifically the yellow or green cotyledon varieties known as dry, smooth or field peas are the naturally dried seeds of *Pisum sativum* L. and are grown around the world for human and animal consumption. World production of peas in 2009 was more than ten million tons, the major producers being Canada, the Russian Federation, China, the USA and India. Peas have long been recognized as an inexpensive, readily available source of protein, complex carbohydrates, vitamins and minerals. The high nutrient density of peas makes them a valuable food commodity, capable of meeting the dietary needs of the estimated 800–900 million undernourished individuals worldwide .The US Department of Agriculture My Plate Guidelines recommend consuming at least three cups of dry beans and peas per week (Wendy J.D., Lauren M. F. and Robert T. T. 2011)

B. Identity, Composition and Quality Specifications :

1. PURIS*Pea* Sensory Characteristics:

Parameter	Comments
Appearance	Cream to Off-White Powder
Taste	Neutral Bland taste
Odor	Clean no Off-Odor

2. PURIS*Pea* Physical Characteristics:

Parameter	Comments	Method
Through 200 mesh (75 microns)	70 % min	Laser particle size analyzer
Poured bulk density	0.47g/ml	Gravimetric
pH	6-7.5	In-House

3. PURIS*Pea* Nutritional Data (Average values for 100g of commercial product):

Chemical Analysis	Values	Tolerance	Unit of Measure	Method
Moisture	6.0	Max	g	AOCS Ba2a-38
Protein (dry matter basis)	80.0	Min	g	Combustion
Total Fat	8.0	Average	g	AOAC 922.06
- **Saturated Fat**	1.0	Average	g	AOAC 996.06
- **Mono-unsaturated fat**	2.0	Average	g	AOAC 996.06
- **Poly-unsaturated fat**	5.0	Average	g	AOAC 996.06
- **Cholesterol**	0.0	Average	g	AOAC 996.06
- **Trans Fatty Acids**	0.0	Average	g	AOAC 996.06
Carbohydrates	6	Average	g	Calculated
- **Sugars**	2	Average	g	AOAC 980.13
- **Dietary Fiber**	4	Average	g	AOAC 991.43(Mod.)
Ash	5	Average	g	AOAC 925.51A
- **Sodium**	1.0-0.100	Average	g	AOAC 984.27
- **Phosphorus**	1.1	Average	g	AOAC 984.27
- **Potassium**	0.55-1.00	Average	g	AOAC 984.27
- **Calcium**	0.40	Average	g	AOAC 984.27
- **Iron**	0.0095	Average	g	AOAC 984.27
Calories	390	Average	Kcal	Atwater Factors

4. Microbiological Characteristics:

Parameter	Values	Method
Aerobic plate Count	< 50,000/g	AOAC 966.23
Coliform MPN	<3 cfu/g	AOAC 966.24
E. Coli	<3 cfu/g	AOAC 966.24
Yeast and Mold	<100 cfu/g	FDA-BAM, 7th ed.
Salmonella	Negative /375 g	AOAC-RI100201

5. Amino Acid Profile (Typical data per 100g protein):

Essential Amino Acids	Values	Non-Essential Amino Acids	Values
Arginine	8.52 g	**Alanine**	4.12 g
Histidine	2.51 g	**Aspartic Acid**	11.81 g
Isoleucine	4.76 g	**Cysteine**	0.87 g
Leucine	8.41 g	**Glutamic Acid**	17.29 g
Lysine	7.36 g	**Glycine**	3.97 g
Methionine	0.98 g	**Serine**	5.43 g
Phenylalanine	5.52 g	**Tyrosine**	3.69 g
Threonine	4.05 g	**Proline**	4.57 g
Valine	5.03 g		
Tryptophan	1.03 g		

6. Heavy Metals :

Parameter	Values	Method
Lead	<0.01 mg/kg	ICP MS
Arsenic	<0.01 mg/kg	ICP MS
Cadmium	<0.05 mg/kg	ICP MS
Mercury	<0.01 mg/kg	ICP MS

7. Aflatoxin :

Parameter	Values	Method
Aflatoxin B1	<0.6 ppb	HPLC AOAC 991.31(Mod.)
Aflatoxin B2	<0.6 ppb	HPLC AOAC 991.31(Mod.)
Aflatoxin G1	<0.6ppb	HPLC AOAC 991.31(Mod.)
Aflatoxin G2	<0.6ppb	HPLC AOAC 991.31(Mod.)
Aflatoxin Total	<0.7ppb	HPLC AOAC 991.31(Mod.)

8.

Parameter	Values	Method
Melamine	<0.25 ppm	FDA 4421
Cyanuric Acid	<0.25 ppm	FDA 4421

9. Allergen Declaration:

Component	Present in the product	Present in other products produced on the same line	Present in the same plant
1. Barley, Rye, Oats	NO	NO	NO
2. Celery (not including seeds)	NO	NO	NO
3. Corn	NO	NO	NO
4. Egg or egg product	NO	NO	NO
5. Fish	NO	NO	NO
6. Milk & Milk by-product	NO	NO	NO
7. Monosodium Glutamate (MSG)	NO	NO	NO
8. Peanuts or peanut products	NO	NO	NO
9. Seeds (Poppy, Sunflower, Cottonseed)	NO	NO	NO
10. Sesame Seeds	NO	NO	NO
11. Shell Fish & Crustaceans	NO	NO	NO
12. Soybean Oil (excluding refined soy oil)	NO	NO	NO
13. Soybean (not including oil)	NO[1]	YES	YES
14. Sulphites (enter maximum ppm)	NO	NO	NO
15. Tree Nuts	NO	NO	NO
16. Wheat or wheat products	NO	NO	NO
17. Gluten <10 ppm	NO	NO	NO
17. Yellow 5 (Tartrazine)	NO	NO	NO
18. Animal Fat	NO	NO	NO
19. Grains containing gluten	NO	NO	NO
20. Mustard	NO	NO	NO
21. Lupin	NO	NO	NO
22. Lactose	NO	NO	NO

1. Purified product derived from Pea. When Tested , soy allergen content less than 2.5 ppm(w/w), detection limit of Soy Allergen – Neogen Veratox, Allergen control program in place to meet the specification.

10. Allergen Validation Program is attached on the link below:
https://worldfoodp.box.com/s/oawiiftgy9aomvys4f1pehjhlk3whc3x

11. Pesticide and Ochratoxin A is attached on the link below:

https://worldfoodp.box.com/s/xinflky6txrckcdt50avgjxq9069qypf

12. Labelling and Storage information:

a. **Label Declaration:** Pea Protein.

b. **Lot Coding:** Example Lot Number: 141003TL1; 14= Year, 10= Month, 03= Date, TL=Site, 1= Dryer Line

c. **Non-GMO Declaration:** PURIS*Pea* is Non-GMO.

d. **Packaging:** Packaged in 20kg multiwall poly lined paper bags.

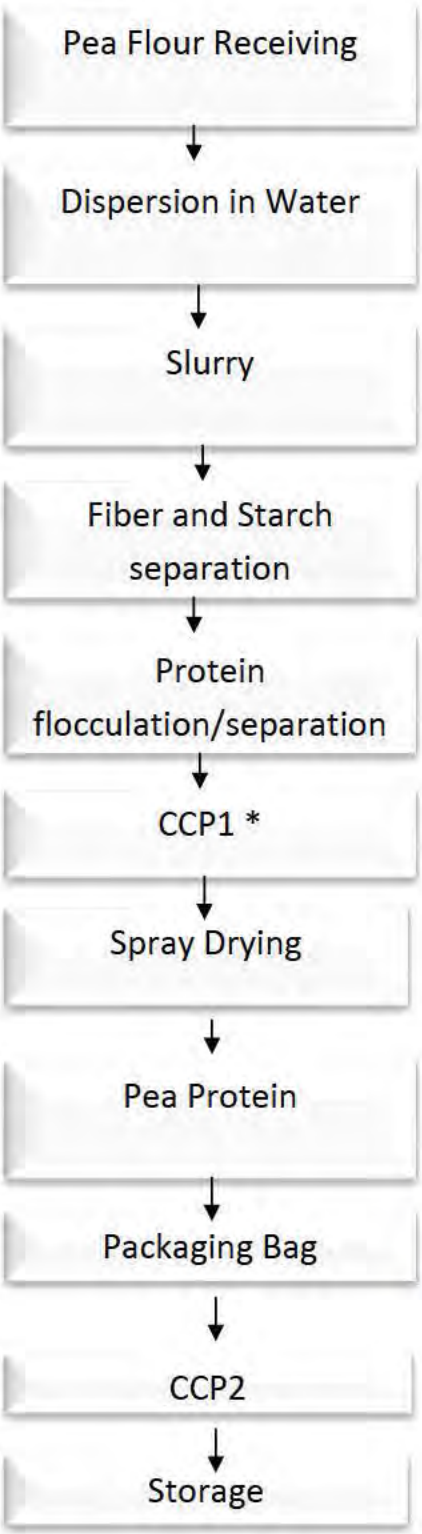
e. **Storage Conditions:** Product should be stored in a cool, dry location, and in the original sealed package away from odorous material**.**

f. **Shelf Life:** The shelf is a minimum of 24 months.

g. **Certification:** Iowa Chai K Kosher, Organic OCIA, ISA Halal.

IV. Manufacturing Process :

A. Flow Chart



HAZARD	Control	Correction
Microbial Pathogens	*CCP1: Manual check of temperature done every hour	In case of failure, all batches produced after the last control are identified and put on "Hold". The site QA Manager is in charge of the investigation and the release of the product.
Metal	CCP2: Metal Detector. Fe 2mm, S.S.: 2.5 mm, non-Fe: 2.5mm Metal detector check sheet every hour	In case of failure, all batches produced after the last control are identified and put on "Hold". The site QA Manager is in charge of the investigation and the release of the product.

*CCP1 is a validated log reduction step, study conducted by Silliker, Inc. Food Science Center

Study attached on the link:

https://worldfoodp.box.com/s/yognifhosem64ee2nuntiw0mszac3py4

Figure (1)

B. Safety of Substances Used in the Manufacture of the Pea Protein Products:

No chemical Solvents are utilized for manufacture of PURIS*Pea* Proteins. All raw materials and processing aids used in the manufacture of Pea protein (PURIS*Pea*) are food-grade materials and/or are used in accordance with applicable U.S. federal regulations for such uses. The manufacturing facility is registered with the FDA under the number: 10089346644. World Food Processing is a United States family owned corporation and the leading non-GMO and organic soy, pea and corn breeding company, vertically integrated into procurement, grain conditioning, ingredient processing, and food formulations. World Food developed the first pea protein grown and manufactured in the USA, branded as PURIS*Pea*, which is known for its unique characteristics and clean flavor as well as their non-GMO Project Verified and Hexane Free PURIS Soy Proteins. World Food's products are free from GMO's, gluten and dairy. World Food Processing - Turtle Lake LLC. Facility is Non-GMO Project verified, Organic certified, Kosher certified, and Halal certified.

C. Manufacturing process detailed information :

Pea protein (PURIS*Pea*) is manufactured according to good manufacturing practices at World Food Processing –Turtle Lake LLC. facility located at 105 South Maple Street, Turtle Lake, Wisconsin – 54889.

World Food Processing – Turtle Lake's QA department reviews the Raw Material COA to insure it meets specifications as stated on the supplier spec. sheet. Like the Raw Material all ingredients and packaging are approved based on the external COA. World Food Processing – Turtle Lake has an approved supplier list which is strictly followed. If the lot does not meet the specifications as stated on the spec sheet the product will be rejected. Pea Flour is the main raw material used in the manufacture of pea protein (PURIS*Pea*). Pea Flour is then added to the hopper and pushed into the Rewet Tank to be reconstituted with water and the pH is slightly increased using food grade buffers to solubilize the proteins. After the correct solids are achieved, the slurry is sent through the centrifugation step to separate the soluble and the insoluble fraction, in this case the soluble material is the pea protein and the insoluble material is the fiber and starch. The soluble protein then goes through a flocculation step in which isoelectric precipitation of protein is used to coagulate the proteins. The isoelectric behavior of food proteins has been well characterized in the food science literature. The isoelectric point (pI) of a protein is a pH at which the protein maintains a zero net electrostatic charge. Therefore, the protein at its pI exhibits the least solubility; however, as the pH is changed, the protein-water electrostatic interactions increase; and consequently, the protein becomes water soluble. This fundamental phenomenon has been used in the food industry for a long time as for example in the cheese-making and tofu manufacture (Jacek J. 2008)

The coagulated pea protein curd goes through a wash step and is re-buffered to neutral pH where enzymes are also added to reduce the viscosity according to customer requirements. Heat Treatment (CCP#1) is used to ensure microbial growth is absent and to also ensure enzymes are made inactive. CCP1 is a validated log reduction step, study conducted by Silliker, Inc. Food Science Center. The product is now spray dried and sent through a magnet to the designated packaging room. Spray-dried dairy products-- milk, whey, cheese, buttermilk, sodium caseinate, coffee whitener, butter, ice-cream mixes-- comprise a large industry. Many are sold commercially or used in commercial products. Spray-dried whole egg, egg yolk and albumen also are prevalent ingredients. Spray drying highly volatile flavors minimizes loss. Savory products often utilize spray-dried meat purees. Many protein sources (soy powders, isolated soy protein, whey proteins and various vegetable sources) come in spray-dried form. Fruit and vegetable pulps, pastes and juices are spray-dried as whole powders or as blends, with common sources being tomato, banana and citrus. Maltodextrins also are spray-dried in various forms-- powdered, granulated or agglomerated for use as a bulking aid. The spray-drying process is older than might commonly be imagined. Earliest descriptions date to the 1860s, and the first patent of note is dated 1872. Refining the process is ongoing. Spray-drying involves transforming a fluid, pump able medium into a dry-powdered or particle form. This is achieved by atomizing the fluid into a drying chamber, where the liquid droplets are passed through a hot-air stream. The objective is to produce a spray of high surface-to-mass ratio droplets (ideally of equal size), then to uniformly and quickly evaporate the water. Evaporation keeps product temperature to minimum, so little high-temperature deterioration occurs. Temperature, food grade enzymes and pH are the major variables which may be used to achieve desired specific differences in the functionality of the PURIS*Pea* protein. This variable is not considered significant to change the GRAS status of the pea protein isolate. The isolated pea protein (PURIS*Pea*) is available as a whitish, beige or yellowish powder. It is totally or partially soluble in water depending on pH. Once finished product is dried it is packaged in 50lb. poly liner bags, run through the Metal Detector (CCP#2), placed on a pallet to be stacked 40 high, wrapped, and store in the finished product warehouse for shipment.

V. Conditions of intended use in food :

A. Structure of Pea Proteins :

In peas, there are two major protein fractions: globulins (salt soluble) and albumins (water soluble). The globulins, often called storage proteins, are legumin, vicilin and convicilin. Legumin (11S) has six subunits each composed of an acidic (40 KDa) and basic (20 KDa) polypeptide joined with a disulfide bridge to form a hexameric quaternary structure with a molecular weight of ~390 KDa (Croy, Derbyshire, Krishna & Boulter, 1979). Vicilin (7S) has a trimeric structure with a molecular weight of 175-180 KDa. The subunits are ~50 KDa with some splintered fragments. Vicilin contains no sulphur residues (Croy, Gatehouse, Tyler & Boulter, 1980; Gatehouse, Croy, Morton, Tyler & Boulter, 1981; Boye, Zare & Pletch, 2010). Convicilin is related to vicilin and often contaminates vicilin isolates. It is also trimeric with subunits ~71 KDa in molecular weight (Croy et al., 1980). Legumin and vicilin are common to all legumes although the quaternary structure may differ by plant (Tromelin et al., 2006).

B. Foods in which the substance is to be used:

PURISPea is used but not limited to the finished conventional food products mentioned below:

Smoothies
Baked Goods (both containing Gluten and Gluten free)
Cereals/Snacks
Dry Blend Beverage
Pre-mix Beverage Powders
Processed Meats/Ready Meals
Protein/Nutrition Bars
Ready-to-Drink Beverages
Extrusion
Soups/Sauce

C. Pea Protein functional benefit if food:

In 2013, the number of new product launches featuring pea protein more than tripled from 2012, according to Mintel's Global New Products Database. First quarter data from 2014 new product launches showed this trend continuing with a 50% increase from 2013. New products represent formulations in cereals, nutrition bars, baked goods, snacks, powdered beverage mixes, ready-to-drink beverages and meat analogs. It is clear that pea protein is one of the hottest ingredients currently being used in food, beverage and Nutraceutical formulations.

The use of plant proteins in foods is expected to increase substantially in the future as a means of meeting the worldwide demand for economical sources of protein. Legume Protein ingredients are use in a number of product categories; as an illustration, GEPV (French vegetable protein producers Association) did a store-check in France in 2007. Pea protein was listed in 79 foods (+43% versus 20015). 2/3 of them are meat products. The essential amino acid profile is very close to that of the ideal protein for human nutrition (FAO/WHO 1985 and 2002). Combined with cereal protein, it represents an even healthier approach for tomorrow's diet.

Among the reasons for interest in plant proteins are the ever increasing number of vegetarians and of the rising costs of conventional protein sources such as eggs (Sethi and Kulkarni, 1994). However, for a long time, soybean has been the principal plant protein resource for food applications including dairy products, meat or fish products, and confectionery and bakery products. Undoubtedly, soy protein ingredients have made a significant impact in the food industry. Field pea proteins, which have now been found to exhibit comparable functional properties with soy proteins, provide significant potential in a variety of food applications. It has been previously reported that field pea flour and pin-milled protein concentrate patties and blended milk products (Sosulski and Mahmoud, 1979; McWatters,1980; McWatters and Heaton, 1979; Sosulski et al, 1978). The results indicated that the baking and organoleptic qualities of the products were not adversely influenced by the addition of pea flour as the replacement for milk protein. However, if the unheated flour was used at a higher concentration, undesirable effects of the protein supplements on dough or baking properties including crust and crumb colour and texture of the products were observed. Adverse flavors may also be a major limitation in the use of these flour and protein concentrates.

Pea protein has excellent emulsification properties, binding both fat and water for a stable emulsion. This is beneficial for egg replacement and is demonstrated well in Hampton Creek's Just Mayo, replacing the eggs with pea protein to make a vegan "mayonnaise." It's also helpful in reducing the fat content of salad dressings, with little impact on mouthfeel or flavor. Beyond Meat uses pea protein for producing meat alternatives, lending a chewy, meat-like texture to their products. It can also be used in ground beef products to act as a binder, increasing the cook yield of meats.

Consider pea protein for applications where partial or whole egg removal may have textural impacts, such as cake or waffle mixes, and egg noodles. It can withstand the rigors of bakery processing, improving softness in breads when added at low levels. The Northern Pulse Growers Association offers some formulations with pea protein as an egg substitute. They show the functionality of pea protein as an egg/milk replacer in cakes, cookies, pasta and cupcakes, and also offer formulations as starting points. Pea protein concentrates demonstrate exceptional volume increases when used for increasing foaming capacity, which can aid in reducing the bulk density of the foods you are developing.

More normal than niche, 'gluten-free' foods have become mainstream. Many in the trade—including the National Restaurant Association—list the gluten-free diet as one of the hottest trends in the food industry today. The market research firm Packaged Facts reports that the market for gluten-free foods and beverages has grown at a compound annual rate of 30% since 2006 to hit $2.6 billion in 2010. The firm projects U.S. gluten-free sales will almost double by 2015 to exceed $5 billion.

A gluten-free diet is the only therapy for people with celiac disease (celiacs). Celiac disease is an auto-immune disorder triggered by gluten, a protein found in wheat, barley, rye and spelt. In celiacs, gluten damages villi in the small intestine and interferes with the absorption of vital nutrients. Symptoms of the disease can mimic many other gastrointestinal disorders, but left untreated celiac disease can be much more serious. Malnutrition, despite adequate food intake, as well as other auto-immune diseases, osteoporosis, thyroid disease and some cancers may explain why a landmark Mayo Clinic study found that untreated celiacs have a four-fold increase in early death compared to those without celiac disease. U.S. health care cost of untreated celiacs is estimated to be between $14.5 and $34.8 billion per year.

Expect pea protein (PURIS*Pea*) to improve moisture retention, flexibility and resilience in gluten free bakery items. Reliance on expensive gums is rarely needed in most applications. Pea proteins (PURIS*Pea*) have strong gelling properties that can help create a more functional gluten-like network by taking advantage of the starch in other gluten-free ingredients such as rice flour. Forget powdery cakes, rubbery breads and cardboard cookies: With deliberate optimization, pea protein can mimic the taste, texture and mouth feel of many gluten-containing favorites

This plant-based pea protein demonstrates stability under high stress processes, and won't lose functionality when exposed to extreme processing temperatures, pH changes or high pressure. It works well as a protein replacement in extruded snacks and cereals, maintaining structural stability and consistent texture. Its functionality in extruded applications is demonstrated in a new protein chip called ProTings, where pea protein isolate is mixed with potato to create a snack chip.

When considering its use for gluten-free formulations, pea protein has been shown to have the most acceptable sensory characteristics compared to other alternative proteins, according to this article.

Table (1)

D. Application Usage Estimates :

Food Category	**Level of use (%) of PURIS*Pea* protein as consumed**
Bakery products (e.g., breads, rolls, bars, cakes, pasta , cookies, gluten free baked products)	5- 10
Snack foods (e.g., chips crackers, energy bars, etc.)	2-10
Ready to drink beverages, soups, nutritional beverages, smoothies (protein fortified smoothies, fruit juices, high protein drinks, vegetable based soups etc.)	3-50
Dairy imitation products (dairy free cheeses, dairy free spreads, dairy free creamers, dairy free desserts, dairy free dips, dairy free whipped toppings)	2-10
Meal Replacement/ Nutritional bars	10-20
Meat Analogs (imitation meat products, fake meat)	10-30
Processed Meat products	2-7
Dry blend protein powders (Proteins shakes, instant protein powders.)	20-90
Extruded product (pea crisps)	30-70

E. Daily consumption calculation:

The total 2014 domestic market for pea protein was estimated to be 10,000 metric tons, which is 10.0×10^6 kilograms.

The total population of the United States is about 318 million people. The mean daily consumption of pea protein per capita is as follows: 10×10^6 (kg/year) x 10^3 (g/kg) ÷ 318×10^6 (persons) ÷ 365 (days/year) = 0.086 g/ person/ day

We conservatively assume that the protein content of the pea protein comprises 80% of the product. The mean daily protein intake from pea protein per capita would thus be:

0.086 g/person/day x 80% = 0.0688 g/person/day.

Table (2)

F. Dietary Reference Intakes: Macronutrients:

Dietary Reference Intakes: Macronutrients Nutrient	Function	Life Stage Group	RDA/AI* g/d [a]	AMDR [b]	Selected Food Sources	Adverse effects of excessive consumption
Protein and amino acids	Serves as the major structural component of all cells in the body, and functions as enzymes, in membranes, as transport carriers, and as some hormones. During digestion and absorption dietary proteins are broken down to amino acids, which become the building blocks of these structural and functional compounds. Nine of the amino acids must be provided in the diet; these are termed indispensable amino acids. The body can make the other amino acids needed to synthesize specific structures from other amino acids.	Infants 0−6 mo 7−12 mo Children 1−3 y 4−8 y Males 9−13 y 14−18 y 19−30 y 31-50 y 50-70 y > 70 y Females 9−13 y 14−18 y 19−30 y 31-50 y 50-70 y > 70 y Pregnancy ≤ 18 y 19-30y 31-50 y Lactation ≤ 18 y 19-30y 31−50 y	9.1* **11.0** **13** **19** **34** **52** **56** **56** **56** **56** **34** **46** **46** **46** **46** **46** **71** **71** **71** **71** **71** **71**	ND [c] ND **5-20** **10-30** **10-30** **10-30** **10-35** **10-35** **10-35** **10-35** **10-30** **10-30** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35** **10-35**	Proteins from animal sources, such as meat, poultry, fish, eggs, milk, cheese, and yogurt, provide all nine indispensable amino acids in adequate amounts, and for this reason are considered “complete proteins”. Proteins from plants, legumes, grains, nuts, seeds, and vegetables tend to be deficient in one or more of the indispensable amino acids and are called ‘incomplete proteins’. Vegan diets adequate in total protein content can be “complete” by combining sources of incomplete proteins which lack different indispensable amino acids.	While no defined intake level at which potential adverse effects of protein was identified, the upper end of AMDR based on complementing the AMDR for carbohydrate and fat for the various age groups. The lower end of the AMDR is set at approximately the RDA..

NOTE: The table is adapted from the DRI reports, see www.nap.edu. It represents Recommended Dietary Allowances (RDAs) in **bold type**, Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy breastfed infants, the AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all individuals in the group, but lack of data prevent being able to specify with confidence the percentage of individuals covered by this intake.

[a] Based on 1.5 g/kg/day for infants, 1.1 g/kg/day for 1-3 y, 0.95 g/kg/day for 4-13 y, 0.85 g/kg/day for 14-18 y, 0.8 g /kg/day for adults, and 1.1 g/kg/day for pregnant (using pre-pregnancy weight) and lactating women.

[b] Acceptable Macronutrient Distribution Range (AMDR)[a] is the range of intake for a particular energy source that is associated with reduced risk of chronic disease while providing intakes of essential nutrients. If an individuals consumed in excess of the AMDR, there is a potential of increasing the risk of chronic diseases and insufficient intakes of essential nutrients.

[c] ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.
SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate. Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005).* This report may be accessed via www nap.edu

As shown in Table 2, the PurisPea protein product will be used in a number of food products. Furthermore, as noted previously, FDA has established a DRV of 50 g/day for protein. In addition as shown in Table 3, the Institute of Medicine (I0M) has established a Recommended Dietary Allowance (RDA) of 56 g/day for adult males and 46 g/day for adult females. Given the variety of food uses in the major food categories listed above, the large average daily consumption of these foods, and the maximum proposed concentration of the additives, it is readily seen that the calculated daily intake of additives can clearly be a substantial fraction of the RDA.

Most of the population's protein intake is derived from, and will continue to be derived from, unprocessed foods, including meat, poultry, fish, and legumes. Moreover, for those processed foods to which the concentrated pea proteins (PURIS*Pea*) will be added, there are competitive products on the market. Thus, the addition of these pea protein ingredients will simply serve as a replacement for these other competitive protein sources and will not increase consumer exposure to protein.

Therefore, we do not realistically expect that the actual consumption of foods containing pea protein (PURIS*Pea*) products will contribute to a significant portion of total protein intake.

VI. Pea proteins Safety overview:

A. Human consumption of pea proteins and clinical trials

There is common knowledge of a long history of human consumption of peas. Peas were one of the earliest food crops. The evidence of wild pea consumption by humans dates back to 9750 BC based on findings from archaeologists exploring the "Spirit Cave" on the border between Burma and Thailand. Cultivation of peas brought stability to once nomadic tribes, and made it possible for peas to be brought by travelers and explorers into the countries of the Mediterranean as well as to the Far East. Pulses, including peas, have long been important components of the human diet due to their content of starch, protein and other nutrients. The field pea was among the first crops cultivated by man. As pea cultivation requires cool weather, historians believe the main center of pea development was middle Asia, including northwest India and Afghanistan. Additional areas of development lie in the Near East, and a third area includes the plateau and mountains of Ethiopia. Wild field peas of related species can still be found in Afghanistan, Iran, and Ethiopia. Peas, more specifically the yellow or green cotyledon varieties known as dry, smooth or field peas, are grown around the world for human and animal consumption. Peas and its different preparations are listed among the foods containing pea protein in the USDA Nutrient Database for Standard Reference (NDSR, 2009). This database includes 55 foods that contain peas, including three baby foods, six legumes and legume products, 15 soups, sauces, and gravies, and 31 vegetables and vegetable products. In addition to peas, there are several other food sources of protein such as legumes, nuts, whole grains, bran products, fruits, and non-starchy vegetables

A body of generally available and acceptable scientific &literature relating to the role of Vegetable protein in food includes the following:

1. Rania Abou-Samra, Lian Keersmaekers, Dino Brienza, Rajat Mukherjee and Katherine Macè (2011) reported “Casein and pea protein showed a stronger effect on food intake compared to whey when consumed as a preload. However, consuming the protein preload as a starter of a meal decreased its impact on food intake as opposed to consuming it 30 min before the meal.”

Because the source of protein may play a role in its satiating effect, they investigated the effect of different proteins on satiation and short-term satiety. Two randomized single-blind cross-over studies were completed. In the first study, we investigated the effect of a preload containing 20 g of casein, whey, pea protein, egg albumin or maltodextrin vs. water control on food intake 30 min later in 32 male volunteers (25 ± 4 years, BMI 24 ± 0.4 kg/m2). Subjective appetite was assessed using visual analogue scales at 10 min intervals after the preload. Capillary blood glucose was measured every 30 min during 2 hrs. before and after the ad libitum meal. In the second study, we compared the effect of 20 g of casein, pea protein or whey vs. water control on satiation in 32 male volunteers (25 ± 0.6 years, BMI 24 ± 0.5 kg/m2). The preload was consumed as a starter during an ad libitum meal and food intake was measured. The preloads in both studies were in the form of a beverage. In the first study, food intake was significantly lower only after casein and pea protein compared to water control ($P = 0.02$; 0.04 respectively). Caloric compensation was 110, 103, 62, 56 and 51% after casein, pea protein, whey, albumin and maltodextrin, respectively. Feelings of satiety were significantly higher after casein and pea protein compared to other preloads ($P < 0.05$). Blood glucose response to the meal was significantly lower when whey protein was consumed as a preload compared to other groups ($P < 0.001$). In the second study, results showed no difference between preloads on ad libitum intake. Total intake was significantly higher after caloric preloads compared to water control ($P < 0.05$).

2. Nicolas B., Christos P., Gaëlle D., Laetitia G., Marie-Hélène S., Catherine L. and François A. (2015) reported "Pea proteins oral supplementation promotes muscle thickness gains during resistance training: a double-blind, randomized, Placebo-controlled clinical trial vs. Whey protein"

The effects of protein supplementation on muscle thickness and strength seem largely dependent on its composition. The current study aimed at comparing the impact of an oral supplementation with vegetable Pea protein (NUTRALYS®) vs. Whey protein and Placebo on biceps brachii muscle thickness and strength after a 12-week resistance training program. One hundred and sixty one males, aged 18 to 35 years were enrolled in the study and underwent 12 weeks of resistance training on upper limb muscles. According to randomization, they were included in the Pea protein (n = 53), Whey protein (n = 54) or Placebo (n = 54) group. All had to take 25 g of the proteins or placebo twice a day during the 12-week training period. Tests were performed on biceps muscles at inclusion (D0), mid (D42) and post training (D84). Muscle thickness was evaluated using ultrasonography, and strength was measured on an isokinetic dynamometer. Results: Results showed a significant time effect for biceps brachii muscle thickness ($P < 0.0001$). Thickness increased from 24.9 ± 3.8 mm to 26.9 ± 4.1 mm and 27.3 ± 4.4 mm at D0, D42 and D84, respectively, with only a trend toward significant differences between groups ($P = 0.09$). Performing a sensitivity study on the weakest participants (with regards to strength at inclusion), thickness increases were significantly different between groups (+20.2 ± 12.3%, +15.6 ± 13.5% and +8.6 ± 7.3% for Pea, Whey and Placebo, respectively; $P < 0.05$). Increases in thickness were significantly greater in the Pea group as compared to Placebo whereas there was no difference between Whey and the two other conditions. Muscle strength also increased with time with no statistical difference between groups. In addition to an appropriate training, the supplementation with pea protein promoted a greater increase of muscle thickness as compared to Placebo and especially for people starting or returning to a muscular strengthening. Since no difference was obtained between the two protein groups, vegetable pea proteins could be used as an alternative to Whey-based dietary products.

3. Abete I., Parra D. & Martinez JA (2009) reported "The ability of peas to improve CVD and promote weight loss may be attributable to their high protein content"

Cardiovascular diseases (CVD) are a major health problem in the industrialized countries, representing the main cause of death in the world. It is estimated that 17 million people globally die of CVD every year and these diseases are responsible for more than half of all deaths in Europe. Legumes could represent valuable tools to prevent CVD, in addition to constitute an important source of dietary proteins (18-40%), dietary fiber, minerals and vitamins. Epidemiological studies have provided consistent evidence of the inverse relationship between legume consumption and the incidence of CVD. The majority of studies that have evaluated the hypocholesterolemic effects of legume consumption examined soybeans. In addition, the meta-analysis showed that diet rich in legumes, such as a variety of beans, peas, and some seeds other than soy decreases total and low-density lipoprotein (LDL) cholesterol. Different legumes have been identified as sources of ACE-inhibitory and antioxidative peptides, mainly soybean, chickpea and pea.

4. Nicolas .G, Sylvain .M, Robert .B, Catherine .L, Henriette .D, Jacques .R and Daniel .T. (1996). British Journal of Nutrition. The gastro-ileal digestion of N-labelled pea nitrogen in adult humans. Volume 76, Issue 01. pp 75-85.

The aim of the present study was to determine the gastro-ileal behaviour of pea protein in humans. For this purpose, twelve healthy volunteers were intubated with an intestinal tube located either in the jejunum (n 5) or in the ileum (n7). After fasting overnight, they ingested 195 mmol N of pea. Intestinal samples were collected for 6 h in the jejunum and for 8 h in the ileum. Before meal ingestion the basal liquid flow rate (ml/min) was 2-01 (SD 0-31) in the jejunum and 2-02 (SD 0-33) in the ileum. After meal ingestion the liquid phase of the meal peaked in the 40–60 min period in the jejunum and in the 150–180 min period in the ileum. The jejmo-ileal transit time of the liquid phase of the meal was 102 min. The basal flow rate of endogenous N (mmol N/min) was 0·22 (SD 0·15) in the jejunum and 016 (SD 0·10) in the ileum. The endogenous N flow rate peaked significantly ($P < 0·05$) in the jejunum in the 40–60 min period whereas no stimulation of endogenous N could be detected in the ileum after meal ingestion. A significantly increased ($P < 0·05$) concentration of exogenous N was detected in the jejunum during the 20–3u) lnin period and during the 9–480 min period in the iteum. The overall true gastro-ileal absorption of pea N was 894 (SD 1·1) % with 69 (SD 14) % absorbed between the stomach and the proximal jejunum and 20·4% between the proximal jejunum and the terminal ileum. The percentage of ethanol-insoluble fraction (PN) in the exogenous N at the terminal ileum increased significantly ($P < 0·05$) to 75% after 360 min. These results suggest that heat-treated pea protein has a digestibility close to that of animal protein

5. Chentouf Aouatif, Ph. Looten, M. V. S. Parvathi, S. Raja Ganesh, and V. Paranthaman (2013) reported “Finally NUTRALYS Pea Protein Isolate is considered non-mutagenic and non-genotoxic at the conditions employed in Ames test, in vitro chromosomal aberration test, and in vivo micronucleus test and suits a toxicologically safe protein supplement.”

In this paper, the possible toxic effects of the Pea Protein Isolate NUTRALYS were evaluated in first-barrier trials. Unifying all the information, the data suggest that the Pea Protein does not induce toxic effects, which could represent the safe implementation for nutritional supplementation of this product. Many nutritional supplement ingredients like Avemar pulvis, comprising fermented wheat germ, were tested for safety evaluation by acute, sub-acute, sub chronic, and genetic toxicity studies and found to have no adverse effects at exposures far in excess of those that are expected to result from their intended use. In its 2004–2009 Strategic Plan NIH’s Office of Dietary Supplements looks for research assessing the effects of dietary supplements on biomarkers associated with chronic diseases, optimal health, and improved performance. For this purpose genotoxic evaluation has been carried out to propose the genotoxic risk to the end user. The strategic recommendation of short-term genotoxic tests to assess the toxicity of the food ingredients follows Ames bacterial reverse mutation test an in vitro chromosomal aberration test followed by an in vivo micronucleus test. This strategy has been implemented and the safety data was proposed for this food supplement. All three tests in the battery elucidated the non genotoxic nature of NUTRALYS Pea Protein Isolate and hence recommended to be used as a dietary supplement for human, for which the humans equivalent dose was extrapolated from cellularity, and a ratio of >1 was observed in males at 800mg/kg b.w., exhibiting a similar trend to that of the concurrent vehicle control. In the limit test no evident increase in the frequencies of MN-PCE was observed in the dose group compared to that of the concurrent vehicle control groups in all time points of sacrifice. However, an evident increase in the MN-PCE (>2 fold) was observed in the positive control group over the vehicle control and dose groups, thus validating the sensitivity of the assay ($P < 0.05$, Dunnett’s test). From the previous results, giving credence to the scientific judgment, it was concluded that Pea Protein Isolate was non-genotoxic in single- and two-day treatments under the test conditions employed.

6. Lefebvre, Sandrine (2004) reported results of trials using three vegetable proteins, wheat gluten, pea and lupin. Nineteen trials were carried out in France and 2 in Switzerland. The results showed that in most foods the vegetable proteins have an equivalent action, if not better, that the animal proteins used as a reference.

7. Roy F, Boye JI & Simpson BK (2010) reported "Hydrolysis of pea and other pulse proteins generates peptides with a variety of bioactivities in vitro, including angiotensin I-converting enzyme inhibitor activity, which has an antihypertensive effect, and antioxidant activity "

8. In GRAS notice number GRN 000182 (2006), FDA had no questions regarding the GRAS determination of "pea protein isolate" under the intended condition of use (filling agent in wine making). Also in GRAS notice number GRN 000525 (2014), FDA had no questions regarding the GRAS determination of "pea fiber" under similar the intended condition of use (e.g. baked goods (bread, cake, noodles), Fruit juices, and Milk (acidified)). The basis for both GRAS notices was scientific procedures (21 CFR § 170.30(b)).

B. Animal Consumption of Pea Proteins and clinical trials

1. Corbett, R. R., Okine, E. K. and Goonewardene, L. A. 1995. Effects of feeding peas to high-producing dairy cows. Can. J. Anim.Sci. 75: 625-629.

The effect of substituting peas for soybean and canola meals as a protein source in a high-producing dairy herd was studied in 66 Holstein cows, divided into two groups based on stage of lactation, parity, level of milk production and days in milk. Two l8.5 % crude protein grain concentrate diet were formulated based on the nutrient analyses of the forages available. The control grain mix contained standard protein sources, principally soybean and canola meal (SBM\CM) while the test grain mix was formulated to contain approximately 25% field peas as the major source of protein. Both grain rations were formulated to the same nutrient specification and balanced for undegradable protein. The duration of the trial was 6 months during which grain feeding levels were adjusted monthly based on milk yield. For cows in early lactation, 4% fat-corrected milk yield was higher($P < 0.05$) for cows fed pea based concentrates (31.3 kg d^{-1}) than for cows fed SBM\CM supplement (29.7 kg d^{-1}). Fat-corrected milk yield was not affected by source of protein in mid- and late lactation cows. Fat-corrected milk production was not different ($P > b.05$) for cows fed SBM\CM compared with cows fed the pea supplement when cows across all stages of lactation were included in the analyses. Milk fat percent was significantly higher ($P < 0.05$) for early- and mid-lactation cows fed the pea supplement. The results suggest that peas can be substituted for SBM\CM as a protein source for high-producing dairy cows

2. Janardhanan R. (2011). Behavioral analysis of pigs when presented with pea-diets. A Thesis Submitted to the College of Graduate Studies and Research in Partial Fulfillment of the Requirements for the Degree of Master of Science in the Department of Animal and Poultry Science University of Saskatchewan Saskatoon, Saskatchewan.

Pigs are commonly used as a human model because of similarities in their digestive system. Studies by Nelson and Sanregret (1997) showed that pigs perceive and respond aversively to compounds that humans find bitter tasting. The response of pigs to the bitter tasting compounds was similar to humans but the concentration at which they responded seemed to vary. Their aversion to peas (if any) might be due to taste because research done by Heng et al. (2006) using a trained panel of consumers showed that saponin content in peas [mainly DDMP (2, 3-dihydro-2, 5-dihydroxy-6-methyl-4H-pyran-4-one) saponin seemed to be bitter in humans. This does not exclude the possibility that the aversion might be due to a negative post-ingestive effect. The amount of peas recommended to be included in grower pig diets is higher up to 66 %, Stein et al., (2006) and the possibility of using field peas as the sole source of supplementary protein in

grower diets has been proven in trials conducted at the Agriculture Canada Research Station in Brandon (Castell et al., 1988). There was no change in carcass quality or dressing percentage when the pea diets were compared with that of a soybean control diet. Pea inclusion rates of 56.8 % did not have any detrimental effects on the feed intake of grower pigs fed from 23 kg to 100 kg (Bell and Keith, 1990). Stein et al. (2006) proved that field peas may replace all of the soybean meal in diets fed to growing pigs without any negative effects on feed intake, carcass composition, carcass quality or pork palatability providing the diets were balanced for amino acids. Palatability of peas was not directly measured in Stein's (2006) study; however no reduction in feed intake was seen in any phase of the study.

The series of experiments conducted in this study demonstrate that peas are palatable to swine. The first experiment revealed that there was no difference in intake over relatively short transition periods (transition from familiar to novel pea diets). An inclusion rate of up to 60 % did not reduce intake in grower pigs. No evidence of an innate taste aversion was seen. A taste issue would have immediately reduced the intake of the pea diets. However, a drop in intake was not noticed during the transition period. Results from the second experiment support the results of the first experiment that peas did not cause a negative post-ingestive effect. This is evidenced by the fact that the animals chose to eat equal amounts of the flavor associated with pea and canola diets. Kyriazakis and Emmans (1992) studied the diet selection of pigs when fed diets containing rapeseed meal which produces goitrogenic effects. The inclusion did not affect the intake and live weight gain of pigs fed rapeseed meal alone. This finding is similar to the result from the first experiment of the present study. However, in Kyriazakis's study when the pigs were given a choice between a rapeseed meal and soybean meal diet the pigs chose the soybean meal diet irrespective of the nutritional properties of the diets. This clearly indicates that the pigs preferred the soybean meal diet over the rapeseed meal diet because of negative effects of the rapeseed meal. This was not the case in the second experiment confirming the fact that commercially available peas used in this study did not cause negative effects because of either taste or post-ingestive feedback issues. The third experiment gives insight into the feeding behavior of pigs during transition to a pea based diet. The pea diets modified the feeding behavior of pigs during the transition period. The pea diets required a larger number of meals and the meals were shorter in length during the initial phase of the adaptation period. However, the feeding behavior became similar to the feeding behavior of pigs on the soybean meal (familiar) diet within a week. This feeding pattern is suggestive of neophobia that corrects within a few days of exposure. The initial response of more feeder visits and reduced time spent eating per visit results in a reduced ingestion per meal, thereby reducing ingestion of toxic substances. Time required for grower pigs to adapt to a novel constraining diet varies from 7 to 14 days depending on previous exposure (Kyriazakis and Emmans, 1995; Whittemore et al., 2001). The pigs in this experiment adapted to the diet within 7 days. In conclusion, the series of experiments help to clarify whether pea taste is a problem or not. The flavor of a food is an important component that contributes to it being widely consumed. Annual production of field peas range

from 3.0 to 3.7 million tonnes and constitute a major source of income for farmers in western Canada. Canada is the main producer of peas in the world. There is a potential to use more Canadian peas in animal nutrition and pea proteins in the feed industry.

3. M. Overlanda, M. Sorensena, T. Storebakkena, M. Penna, A. Krogdahla, and A. Skredea. (2009) Pea proteinconcentrate substituting fish meal or soybean meal in diets for Atlantic salmon (*Salmo salar*)—Effect on growth performance, nutrient digestibility, carcass composition, gut health, and physical feed quality. Aquaculture. Volume 288, Issues 3–4, Pages 305–31.

The effect of pea protein concentrate in diets for Atlantic salmon on growth performance, nutrient digestibility, carcass composition, blood chemistry, histology of the gastro-intestinal tract (GIT), and physical feed quality was investigated. A 12-week study was conducted using triplicate groups of Atlantic salmon with 0.16 kg initial weight kept in seawater. The dietary treatments consisted of one control diet based on high-quality fish meal (FM diet), one control diet containing 200 g kg− 1 soybean meal (SBM diet), and two experimental diets containing 200 g kg− 1 pea protein concentrate with either 350 or 500 g kg− 1 crude protein (PPC 35% CP and PPC 50% CP diet), substituting for fish meal protein. There were no significant differences among dietary treatments for weight gain or feed intake, but there was a tendency ($P < 0.07$) toward a lower feed conversion ratio in fish fed the PPC 50% CP diet. There were no differences in the digestibility of protein, fat, starch and most essential amino acids between the fish fed the FM and the PPC 35% CP or PPC 50% CP diets, but the PPC diets gave lower energy digestibility. The SBM diet gave reduced digestibility for protein, fat, starch, essential amino acids, and energy compared with the FM and the PPC diets. Also, feeding the PPC diets had no effect on body composition, while the SBM diet reduced ($P < 0.05$) the content of carcass fat and energy compared with the FM diet. Feeding the PPC diets did not induce morphological changes in the intestine, or affect the size of the GIT. Brush border maltase activity and fecal trypsin activity were unaffected. Feeding the SBM diet increased the size of the stomach, decreased the size of the distal intestine (DI), induced morphological changes in the DI, reduced brush border maltase activity, and increased fecal trypsin activity compared with the FM and PPC diets. In conclusion, pea protein concentrate was shown to be a promising new protein ingredient for salmonids and could replace 20% of high-quality fish meal protein in the feed without any adverse effect on growth performance, carcass composition or histology of the DI.

C. Allergenicity to pea proteins:

Pea Protein is not a major allergen (Food Allergen Labeling and Consumer Protection Act of 2004).

A food allergy is a potentially serious response to consuming certain foods or food additives. For those who are sensitive, a reaction can occur within minutes or hours, and symptoms can range from mild to life threatening. The eight leading causes of food allergies are milk, eggs, fish, shellfish, tree nuts, peanuts, wheat, and soybeans. USDA's Food Safety and Inspection Service (FSIS) and the U.S. Food and Drug Administration (FDA) both have laws requiring that all the ingredients in a food product be listed on the food label

Food allergies affect about 2 percent of adults and 4 to 8 percent of children in the United States. Each year in the U.S., it is estimated that anaphylaxis to food results in 30,000 emergency room visits, 2,000 hospitalizations, and 150 deaths.

FALCPA identifies eight foods or food groups as the major food allergens. They are milk, eggs, fish (e.g., bass, flounder, and cod), Crustacean shellfish (e.g., crab, lobster, and shrimp), tree nuts (e.g., almonds, walnuts, and pecans), peanuts, wheat, and soybeans.

FALCPA's labeling requirements do not apply to the potential or unintentional presence of major food allergens in foods resulting from "cross-contact" situations during manufacturing, e.g., because of shared equipment or processing lines. In the context of food allergens, "cross-contact" occurs when a residue or trace amount of an allergenic food becomes incorporated into another food not intended to contain it. FDA guidance for the food industry states that food allergen advisory statements, e.g., "may contain [allergen]" or "produced in a facility that also uses [allergen]" should not be used as a substitute for adhering to current good manufacturing practices and must be truthful and not misleading. FDA is considering ways to best manage the use of these types of statements by manufacturers to better inform consumers (Food Allergen Labeling and Consumer Protection Act of 2004).

In limited situations, FSIS labeling policies provide for the use of factual labeling statements about a product's manufacturing environment, e.g., "produced in a plant that uses peanuts," may be used where good manufacturing practices, and effective sanitation standard operating procedures (SSOPs), cannot reasonably eliminate the unintended presence of certain ingredients.

VII. Summary Basis for GRAS Determination:

World Food Processing LLC. has determined the Generally Recognized as Safe (GRAS) status of PURIS*Pea* Protein based on the following:

• The published toxicological studies by where materials similar to PURIS*Pea* proteins were studied. Chentouf Aouatif, Ph. Looten, M. V. S. Parvathi, S. Raja Ganesh, and V. Paranthaman (2013) reported "Finally NUTRALYS Pea Protein Isolate is considered non-mutagenic and non-genotoxic at the conditions employed in Ames test, in vitro chromosomal aberration test, and in vivo micronucleus test and suits a toxicologically safe protein supplement."

• The history of safe use of Pea Protein (*Pisum sativum* L.) in animals, including cattle, swine, poultry and fish.

• The PURIS*Pea* proteins are manufactured under good manufacturing practices (GMPs) and meet appropriate food grade specifications. The Material is prop 65 complaint and no residue of pesticide found in the final product.

• Pea Protein is not a major allergen (Food Allergen Labeling and Consumer Protection Act of 2004).

• The unanimous conclusions reached through scientific procedures, by a panel of experts, qualified by scientific training and experience, that the PURIS*Pea* protein products are GRAS for the intended uses when manufactured and used in accordance with GMPs and meeting appropriate food grade specifications.

Availability of information:

The data and information that forms the basis for this GRAS determination will be provided to the Food and Drug Administration upon request. The data and information will be available for FDA review and copying at reasonable times at the offices of:

World Food Processing LLC.
Attn: Kushal Chandak
4301 World Food Ave
Oskaloosa
Iowa- 52577

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Sosulski, F.W. and Mahmoud, R.M. (1979). Effects of protein supplements on carbonyl compounds and flavour in bread. Cereal Chem. 56: 533-536.

Stein, H. H., Benzoni, G., Bohlke, R. A. and Peters, D. N. 2004. Assessment of the feeding value of South Dakota grown field peas (Pisum sativum L.) for growing pigs. Journal of Animal Science. 82: 2568-2578.

Stein, H. H. 2006. Field peas in diets fed to swine. Cooperative Extension Service. South Dakota State University.

Stein, H. H., Everts, A. K. R., Sweeter, K. K., Peters, D. N., Maddock, R. J., Wulf, D. M. and Pedersen, C. 2006. The influence of dietary field peas (Pisum sativum L.) on pig performance, carcass quality, and the palatability of pork. Journal of Animal Science. 84: 3110-3117.

Sosulski, F.W. and Youngs, C.G. (1979). Yield and functional properties of airclassified protein and starch fractions from eight legume flours. J. Am. Oil. Chem. Soc. 56: 292-295.

Stein, H. and Lange, K. 2007. Alternative Feed Ingredients for Pigs. London Swine Conference – Today's Challenges, Tomorrow's Opportunities.

Tromelin, A., Andriot, I. & Guichard, E. (2006). Protein-flavour interactions. In A. Voilley & P. Etiévant (Eds.), Flavour in food (pp. 172-207). Cambridge, UK: Woodhead Publishing.

Wendy J.D., Lauren M. F. and Robert T. T. 2011. Review of the health benefits of peas (Pisum sativum L.). British Journal of Nutrition.

Whittemore, E. C., Kyriazakis, I., Emmans, G. C. and Tolkamp, B. J. 2001. Tests of two theories of food intake using growing pigs. 1. The effect of ambient temperature on the intake of foods of differing bulk content. Animal Science. 72, 351-360.

FDA Atty
Contract In-House Counsel & Consultants, LLC

August 21, 2015

Talia Lindheimer
Office of Food Additive Safety (HFS-200),
Center for Food Safety and Applied Nutrition,
Food and Drug Administration,
5100 Paint Branch Pkwy, College Park, MD 20740

Re: GRN 000581 Supplemental Response

Dear Ms. Lindheimer:

Kindly find attached a supplemental response to address the questions raised by the technical review panel. The attached answers are expanded responses to the preliminary responses provide during the teleconference on August 14, 2015.

The firm would also like to describe the raw material of the notified substance as "pea flour" rather than "(b) (6)" The firm raised concerns in regards to the propriety of disclosing the term (b) (6) to describe its protected process for making the notified substance. There is no material change to the substance merely a change in what in the way it should be described in publicly available documents.

Atlanta | Washington, D.C.
404.895.4882
msanchez@fdaatty.com

Please feel free to contact me with any questions or requests for additional information.

Kind Regards,

/s/Marc C. Sanchez Esq

Marc C. Sanchez
Contact In-House Counsel
World Food Processing, LLC

CC: Tyler Lorenzen, Vice-President Business Development

In reviewing World Food Processing, LLC's Notice 0581, we would like the notifier to clarify/address the following:

Chemistry Questions/Clarifications:

1. Your notice states that pea protein is isolated from yellow peas, however, alternate common and scientific names and a discussion that includes a variety of pea cultivars and varieties is also given. Further, the notice states that the starting material for the manufacture of the notified substance is pea protein concentrate. **Please clearly state the identity (e.g. subspecies, cultivar, and/or composition) of the source material that is used in the manufacture of pea protein.**

   Answer: The source material that is used to manufacture pea protein is *Pisum Sativum* L. (field pea).

2. Your notice discusses the structures and composition of proteins in peas (Section V. A.), however, it is not clear if this discussion is intended to describe the composition of the notified substance. Please provide information to demonstrate how the description in Section V. A. of the notice correlates to the composition of your pea protein product.

   Answer: PURISPea is extracted from *Pisum Sativum* L. (field pea), this involves dry milling of field peas, removal of fibrous and starch portion of the milled flour, isoelectric precipitation / coagulation of the pea protein. At this point the pea protein fractions mentioned in Sec V.A. are extracted due to isoelectric precipitation (Barry, 1999).

   Barry, G.S. (1999). Pea and Lentil protein extraction and functionality. Journal of the American Oil Chemist's Society, 67(5), 276-280.

3. In Section V. A, your notice also mentions water soluble albumins as one of the two major protein fractions, but does not discuss them further. We note that albumins may include protease inhibitors, amylase inhibitors, and lectins. **Please address if albumins are removed during the manufacturing process.**

   Answer: Albumins also contain essential amino acids; as Albumins will go with the rest of the proteins in to the final product during precipitation. Please refer to point 6 for further explanation.

4. Your notice states that food grade enzymes are used in the manufacture of pea protein. **Please elaborate on the identity and/or function of the enzymes used and how the use of enzyme(s) affects the composition of pea protein.**

Answer: Food Grade protease enzymes, Liquipanol T-200 (EC 3.4.22.2) and Enzeco Bromelain Concentrate are (EC 3.4.22.32) are used. Liquipanol T-200 is a food grade liquid enzyme preparation processed from the dried latex of the fruit of *Carica papaya L.* Enzeco Bromelain Concentrate is a food grade powdered enzyme derived from the mature pineapple plant stems of the *Bromeliceae family*. Both enzymes comply with the purity specifications for food-grade enzymes of the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and the FCC.

The function of the above enzymes is to split pea proteins via hydrolysis, i.e., the addition of water across peptide bonds (Figure 1). The hydrolysis of peptide bonds by proteases is termed proteolysis. The products of proteolysis are peptides and amino acids. The above protease enzymes hydrolyze (breaks) the peptide bonds (linkages) in pea proteins; releasing lower molecular weight peptides of shorter chain length, and amino acids. As shown in the Figure (1) below

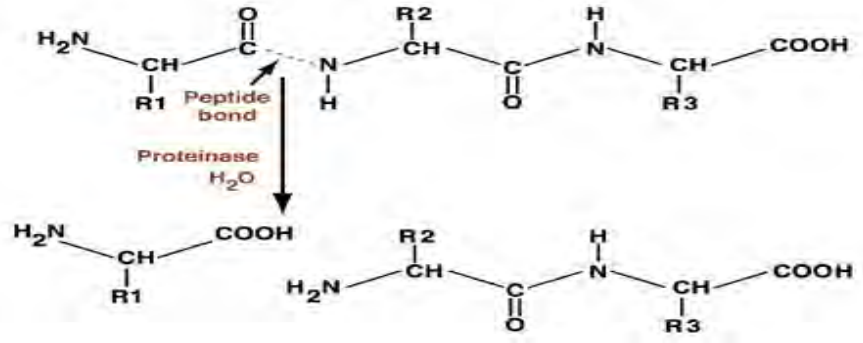

Fig. (1)

5. Your notice states that temperature, food grade enzymes, and pH may be modified during the manufacture of pea protein to achieve specific differences in the functionality of pea protein. **Please elaborate on the nature of these differences in functionality, and how these differences relate to the composition of the final product.**

Answer:

1. **Effect of Temperature: As the temperature of a solution containing the protein is raised, the extra heat causes twisting, rotating, and bending of bonds and functional groups within the molecule; the higher the temperature, the more of this there is. The heat will make the native protein to denature, and during the denaturation disulfide bonds will be formed and hydrophobic amino acid residues are exposed. After denaturation and further heating, the proteins will aggregate and interact with other proteins and form either a gel or a coagulum. Which type that is formed depends on conditions like molecular weight, heating time and protein concentration. The gel structure is a more structured network compared to the coagulum that is a disorganized aggregation**

2. **Effect of Enzymes: This has been covered in question (4) of chemistry questions.**

3. **Effect of pH: The solubility of Pea protein depends on solution pH, the minimum solubility observed at its isoelectric point. At a protein's pI, the net charge on the protein is zero by definition and this condition DOES NOT attract molecules of water for hydration, doesn't bind water as efficiently as a net positive or net negative charge would. Further away from the pI, the more net charge there will be on the protein. Therefore, water will bind more easily, the curve in figure (2) shows this. You would expect water holding capacity of a protein to be better at pH 10 or pH 2 than pH 5.5 because at pH 5 you are near the pI.**

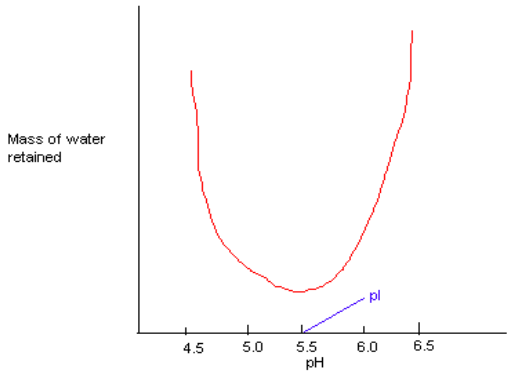

Fig.(2)

6. As discussed in the literature, potential components of pea protein products include anti-nutritional factors. For example, proteinase inhibitors (e.g. trypsin inhibitors and chymotrypsin inhibitors) and lectins, and non-protein components including saponins, phytate and raffinose oligosaccharides are reported as potential constituents of pea protein isolates. These anti-nutritional factors are described to have a variety of potential effects ranging from decreased protein digestibility and mineral absorption to increased incidents of flatulence. **In your notice, please comment if anti-nutritional factors were considered in your review of pea protein for use in food, and if you would expect these anti-nutrient factors to be present in pea protein.** Also, please **provide any specified limits that exist for the presence of these components in pea protein.**

Answer: Yes, anti-nutritional factors were considered but not mentioned in the review. PURIS*Pea* extraction process involves removal of the non-protein material such as fiber and starches which include majority of the saponin Raffinose, oligosaccharide; it is unlikely that non-protein anti-nutritional factors will be present at a point to affect the nutritional attributes of pea protein (PURIS*Pea*). We expect to see anti-nutritional factors in PURIS*Pea* but within limits that will not compromise the quality of pea protein, as PURIS*Pea* goes through a log reduction step (moist heat treatment) that will support to deactivate the antinutritional factors.

Legumes include peas, beans, lentils, peanuts, and other podded plants that are used as food (Messina 1999).

Protease inhibitors are widely distributed within the plant kingdom, including the seeds of most cultivated legumes and cereals. Protease inhibitors are the most commonly encountered class of anti-nutritional factors of plant origin. Protease inhibitors have the ability to inhibit the activity of proteolytic enzymes within the gastrointestinal tract of animals (Gemede, 2014).

Due to their particular protein nature, protease inhibitors may be easily denatured by heat processing although some residual activity may still remain in the commercially produced products (Rackis et al., 1981) also there is little reason to think that the amount of trypsin inhibitors obtained by eating commonly consumed beans would exert any adverse effects in humans (Liener, 1994). Further the levels of TI's and chymotrypsin inhibitors in raw beans and peas are lower than soybeans (Rackis et al., 1981). The protease inhibitor variants are also readily inactivated by moist-heat Treatment. The practical significance of these findings is that Protease inhibitors and other antinutritional factors that may arise in raw immature, mature, and germinated soybeans (regardless of variety) can be readily eliminated by ordinary cooking and moist-heat Treatment (Rackis et al., 1981)

Most pulses contain protease inhibitors—the main ones being trypsin inhibitor and chymotrypsin inhibitor. The levels of protease inhibitors in legumes may be very low (e.g. lupins) or very high, (e.g. soybeans). For peas, few special precautions are necessary. The levels of trypsin inhibitor are low enough, usually less than 4 TIU/mg, to not be a practical concern (Liener, 1983; Sauer and Jaikaran, 1994)

A comparison of lectins from a number of bean varieties revealed that their toxicity was highly dependent on the variety, but even the most toxic ones were easily deactivated by heat treatment (Liener, 1976)

After extensively reviewing the studies mentioned below it is unlikely that the antinutritional factors present in PURIS*Pea* will affect the quality of the pea protein (PURIS*Pea*).

References:

Dahl, W.J., Foster, L.M., and Tyler, R.T. (2012). Review of the health benefits of peas (Pisum Sativum L.). British Journal of Nutrition, 103: S3-S10.

Gemede, H.F., Ratta, N. (2014). Antinutritional Factors in Plant Foods: Potential Health Benefits and Adverse Effects. International Journal of Nutrition and Food Science, 3(4), 284-289.

Habtamu, F.G., Negussie, R. (2014). Anti-nutritional factors in plant foods: Potential health benefits and adverse effects. International Journal of Nutrition and Food Sciences, 3(4): 284-289

Liener, I.E. (1976). Legume toxins in relation to protein digestibility – a review. Journal of Food science, 41(5), 1076-1081.

Liener, I.E. (1983) .Chemistry and biochemistry of legumes Toxic constituents in legumes. Edward Arnold Publishers Limited, pp. 217-258.

Liener, I.E. (1994). Implications of antinutritional components in soybean foods. Food Science and Nutrition, 34:31–67.

Messina, M.J. (1999). Legumes and soybeans: overview of their nutritional profiles and health effects. The American Journal of Clinical Nutrition, 70: 439S-50S.

Rackis, J.J. and Gumbmann, M. R. (1981). PROTEASE INHIBITORS: PHYSIOLOGICAL PROPERTIES AND NUTRITIONAL SIGNIFICANCE. In R.L. Ory (Eds.), in Antinutrients and Natural Toxicants in Foods (203-237), Food & Nutrition Press, Inc., Westport, CT 06880 USA.

Sauer, W.S. and Jaikaran, S. (1994). Amino acid and energy digestibility in peas (pisum sativum) from white-flowered spring cultivars for growing pigs. Journal of the Science of Food Agriculture, 64: 249-256

United States Department of Agriculture. (2011). My Plate Guidelines. http://www.choosemyplate.gov (accessed August 2015)

7. Your notice provides a *per capita* estimate of daily exposure to pea protein based on its estimated production in 2014 (10,000 metric tons). **Please clarify if this production estimate and mean *per capita* daily consumption includes the intended uses and food categories described in your notice.**

Answer: No

In 2009, the World production of peas was reported to be over ten million tons. The major producers of pea are reported as Canada, the Russian Federation, China, the USA and India (Dahl et al., 2012). Although peas have been used as a feed for livestock, it is also commonly consumed as food in developing countries for its protein content. In developing countries, shortage of grain legumes has adverse effects on the nutritional standard of poor people. Legumes have played an important role in the traditional diets of many regions throughout the world. It is difficult to think of the cuisines of Asia, India, South America, the Middle East, and Mexico without picturing soybeans, lentils, black beans, chick-peas, and pinto beans, respectively. In contrast, in many Western countries beans play a less significant dietary role (Messina, 1999). At the beginning of the 1960's, the consumption of dry pea was 2.2 kg/capita. Based on this information, the daily intake of "pea" is estimated to be 6.03 g/person/day. The available information on composition indicates that dry peas contain approximately 32 % protein (Dahl et al., 2012)

World Food processing targets to use Pea Protein (PURIS*Pea*) at amounts of 1.0 g/ serving (Reference amounts customarily consumed, 21 CFR 101.12) in foods such as juices, baked goods, snacks, cereal and soups.

The intended use levels in the table below were calculated using USDA survey data. The USDA survey was used to estimate mean and 90th percentile per capita levels of consumption from the chosen food categories (USDA CSFII Survey).

Food Category	Consumption of food product (g/day)		Use levels (g/serving)	Use levels (g/kg)	Average Serving Size (g)	Daily intake by adult (g/person)	
						Mean	90th %
	Mean	90th %					
Fruit and vegetable juices	207	496	2.0	4.25	240	0.85	2.06
Baked goods	56	104	2.0	20	50	1.12	2.08
Cereal /Snacks	54	93	2.0	40	25	2.16	3.72
Soups	398	697	2.0	4.25	240	1.65	2.9
Total (g/person/day)						5.78	10.76

Dahl, W.J., Foster, L.M., and Tyler, R.T. (2012). Review of the health benefits of peas (Pisum Sativum L.). British Journal of Nutrition, 103: S3-S10.

Messina, M.J. (1999). Legumes and soybeans: overview of their nutritional profiles and health effects. The American Journal of Clinical Nutrition, 70: 439S-50S.

Toxicology Questions/Clarifications:

1. Your notice identifies GRN 0182 as a notice to support the GRAS determination of pea protein as a food ingredient. The subject of GRN 0182 is not pea protein alone, but plant proteins derived from wheat and peas. The plant proteins (substance of commerce) were used as a processing aid in wine and removed prior to bottling; therefore, there is no increase in dietary exposure to plant proteins for consumers of wine processed with plant protein. The information provided in GRN 0182 is not suitable to support the safety claim of pea protein in GRN 0581.

2. GRN 0581 categorically states that "[p]ea is not an allergen," and identifies GRN 0525 as a notice supporting the GRAS determination of pea protein as a food ingredient. The subject of GRN 0525 is pea fiber (FIPEA^{TM}), which contains 3-8% protein. The Notifier of pea fiber describes studies that clearly show the allergenicity of pea proteins, stating pea is one of the "most common foods causing immunologically mediated reactions" and that "a great degree of cross-reactivity" was demonstrated among lentil, chick pea, pea and peanut allergy. Additionally, scientific data on anaphylaxis due to pea protein is mentioned in GRN 0525. The Notifier of GRN 0525 also states that while pea protein is allergenic, pea fiber is unlikely to be allergenic, and thus does not discuss why pea protein allergenicity does not pose a safety concern. Therefore, the information provided in GRN 0525 is not suitable in support of the safety of pea protein as an allergen in GRN 0581.

   Moreover, GRN 0581'sexpert GRAS panel (Silliker) noted that green pea can be found in the Food Allergy Research and Resource Database. Our own thorough review of the scientific literature on the allergenicity of pea protein yielded a large number of publications that showed that although somewhat rare, pea protein allergy does exist. **Your notice needs to provide a robust discussion of the allergenicity of pea proteins and why it does not pose a safety concern.** At the end of our questions, we've included References 1 through 8 as examples of the scientific literature that may be used for allergenicity discussions.

Answer:

Wensing, M., Knulst, A. C., Piersma, S., O'Kane, F., Knol, E. F., & Koppelman, S. J. (2003). Patients with anaphylaxis to pea can have peanut allergy caused by cross-reactive IgE to vicilin (Ara h 1). Journal of Allergy and Clinical Immunology, 111(2), 420-424.

Three patients have been studied in the above test with a history of anaphylaxis to pea are reported to subsequently had symptoms after ingestion of peanut. The study investigated whether the peanut-related symptoms were due to cross-reactivity between pea and peanut proteins. Peanut-related symptoms were documented according to case history or double-blind, placebo-controlled food challenge results. Skin prick tests were performed, and specific IgE levels were determined for pea and peanut. Cross-reactivity was studied by means of immunoblot and ELISA inhibition studies with whole extracts and purified allergens. All patients had a positive skin prick test response and an increased IgE level to pea and peanut. Immunoblotting revealed strong IgE binding to mainly vicilin in pea extract and exclusively to Ara h 1 in crude peanut extract. Immunoblot and ELISA inhibition studies with crude extracts, as well as purified proteins, showed that IgE binding to peanut could be inhibited by pea but not or only partially the other way around. Clinically relevant cross-reactivity between pea and peanut does occur. Vicilin homologues in pea and peanut (Ara h 1) are the molecular basis for this cross-reactivity.

Sanchez-Monge, R., Lopez-Torrejón, G., Pascual, C. Y., Varela, J., Martin-Esteban, M., & Salcedo, G. (2004). Vicilin and convicilin are potential major allergens from pea. Clinical & Experimental Allergy, 34(11), 1747-1753.

In the above study a serum pool or individual sera from 18 Spanish patients was used to identify the main IgE binding components from pea seeds by immunodetection and immunoblot inhibition assays. IgE immunodetection of crude pea extracts revealed that convicilin (63 kDa), as well as vicilin (44 kDa) and one of its proteolytic fragments (32 kDa), reacted with more than 50% of the individual sera tested. Additional proteolytic subunits of vicilin (36, 16 and 13 kDa) bound IgE from approximately 20% of the sera.. Thus Vicilin and convicilin are potential major allergens from pea seeds. Furthermore, proteolytic fragments from vicilin are also relevant IgE binding pea components.

Ibanez, M. D., Martinez, M., Sanchez, J. J., & Fernández-Caldas, E. (2002). [Legume cross-reactivity]. Allergologia et immunopathologia, 31(3), 151-161.

Legumes are an important ingredient in the Mediterranean diet. Among Spanish children, sensitivity to legumes is the fifth most prevalent food allergy. Lentil and chick-pea are the most frequent cause of allergic reactions to legumes in Spanish children. The different legumes have structurally homologous proteins, but they are not all equally allergenic, thus making it difficult to distinguish in vitro and in vivo cross-reactivity. In the above study it has been demonstrated by skin tests and CAP that most of the patients are sensitized to more than one legume. A great degree of cross-reactivity among lentil, chick-pea, pea and peanut by ELISA inhibition (> 50 % max. inhibition) has been established based on the data from the above study. The majority of patients showed symptoms with more than one legume (median 3 legumes). These investigators challenged (open or simple blind) 39 patients with two or more legumes and 32 (82%) reacted to two or more legumes: 43.5% to 3, 25.6% to 2, 13% to 4 legumes. Among these patients, 73% challenged with lentil and pea had positive reaction to both, 69.4% to lentil and chick-pea, 60% to chick-pea and 64.3% to lentil, chick-pea and pea simultaneously. In this study, 82% of the children allergic to legumes had a sensitization to pollen. The decision to eliminate one legume from the diet should be based on a positive oral food challenge.

Conclusion:

After exhaustive review of the above scientific literature it is proven that Allergenicity to pea has been reported and the occurrence to pea allergy differs among diverse population. In comparison to chickpeas and lentils, adverse reactions to peas have been rarely reported (Gowland, 2010). Cross reactivity has been demonstrated among peanut, pea, lentil and chickpea. Vicilin and Convicilin are reported to be the potential allergenic protein fractions from pea. However searches of Centers for Disease Control and Prevention (CDC) data yielded no documented cases of reactions to pea protein in the United States. Pea Protein (PURIS*Pea*) do not contain any of the eight allergens (Milk, Egg, Fish, Crustacean Shellfish, Tree nuts, Peanuts, Soybeans, Wheat) considered to be major food allergens under the U.S. Food Allergen Labelling and Consumer Protection Act of 2004 (FALCPA).

Gowland, M. H. (2010). Emerging allergens and the future. In J. I. Boye and S. B. Godefroy Editor(Eds.), in Allergen Management in the Food Industry (502-504), John Wiley & Sons, Inc., Hoboken, NJ, USA.

3. In the cover letter included with the notice, the third major point to support the safety of PURISPea is "published toxicological studies examining proteins similar to PURISPea proteins were studied and found the protein isolate 'non-mutagenic and non-genotoxic'." The pea protein product found to be non-mutagenic and non-genotoxic was NUTRALYS. **Please provide in what aspects (such as composition) NUTRALYS and PURISPea are similar as well as in what aspects they are different?** Without this information and a thorough bridging discussion, the conclusion regarding the safety of pea protein (PURISPea) can be evaluated.

Answer:

a. After thoroughly reviewing and considering the following points the determination of The above two pea proteins being similar is made:

1. **Processing: NUTRALYS® pea protein is extracted from yellow peas (*Pisum sativum*), First peas are cleaned and ground to a dry flour. The flour is then hydrated and the pea starch and internal fiber are extracted separately. The protein fraction is coagulated for further purification and carefully dried in a spray dryer (Joost et al., 2015). PURIS*Pea* is processed using the same principles of separating the fiber and starch ground yellow peas and purification of flocculated protein with spray drying it at the end.**

2. **Composition: The composition of NUTRALYS Protein is very similar to that of PURIS*Pea* protein. Both Proteins are > 80 % protein and identical in fat, ash and carbohydrate %. The Amino –Acid and heavy metal profile is very comparable.**

3. **Allergenicity: PURIS*Pea* and NUTRALYS® Pea proteins both are devoid of the Top 8 Allergen recognized by FALCPA**

b. Differences:

1. **PURIS*Pea* has a finer particle size compared to NUTRALYS Pea Proteins.**

2. **PURISPea is slightly lighter in color than NUTRALYS Pea Proteins.**

3. **PURIS*Pea* is manufactured in TURTLE LAKE, WISCONSIN while NUTRALYS is manufactured in LESTREM FRANCE.**

Joost, O., Laetitia, G-D., Daniel, W., Tim, T. (2015) NUTRALYS® pea protein: characterization of in vitro gastric digestion and in vivo gastrointestinal peptide responses relevant to satiety. Food & Nutrition Research, 59: 25622. Available at http://dx.doi.org/10.3402/fnr.v59.25622

4. The last bulletin point of the cover letter supporting the GRAS determination of pea protein states, "[a]n expert panel reviewed the food ingredient and manufacturing process and affirmed the GRAS conclusion." This GRAS determination was done by Silliker, a Merieux NutriSciences Company, however is deficient for the following reasons:

    a. **The members of the panel and their expertise are not listed.**

    b. **There is only one signature at the end of the review summary by Silliker. Each GRAS Panel member must sign the GRAS summary prepared by Silliker.**

    Answer: Please see the attached Letter.

5. Your notice lists 5 aflatoxins, B1, B2, G1, G2, and G2. The same aflatoxin (G2) is mentioned twice. **Please clarify if there are four or five aflatoxins present in the product.** If five are present, please identify the 5th one with its correct name.

    Answer: Thank you for bringing this to our attention. Aflatoxin (G2) got mentioned twice, the total list of Aflatoxin is B1, B2, G1, and G2. Please find the attached copy of page 10 to reflect the changes on Aflatoxin.

6. Your notice states the individual levels of each aflatoxin to be below 0.6 ppb and the total aflatoxin level below 0.7 ppb. Aflatoxins are considered to be human liver carcinogens. **Please discuss what levels are considered safe for humans and provide reference(s) for these safe levels.** As provided at the end of these notes, please consider Reference 9 as an example of the literature that may be used for this discussion.

    Answer: The total Aflatoxin levels that are considered safe for humans that are designed to provide an adequate safety to protect human and animal health is 20 pbb (FDA, 2000; USDA, 1998; WHO, 1998). The total aflatoxin level as well as the individual aflatoxins in PURIS*Pea* is well below the safety threshold of 20ppb.

References:

1. **International Programme on Chemical Safety, World Health Organization, Safety Evaluation of Certain Food Additives and Contaminants: WHO Food Additive Series 40: Aflatoxins. (1988). Available online at http://www.inchem.org/documents/jecfa/jecmono/v040je16.htm.**

2. **U.S. Department of Agriculture (USDA), Grain Inspection, Packers and Stockyards Administration (GIPSA). "GIPSA Backgrounder: Aflatoxin," September, 1998. Available online at www.usda.gov/gipsa/newsroom/backgrounders/b-aflatox.html**

3. **U.S. Food and Drug Administration (FDA), Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed. (2000). Available online at http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ChemicalContaminantsMetalsNaturalToxinsPesticides/ucm077969.htm**

7. The notice states that both the melamine and cyanuric acid levels are below 0.25 ppm each. Melamine combines with cyanuric acid and related compounds to form melamine cyanurate and related crystal structures, which have been implicated as contaminants or biomarkers in protein adulterations. **Please discuss what levels are considered safe (or allowed) for humans and provide references for these levels.**

Answer : After a comprehensive review of articles and electronic links provided in the reference section the considered safe (or allowed) for melamine an cyanuric acid levels for infant formula is 1.0 ppm while other foods is 2.5 ppm. At <0.25 ppm., the level of Melamine and Cyanuric acid found in PURIS*Pea* is well below the allowed level for both infant formula and other foods.

References:

1. **Toxicological and health aspects of melamine and cyanuric acid: report of a WHO expert meeting in collaboration with FAO, supported by Health Canada, Ottawa, Canada, 1–4 December 2008. Available online at http://www.who.int/foodsafety/publications/chem/Melamine_report09.pdf**

2. **U.S. Food and Drug Administration (FDA), FDA Issues Interim Safety and Risk Assessment of Melamine and Melamine-related Compounds in Food. (2008). Available online at http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/2008/ucm116960.htm**

3. **U.S. Food and Drug Administration (FDA), Update: Interim Safety and Risk Assessment of Melamine and its Analogues in Food for Humans. (2008). Available online at http://www.fda.gov/Food/FoodborneIllnessContaminants/ChemicalContaminants/ucm164520.htm**

8. **On page 12 of your notice, the links you provided are blocked by FDA. Please provide the detailed information contained in the links provided for the following:**

   Point 10: Allergen Validation Program b.
   Point 11: Pesticide and Ochratoxin A

Answer: Please find the attached Document for the above Point 10 and Point 11.

9. The GRAS notice does not include scientific literature to discuss and support the safety of pea protein. Your notice mentions articles pertaining to the role of pea and/or vegetable protein in food. These articles do not contain safety information for mammals. Given the long history of safe dietary uses of pea, we recognize there is a lack of well-designed animal and human studies investigating the toxicity of pea protein. Nonetheless, a few of the scientific articles discussing the efficacy of pea protein and pea protein hydrolysate when used to treat conditions such as high blood pressure or hypercholesterolemia do contain some safety information at specific consumption levels. **Please review and discuss some of these articles; reference 10 is an example of one that may be used for this purpose.**

Answer:

1. **Aouatif, C., Looten, P., Srinivasan, M., Srinivas,A., Murkunde, Y.V. (2013). Subchronic toxicological effects of pea protein isolate (nutralys) on wistar rats: A ninety-day dietary. The Journal of Toxicology and Health, Photon 103, 225-233.**

The aim of the above study was to evaluate the safety of pea protein isolate using a sub chronic toxicity study design. Wistar rats of either sex were used as experimental animals and feed with dietary levels of low (25000 ppm), intermediate (50000 ppm) and high (100000 ppm) for ninety days. The animals involved in the clinical trial were observed once per day for clinical signs. Once per week body weight of the rats was measure. Water and food intake was measured daily and reported on a weekly basis. At autopsy, the liver, kidneys, adrenals, testes, epididymides, uterus, ovaries, thymus, spleen, brain and heart were removed and weighed. In addition, the liver, spleen, lungs, heart, aorta, kidneys, adrenals, brain, pituitary, trachea, thyroid, parathyroid, oesophagus, small intestine, large intestine, salivary glands, lymph nodes (Mandibular and mesenteric), spinal cord, thymus, stomach, pancreas, ovaries, uterus, accessory sex organs, female mammary gland, prostate, urinary bladder, peripheral nerve (Sciatic), bone marrow (sternum), skin were collected from all animals and preserved in 10% neutral buffered formalin, except testis, which was preserved in Modified avidson's for 48 hours and transferred in to 10 % buffered formalin after 5 minutes washing in running tap water. The lungs were inflated with 10% neutral buffered formalin before preservation. The identity and analysis of the Pathology slides were blind to the pathologist. During the feeding period, there were no deaths or signs of toxicity on gross observation that were attributable to Pea protein isolate ingestion. Pea protein isolate for 90 days did not reveal any induced toxicological changes as their clinical signs, body weights, food consumption, and water consumption; hematological, blood biochemical and urinalysis were comparable with concurrent control

animals. Further, organ weights, gross and histological examinations did not reveal any systemic toxicity induced by Pea Protein consumption. Taken together, under the current experimental conditions, the oral diet No Observed Adverse Effect Level (NOAEL) of Pea Protein Isolate for males and female rats were found to be 10% (equivalent to 8726 mg/kg b.w. for male rats and 9965 mg/kg b.w. for female rats) respectively.

2. **Finks, A.J., Jones, D. B. & Johns, C.O. (1922). The role of cysteine in the dietary properties of the proteins of the cowpea, Vigna Sinensis, and of the field pea, Pisum Sativum. The ournal of Biological Chemistry, 52: 403-410.**

The above experiment reported that the field pea (Pisum sativum) when fed as 75% of the diet had given "normal growth" in young rats, and the opinion has been very generally held that the protein of the field pea supplies adequate amounts of all the nutritionally essential amino-acids.

3. **Dahl, W.J., Foster, L.M., and Tyler, R.T. (2012). Review of the health benefits of peas (Pisum Sativum L.). British Journal of Nutrition, 103: S3-S10.**

Pulses, including peas, have long been important components of the human diet due to their content of starch, protein and other nutrients. More recently, the health benefits other than nutrition associated with pulse consumption have attracted much interest. World production of peas in 2009 was more than ten million tonnes. The US Department of Agriculture My Plate Guidelines recommends consuming at least three cups of dry beans and peas per week. The review in the above study briefly describes the nutritional characteristics of peas, along with demonstrated and potential health benefits associated with their consumption. Although some health benefits, such as improved gastrointestinal function and reduced glycemic index, have been documented, others require further research.

4. **Li, H., Prairie, N., Udenigwe, C. C., Adebiyi, A. P., Tappia, P. S., Aukema, H. M., & Aluko, R. E. (2011). Blood pressure lowering effect of a pea protein hydrolysate in hypertensive rats and humans. Journal of agricultural and food chemistry, 59(18), 9854-9860.**

According to findings publishes in the Journal of Agricultural and Food Chemistry, Three weeks of consuming a supplement containing a pea protein hydrolysate was associated with a 6 mmHg reduction in systolic blood pressure. The ingredient is extracted from yellow garden pea. The Manitoba-based researchers used rats genetically predisposed to develop high blood pressure (so-called spontaneously hypertensive rats), and fed them the pea protein at doses of 100 and 200 mg per kg of body weight. The maximum reduction in systolic blood pressure was measured at 19 mmHg four hours after consuming the ingredients. In contrast, orally administered un-hydrolyzed PPI had no blood pressure reducing effect in SHR, suggesting that thermolysin hydrolysis may have been responsible for releasing bioactive peptides from the native protein. Oral administration of the PPH to the Han: SPRD-cy rat (a model of chronic kidney disease) over an 8-week period led to 29 and 25 mmHg reductions in SBP and diastolic blood pressure, respectively. The PPH-fed rats had lower plasma levels of angiotensin II, the major vasopressor involved in development of hypertension, but there was no effect on plasma activity or renal mRNA levels of ACE. However, renal expression of renin mRNA levels was reduced by approximately 50% in the PPH-fed rats, suggesting that reduced renin may be responsible for the reduced levels of angiotensin II. Reductions of 5 to 6 mmHg were observed in the human study – which

involved seven volunteers aged between 30 and 55, and with systolic blood pressure ranging from 125 to 170 mmHg. Volunteers were given either 1.5 or 3g of the pea protein hydrolysates

5. **Lhoste, E.F., Mouzon, B., Andrieux, C., Gueugneau, A.M., Fiszlewicz, M., Corring, T., Szylit, O. (1998). Physiological effects of a pea protein isolate in gnotobiotic rats: comparison with a soybean isolate and meat. Ann Nutr Metab, 42(1), 44-54.**

Pea proteins have been considered for the introduction into the human diet only recently. This protein source was tested on nutritional and digestive parameters in heteroxenic male Fischer rats inoculated with a human faecal microflora from a methane producer. Compared to soybean proteins, pea proteins have similar effects on the rat's endogenous and bacterial digestive patterns. Compared to the pea proteins, a diet containing a standard meat meal enhanced the pH and the production of ammonia, while a lyophilized beef meat enhanced that of urea. The diet containing the standard meat decreases short-chain fatty acids and modifies the ratio of caecal short-chain fatty acids. Both animal diets decreased the specific activities of pancreatic proteases such as chymotrypsin (EC 3.4.21.1), trypsin (EC 3.4.21.4), and carboxypeptidase A (EC 3.4.17.1) when compared to the diet containing the pea isolate. In conclusion, the whole composition of the diet, more than the origin of the dietary protein, influences the rat's digestive pattern.

6. **Spielmann, J., Stangl, G.I., Eder, K. (2007). Dietary pea protein stimulates bile acid excretion and lowers hepatic cholesterol concentration in rats. Journal of Animal Physiology and Nutrition, 92, 683–693.**

It has been shown that some dietary plant proteins beneficially influence lipid metabolism in animals. The effect of pea protein in this respect however has not yet been investigated. Therefore, we studied the effect of purified pea protein on the lipid metabolism in rats. Twenty-four rats received diets with either 200 g/kg of casein or purified pea protein for 16 days. Concentrations of triacylglycerols in liver, plasma and lipoproteins did not differ between both groups of rats. However, rats fed the pea protein diet had a lower concentration of total cholesterol in the liver and the very low density lipoproteins (VLDL) fraction than rats fed theCasein diet ($p < 0.05$); cholesterol concentration in plasma, low density lipoproteins (LDL) and high density lipoproteins (HDL) did not differ between both groups. Rats fed pea protein moreover had an increased mRNA concentration of cholesterol-7a-hydroxylase in the liver and an increased amount of bile acids excreted via faeces compared with rats fed casein ($p < 0.05$). Concomitantly, mRNA concentrations of sterol regulatory element-binding protein (SREBP)-2 and its target genes 3-hydroxy- 3-methylglutaryl coenzyme A (HMG-CoA) reductase and LDL receptor in the liver were increased in rats fed pea protein ($p < 0.05$). The data of this study suggests that pea protein stimulates formation and excretion of bile acids, which leads to a reduced hepatic cholesterol concentration and a reduced secretion of cholesterol via VLDL. An increased geneexpression of SREBP-2 and its target genes HMG-CoA reductase and LDL receptor may be a means to compensate for the increased loss of cholesterol for bile acid synthesis.

Additional Questions:

1. **What FSIS products will "isolated pea products" be incorporated in to? On page 3 of your notice it states that isolated pea product will be used in processed meat products; please provide examples of these types of products.**

   Answer: Mainly in meat balls, meat patties, sausages, hamburgers, and chicken burgers.

2. **Please explain the function of isolated pea product in meat products.**

   Answer: The Isolated pea product will provide beneficially textural attributes by great water binding, oil absorption, gelling, and emulsification properties.

3. **Please confirm your notified limit is up to 2% in meat products.**

   Answer: This was our oversight; the notified limit is from 2-7 %.

4. **Regarding labeling, please discuss if you intend to label the meat products in which the isolated pea product is used in.**

   Answer: Thank you for bringing this to our attention, we intend to label the meat products in which isolate pea product is used in.

References:

1. Wensing, M., Knulst, A. C., Piersma, S., O'Kane, F., Knol, E. F., & Koppelman, S. J. (2003). Patients with anaphylaxis to pea can have peanut allergy caused by cross-reactive IgE to vicilin (Ara h 1). Journal of Allergy and Clinical Immunology, 111(2), 420-424.)

2. Sanchez-Monge, R., Lopez-Torrejón, G., Pascual, C. Y., Varela, J., Martin-Esteban, M., & Salcedo, G. (2004). Vicilin and convicilin are potential major allergens from pea. Clinical & Experimental Allergy, 34(11), 1747-1753.

3. Sicherer, S. H., Eigenmann, P. A., & Sampson, H. A. (1998). Clinical features of food protein–induced enterocolitis syndrome. The Journal of pediatrics, 133(2), 214-219.

4. Nowak-Wegrzyn, A., Sampson, H. A., Wood, R. A., & Sicherer, S. H. (2003). Food protein-induced enterocolitis syndrome caused by solid food proteins. Pediatrics, 111(4), 829-835.

5. Malley, A., Baecher, L., Mackler, B., & Perlman, F. (1975). The isolation of allergens from the green pea. Journal of Allergy and Clinical Immunology, 56(4), 282-290.

6. Malley, A., Baecher, L., & Mackler, B. (1976). Further characterization of a low-molecular weight allergen fragment isolated from the green pea. Clinical and experimental immunology, 25(1), 159.)

7. Ibanez, M. D., Martinez, M., Sanchez, J. J., & Fernández-Caldas, E. (2002). [Legume cross-reactivity]. Allergologia et immunopathologia, 31(3), 151-161.

8. Martínez, S. I. M., Ibáñez, S. M., & Fernandez-Caldas, E. (1999). Hypersensitivity to members of the botanical order Fabales (legumes). Journal of investigational allergology & clinical immunology, 10(4), 187-199.

9. International Programme on Chemical Safety, World Health Organization, Safety Evaluation of Certain Food Additives and Contaminants: WHO Food Additive Series 40: Aflatoxins. (1988). Available online at http://www.inchem.org/documents/jecfa/jecmono/v040je16.htm.

10. Li, H., Prairie, N., Udenigwe, C. C., Adebiyi, A. P., Tappia, P. S., Aukema, H. M., & Aluko, R. E. (2011). Blood pressure lowering effect of a pea protein hydrolysate in hypertensive rats and humans. Journal of agricultural and food chemistry, 59(18), 9854-9860.

November 27, 2014

VALIDATION STUDY for ALLERGEN cleaning during changeover from SOY to PEA

Prepared by:
Kushal Chandak
R&D Manager
World Food Processing LLC.

VALIDATION STUDY for ALLERGEN cleaning during changeover from SOY to PEA

BACKGROUND AND OBJECTIVE

The aim of the study is to validate the CIP and the cleaning procedures at World Food Processing-Turtle Lake Facility for allergen changeover between Soy to Pea. The only allergen approved for use in the Turtle Lake facility is "**SOY**". WFTL processes Soy and Pea Protein. Soy is identified as a primary raw material in WFTL process of making Soy Protein and is not used in the process of making Pea Protein. The Allergen Control Plan will be held to highest degree of scrutiny and followed thoroughly to ensure the quality of WFTL products, ensuring the safety of our customers as we understand the severity of allergic food reactions. WFTL understands that allergen contaminations are results of processing errors or oversights that include but not limited to: inadequate cleaning of shared equipment (non-allergen containing products run after allergen containing products resulting in cross-contamination); use of rework (not using "like into like" practices); switching of ingredients (and not following up with an allergen assessment of new ingredients); and labeling terms (using uncommon or incorrect terminology for the top 8 allergens); and frequency of HACCP plan review. As a part of the ALLERGEN CONTROL Program this Study has been conducted by Kushal Chandak, R&D Manager at World Food Processing.

MATERIALS AND METHODS

Test Products

Raw Material obtained from the supplier will be randomly sampled during production
CIP Rinse water samples from the wet process
CIP Rinse water samples during the dryer wet clean down
Final finished product samples

Separate cleaning tools are used during soy and pea production to avoid soy allergen cross contamination.

Sampling Method

Raw material samples were taken according to the finished product sampling SOP to eliminate the sample from being compromised. 6 different samples were taken (3) from AGT, (3) from Dakota Dry Beans, both of these suppliers are listed on the approved supplier list for World Food Processing – Turtle Lake. Samples were randomly taken during production.

CIP Rinse water samples from the wet process

CIP Circuit:

Step	Product	Concentration	Temp	Time
1. Pre Rinse	Water		50-60F	Flood
2. Alkaline Wash	50% Caustic	1.5%-2% (5 gallons)	180-190F	20 Min
3. Mid Rinse	Water			10 Min
4. Acid Wash	AC 55-5 RED	0.5-1.0 oz. /gal (2 gallons)	140-150F	10 Min
5. Post Rinse	Water		50-60F	10 Min
6. Sanitize	Oxonia Active	2106-2754 ppm (1 ½ gallons)	Cold	Flood

a. The solvent rinse occurs after the cleaning has been completed, Step 5

b. This method is not as direct as swabbing but will cover the entire surface (and parts inaccessible to swabs and is more effective in terms of giving an overall picture of the CIP of the equipment

c. Water is chosen as the appropriate solvent as recovery for residues can be quantified

d. Post rinse samples were sent for testing before the application of Sanitizer in step (6)

CIP Rinse water samples during the dryer wet clean down

CIP Circuit:

Step	Product	Concentration	Temp
1. Pre Rinse	Water		50-60F
2. Alkaline Wash	50% Caustic	1.5%-2% (5 gallons)	180-190F
3. Mid Rinse	Water		
4. Acid Wash	AC 55-5 RED	0.5-1.0 oz. /gal (2 gallons)	140-150F
5. Post Rinse	Water		50-60F
6. Sanitize	Oxonia Active	2106-2754 ppm (1 ½ gallons)	Cold

a. The solvent rinse occurs after the cleaning has been completed, Step 5

b. This method is not as direct as swabbing but will cover the entire surface (and parts inaccessible to swabs and is more effective in terms of giving an overall picture of the CIP of the equipment

c. Water is chosen as the appropriate solvent as recovery for residues can be quantified

d. Post rinse samples were sent for testing before the application of Sanitizer in step (6)

Final finished product samples will be taken according to the finished product sampling SOP for testing. Samples are tested individually and composited (not more than 15 samples per composite) at certain times to show that compositing the samples does not dilute down the samples.

Shipping address

All the above samples will be shipped to
Silliker Laboratories,

Address: 11585 K-Tel Dr, Minnetonka, MN 55343
Phone: (952) 932-2800

Testing methods

Gliadin (component of gluten)	Neogen Kit Insert (< 5 ppm LOD) / r-Biopharm R7001 (<2.5 ppm LOD)
Soy Allergen	Neogen Veratox Test (< 2.5 ppm LOD)

RESULTS AND DISCUSSION

The Gliadin and Soy Allergen data has been attached in the sequence below

Raw Material obtained from the supplier will be randomly sampled during production
CIP Rinse water samples from the wet process
CIP Rinse water samples during the dryer wet clean down
Final finished product samples

Allergen test results have been evaluated and are attached for the study. The SOY allergen and the GLUTEN allergen test results tested below the lower detection limit of 2.5 ppm (SOY) and 5.0 ppm (GLUTEN) respectively. Based on the data, World Food Processing's CIP and cleaning procedures are VALIDATED for change over procedure between SOY to PEA.

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Minnesota Laboratory
11585 K-Tel Drive, Minnetonka, MN 55343
Tel. 877/ 777 6375 Fax. 952/ 932 0764

CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
Page 1 of 31	

TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1:	PURIS Pea 870	**Laboratory ID:**	348395358
Desc. 2:	lot # 140701	**Condition Rec'd:**	NORMAL
Desc. 3:	RDP1	**Temp Rec'd (°C):**	18.1
Desc. 4:	y0003		

Analyte	Result	Units	Method Reference	Test Date	Loc.
Multi Residue Pesticide Screen			EN15662/CFIA PMR-001	9/19/14	CHG
Compounds Detected					
(none detected)					
Compounds Not Detected					
Acephate	<0.005	ppm (w/w)			
Acetamiprid	<0.005	ppm (w/w)			
Acibenzolar-s-methyl	<0.005	ppm (w/w)			
Alachlor	<0.005	ppm (w/w)			
Aldicarb	<0.005	ppm (w/w)			
Aldicarb sulfone	<0.005	ppm (w/w)			
Aldicarb sulfoxide	<0.005	ppm (w/w)			
Aldrin	<0.005	ppm (w/w)			
Allethrin/Bioallethrin	<0.005	ppm (w/w)			
Allidochlor	<0.005	ppm (w/w)			
Ametryn	<0.005	ppm (w/w)			
Aminocarb	<0.005	ppm (w/w)			
Aramite	<0.005	ppm (w/w)			
Aspon	<0.005	ppm (w/w)			
Atrazine	<0.005	ppm (w/w)			
Atrazine-desethyl	<0.005	ppm (w/w)			
Azinphos-ethyl	<0.005	ppm (w/w)			
Azinphos-methyl	<0.005	ppm (w/w)			
Azoxystrobin	<0.005	ppm (w/w)			
Benalaxyl	<0.005	ppm (w/w)			
Bendiocarb	<0.005	ppm (w/w)			
Benfluralin	<0.005	ppm (w/w)			
Benodanil	<0.005	ppm (w/w)			
Bensulide	<0.005	ppm (w/w)			
Benzoylprop-ethyl	<0.005	ppm (w/w)			
Bifenox	<0.005	ppm (w/w)			
Bifenthrin	<0.005	ppm (w/w)			
Biphenyl	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
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COA Date	6/3/15
Page 2 of 31	

TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Boscalid	<0.005	ppm (w/w)			
Bromacil	<0.005	ppm (w/w)			
Bromophos	<0.005	ppm (w/w)			
Bromophos-ethyl	<0.005	ppm (w/w)			
Bromopropylate	<0.005	ppm (w/w)			
Bufencarb	<0.005	ppm (w/w)			
Bupirimate	<0.005	ppm (w/w)			
Buprofezine	<0.005	ppm (w/w)			
Butachlor	<0.005	ppm (w/w)			
Butralin	<0.005	ppm (w/w)			
Butylate	<0.005	ppm (w/w)			
Captan and metabolites	<0.005	ppm (w/w)			
Carbaryl	<0.005	ppm (w/w)			
Carbetamide	<0.005	ppm (w/w)			
Carbofenthion	<0.005	ppm (w/w)			
Carbofuran	<0.005	ppm (w/w)			
Carboxin	<0.005	ppm (w/w)			
Chlorbenside	<0.005	ppm (w/w)			
Chlorbufam	<0.005	ppm (w/w)			
Chlordane (cis & trans)	<0.005	ppm (w/w)			
Chlordimeform	<0.005	ppm (w/w)			
Chlorfenapyr	<0.005	ppm (w/w)			
Chlorfenson	<0.005	ppm (w/w)			
Chlorfenvinphos-e	<0.005	ppm (w/w)			
Chlorfenvinphos-z	<0.005	ppm (w/w)			
Chlorflurenol-methyl	<0.005	ppm (w/w)			
Chloridazon	<0.005	ppm (w/w)			
Chlormephos	<0.005	ppm (w/w)			
Chlorobenzilate	<0.005	ppm (w/w)			
Chlorobromuron	<0.005	ppm (w/w)			
Chloroneb	<0.005	ppm (w/w)			
Chloropropylate	<0.005	ppm (w/w)			

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Page 3 of 31	

TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Chlorothalonil	<0.005	ppm (w/w)			
Chlorpropham	<0.005	ppm (w/w)			
Chlorpyriphos	<0.005	ppm (w/w)			
Chlorpyriphos-methyl	<0.005	ppm (w/w)			
Chlorthal-dimethyl	<0.005	ppm (w/w)			
Chlorthiamid	<0.005	ppm (w/w)			
Chlorthion	<0.005	ppm (w/w)			
Chlorthiophos	<0.005	ppm (w/w)			
Chlozolinate	<0.005	ppm (w/w)			
Clomazone	<0.005	ppm (w/w)			
Coumaphos	<0.005	ppm (w/w)			
Crotoxyphos	<0.005	ppm (w/w)			
Crufomate	<0.005	ppm (w/w)			
Cyanazine	<0.005	ppm (w/w)			
Cyanophos	<0.005	ppm (w/w)			
Cycloate	<0.005	ppm (w/w)			
Cyfluthrin	<0.005	ppm (w/w)			
Cyhalothrin-lambda	<0.005	ppm (w/w)			
Cypermethrin	<0.005	ppm (w/w)			
Cyprazine	<0.005	ppm (w/w)			
Cyproconazole	<0.005	ppm (w/w)			
Cyprodinil	<0.005	ppm (w/w)			
Cyromazine	<0.005	ppm (w/w)			
DDD-op	<0.005	ppm (w/w)			
DDD-pp	<0.005	ppm (w/w)			
DDE-op	<0.005	ppm (w/w)			
DDE-pp	<0.005	ppm (w/w)			
DDT-op	<0.005	ppm (w/w)			
DDT-pp	<0.005	ppm (w/w)			
Deltamethrin	<0.005	ppm (w/w)			
Demeton-o	<0.005	ppm (w/w)			
Demeton-s	<0.005	ppm (w/w)			

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Page 4 of 31	

TO:
Mr. Kushal Chandak
Food Scientist
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
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Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Demeton-s-methyl	<0.005	ppm (w/w)			
Desmetryn	<0.005	ppm (w/w)			
Diallate	<0.005	ppm (w/w)			
Diazinon	<0.005	ppm (w/w)			
Diazinon o-analogue	<0.005	ppm (w/w)			
Dichlobenil	<0.005	ppm (w/w)			
Dichlormid	<0.005	ppm (w/w)			
Dichlorvos	<0.005	ppm (w/w)			
Diclobutrazole	<0.005	ppm (w/w)			
Diclofenthion	<0.005	ppm (w/w)			
Diclofluanid	<0.005	ppm (w/w)			
Diclofop-methyl	<0.005	ppm (w/w)			
Dicloran	<0.005	ppm (w/w)			
Dicofol	<0.005	ppm (w/w)			
Dicrotophos	<0.005	ppm (w/w)			
Dieldrin	<0.005	ppm (w/w)			
Diethatyl-ethyl	<0.005	ppm (w/w)			
Dimethachlor	<0.005	ppm (w/w)			
Dimethoate	<0.005	ppm (w/w)			
Dimethomorph	<0.005	ppm (w/w)			
Dinitramine	<0.005	ppm (w/w)			
Dioxacarb	<0.005	ppm (w/w)			
Dioxathion	<0.005	ppm (w/w)			
Diphenamid	<0.005	ppm (w/w)			
Diphenylamine	<0.005	ppm (w/w)			
Disulfoton	<0.005	ppm (w/w)			
Disulfoton sulfone	<0.005	ppm (w/w)			
Edifenphos	<0.005	ppm (w/w)			
Endosulfan (alpha + beta)	<0.005	ppm (w/w)			
Endosulfan sulfate	<0.005	ppm (w/w)			
Endrin	<0.005	ppm (w/w)			
EPN	<0.005	ppm (w/w)			

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Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
EPTC	<0.005	ppm (w/w)			
Erbon	<0.005	ppm (w/w)			
Esfenvalerate	<0.005	ppm (w/w)			
Etaconazole-b	<0.005	ppm (w/w)			
Ethalfluralin	<0.005	ppm (w/w)			
Ethion	<0.005	ppm (w/w)			
Ethofumasate	<0.005	ppm (w/w)			
Ethoprophos	<0.005	ppm (w/w)			
Ethylan	<0.005	ppm (w/w)			
Etridiazol	<0.005	ppm (w/w)			
Etrimfos	<0.005	ppm (w/w)			
Fenamidone	<0.005	ppm (w/w)			
Fenamiphos	<0.005	ppm (w/w)			
Fenamiphos sulfone	<0.013	ppm (w/w)			
Fenamiphos sulfoxide	<0.005	ppm (w/w)			
Fenarimol	<0.005	ppm (w/w)			
Fenbuconazole	<0.005	ppm (w/w)			
Fenchlorophos	<0.005	ppm (w/w)			
Fenfuram	<0.005	ppm (w/w)			
Fenhexamid	<0.005	ppm (w/w)			
Fenitrothion	<0.005	ppm (w/w)			
Fenpropathrin	<0.005	ppm (w/w)			
Fenpropimorph	<0.005	ppm (w/w)			
Fenson	<0.005	ppm (w/w)			
Fensulfothion	<0.005	ppm (w/w)			
Fenthion	<0.005	ppm (w/w)			
Fenvalerate	<0.005	ppm (w/w)			
Fipronil	<0.005	ppm (w/w)			
Flamprop-isopropyl	<0.005	ppm (w/w)			
Flamprop-methyl	<0.005	ppm (w/w)			
Fluchloralin	<0.005	ppm (w/w)			
Fludioxonil	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Flumetralin	<0.005	ppm (w/w)			
Fluorochloridone	<0.005	ppm (w/w)			
Fluorodifen	<0.005	ppm (w/w)			
Flusilazole	<0.005	ppm (w/w)			
Fluvalinate-tau	<0.005	ppm (w/w)			
Folpet	<0.012	ppm (w/w)			
Fonofos	<0.005	ppm (w/w)			
HCH-alpha	<0.005	ppm (w/w)			
HCH-beta	<0.005	ppm (w/w)			
HCH-delta	<0.005	ppm (w/w)			
HCH-gamma (Lindane)	<0.005	ppm (w/w)			
Heptachlor	<0.005	ppm (w/w)			
Heptachlor epoxide-endo	<0.005	ppm (w/w)			
Heptachlor epoxide-exo	<0.005	ppm (w/w)			
Heptanophos	<0.005	ppm (w/w)			
Hexachlorobenzene	<0.005	ppm (w/w)			
Hexaconazole	<0.005	ppm (w/w)			
Hexazinone	<0.005	ppm (w/w)			
3-Hydroxycarbofuran	<0.005	ppm (w/w)			
Imazalil	<0.005	ppm (w/w)			
Indoxacarb	<0.005	ppm (w/w)			
Iodofenphos	<0.005	ppm (w/w)			
Iprobenfos	<0.005	ppm (w/w)			
Iprodione	<0.005	ppm (w/w)			
Isazophos	<0.005	ppm (w/w)			
Isofenphos	<0.005	ppm (w/w)			
Isoprocarb	<0.005	ppm (w/w)			
Isopropalin	<0.005	ppm (w/w)			
Isoprothiolane	<0.005	ppm (w/w)			
Kresoxim-methyl	<0.005	ppm (w/w)			
Leptophos	<0.005	ppm (w/w)			
Linuron	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
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TO:
Mr. Kushal Chandak
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World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Malaoxon	<0.005	ppm (w/w)			
Malathion	<0.005	ppm (w/w)			
Mecarbam	<0.005	ppm (w/w)			
Metalaxyl	<0.005	ppm (w/w)			
Metazachlor	<0.005	ppm (w/w)			
Methamidophos	<0.005	ppm (w/w)			
Methidathion	<0.005	ppm (w/w)			
Methiocarb	<0.005	ppm (w/w)			
Methiocarb sulfoxide	<0.005	ppm (w/w)			
Methomyl	<0.005	ppm (w/w)			
Methoprotryne	<0.005	ppm (w/w)			
Methoxychlor	<0.005	ppm (w/w)			
Methyl pentachlorophenyl sulfide	<0.005	ppm (w/w)			
Methyl-trithion	<0.005	ppm (w/w)			
Metobromuron	<0.005	ppm (w/w)			
Metolachlor	<0.005	ppm (w/w)			
Metribuzin	<0.005	ppm (w/w)			
Mevinphos	<0.005	ppm (w/w)			
Mexacarbate	<0.005	ppm (w/w)			
Mirex	<0.005	ppm (w/w)			
Molinate	<0.005	ppm (w/w)			
Monocrotophos	<0.005	ppm (w/w)			
Monolinuron	<0.005	ppm (w/w)			
Myclobutanil	<0.005	ppm (w/w)			
Nitrapyrin	<0.005	ppm (w/w)			
Nitrofen	<0.005	ppm (w/w)			
Nitrothal-isopropyl	<0.005	ppm (w/w)			
Norflurazon	<0.005	ppm (w/w)			
Nuarimol	<0.005	ppm (w/w)			
Octhilinone	<0.005	ppm (w/w)			
Omethoate	<0.005	ppm (w/w)			
o-Phenyl phenol	<0.005	ppm (w/w)			

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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Oxadiazon	<0.005	ppm (w/w)			
Oxadixyl	<0.005	ppm (w/w)			
Oxamyl	<0.005	ppm (w/w)			
Oxycarboxin	<0.005	ppm (w/w)			
Oxychlordane	<0.005	ppm (w/w)			
Oxydemeton-methyl	<0.005	ppm (w/w)			
Oxyflurofen	<0.005	ppm (w/w)			
Paraoxon	<0.005	ppm (w/w)			
Parathion	<0.005	ppm (w/w)			
Parathion-methyl	<0.005	ppm (w/w)			
Pebulate	<0.005	ppm (w/w)			
Penconazole	<0.005	ppm (w/w)			
Pendimethalin	<0.005	ppm (w/w)			
Pentachlorbenzene	<0.005	ppm (w/w)			
Pentachloroaniline	<0.005	ppm (w/w)			
Pentachloronitrobenzene (Quintozene)	<0.005	ppm (w/w)			
Permethrin (cis + trans)	<0.005	ppm (w/w)			
Phenthoate	<0.005	ppm (w/w)			
Phorate	<0.005	ppm (w/w)			
Phorate sulfone	<0.005	ppm (w/w)			
Phosalone	<0.005	ppm (w/w)			
Phosmet	<0.005	ppm (w/w)			
Phosphamidon	<0.005	ppm (w/w)			
Piperonyl butoxide	<0.005	ppm (w/w)			
Pirimicarb	<0.005	ppm (w/w)			
Pirimiphos-ethyl	<0.005	ppm (w/w)			
Pirimiphos-methyl	<0.005	ppm (w/w)			
Prochloraz	<0.005	ppm (w/w)			
Procymidone	<0.005	ppm (w/w)			
Profenofos	<0.005	ppm (w/w)			
Profluralin	<0.005	ppm (w/w)			
Promecarb	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Prometon	<0.005	ppm (w/w)			
Prometryne	<0.005	ppm (w/w)			
Pronamide	<0.005	ppm (w/w)			
Propachlor	<0.005	ppm (w/w)			
Propamocarb	<0.005	ppm (w/w)			
Propanil	<0.005	ppm (w/w)			
Propargite	<0.005	ppm (w/w)			
Propazine	<0.005	ppm (w/w)			
Propetamphos	<0.005	ppm (w/w)			
Propham	<0.005	ppm (w/w)			
Propiconazole	<0.005	ppm (w/w)			
Propoxur	<0.005	ppm (w/w)			
Prothiofos	<0.005	ppm (w/w)			
Pymetrozine	<0.005	ppm (w/w)			
Pyracarbolid	<0.005	ppm (w/w)			
Pyraclostrobin	<0.005	ppm (w/w)			
Pyrazophos	<0.005	ppm (w/w)			
Pyridaben	<0.005	ppm (w/w)			
Pyriproxifen	<0.005	ppm (w/w)			
Quinalphos	<0.005	ppm (w/w)			
Quinomethionate	<0.005	ppm (w/w)			
Secbumeton	<0.005	ppm (w/w)			
Simazine	<0.005	ppm (w/w)			
Simetryn	<0.005	ppm (w/w)			
Sulfallate	<0.005	ppm (w/w)			
Sulfotep	<0.005	ppm (w/w)			
Sulprophos	<0.005	ppm (w/w)			
TCMTB	<0.006	ppm (w/w)			
Tebuconazole	<0.005	ppm (w/w)			
Tecnazene	<0.005	ppm (w/w)			
Terbacil	<0.005	ppm (w/w)			
Terbufos	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140701
Desc. 3: RDP1
Desc. 4: y0003

Laboratory ID: 348395358
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Terbumeton	<0.005	ppm (w/w)			
Terbutryne	<0.005	ppm (w/w)			
Terbutylazine	<0.005	ppm (w/w)			
Tetrachlorvinphos	<0.005	ppm (w/w)			
Tetradifon	<0.005	ppm (w/w)			
Tetraiodoethylene	<0.005	ppm (w/w)			
Tetramethrin	<0.005	ppm (w/w)			
Tetrasul	<0.005	ppm (w/w)			
Thiabendazole	<0.005	ppm (w/w)			
Thiobencarb	<0.005	ppm (w/w)			
Thiodicarb	<0.005	ppm (w/w)			
Thionazin	<0.005	ppm (w/w)			
Toclophos-methyl	<0.005	ppm (w/w)			
Tolylfluanid	<0.005	ppm (w/w)			
Tralomethrin	<0.005	ppm (w/w)			
Triadimefon	<0.005	ppm (w/w)			
Triadimenol	<0.005	ppm (w/w)			
Triallate	<0.005	ppm (w/w)			
Triazophos	<0.005	ppm (w/w)			
Tribufos	<0.005	ppm (w/w)			
Tricyclazole	<0.005	ppm (w/w)			
Trifloxystrobin	<0.005	ppm (w/w)			
Triflumizole	<0.005	ppm (w/w)			
Trifluralin	<0.005	ppm (w/w)			
Vernolate	<0.005	ppm (w/w)			
Vinclozolin	<0.005	ppm (w/w)			
Ochratoxin by HPLC	2.5	mcg/kg	AOAC 2000.03	9/22/14	CHG

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COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1:	PURIS Pea 870	**Laboratory ID:**	348395383
Desc. 2:	lot # 140703	**Condition Rec'd:**	NORMAL
Desc. 3:	RDP1	**Temp Rec'd (°C):**	18.1
Desc. 4:	y0006		

Analyte	Result	Units	Method Reference	Test Date	Loc.
Multi Residue Pesticide Screen			EN15662/CFIA PMR-001	9/19/14	CHG
Compounds Detected					
(none detected)					
Compounds Not Detected					
Acephate	<0.005	ppm (w/w)			
Acetamiprid	<0.005	ppm (w/w)			
Acibenzolar-s-methyl	<0.005	ppm (w/w)			
Alachlor	<0.005	ppm (w/w)			
Aldicarb	<0.005	ppm (w/w)			
Aldicarb sulfone	<0.005	ppm (w/w)			
Aldicarb sulfoxide	<0.005	ppm (w/w)			
Aldrin	<0.005	ppm (w/w)			
Allethrin/Bioallethrin	<0.005	ppm (w/w)			
Allidochlor	<0.005	ppm (w/w)			
Ametryn	<0.005	ppm (w/w)			
Aminocarb	<0.005	ppm (w/w)			
Aramite	<0.005	ppm (w/w)			
Aspon	<0.005	ppm (w/w)			
Atrazine	<0.005	ppm (w/w)			
Atrazine-desethyl	<0.005	ppm (w/w)			
Azinphos-ethyl	<0.005	ppm (w/w)			
Azinphos-methyl	<0.005	ppm (w/w)			
Azoxystrobin	<0.005	ppm (w/w)			
Benalaxyl	<0.005	ppm (w/w)			
Bendiocarb	<0.005	ppm (w/w)			
Benfluralin	<0.005	ppm (w/w)			
Benodanil	<0.005	ppm (w/w)			
Bensulide	<0.005	ppm (w/w)			
Benzoylprop-ethyl	<0.005	ppm (w/w)			
Bifenox	<0.005	ppm (w/w)			
Bifenthrin	<0.005	ppm (w/w)			
Biphenyl	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Boscalid	<0.005	ppm (w/w)			
Bromacil	<0.005	ppm (w/w)			
Bromophos	<0.005	ppm (w/w)			
Bromophos-ethyl	<0.005	ppm (w/w)			
Bromopropylate	<0.005	ppm (w/w)			
Bufencarb	<0.005	ppm (w/w)			
Bupirimate	<0.005	ppm (w/w)			
Buprofezine	<0.005	ppm (w/w)			
Butachlor	<0.005	ppm (w/w)			
Butralin	<0.005	ppm (w/w)			
Butylate	<0.005	ppm (w/w)			
Captan and metabolites	<0.005	ppm (w/w)			
Carbaryl	<0.005	ppm (w/w)			
Carbetamide	<0.005	ppm (w/w)			
Carbofenthion	<0.005	ppm (w/w)			
Carbofuran	<0.005	ppm (w/w)			
Carboxin	<0.005	ppm (w/w)			
Chlorbenside	<0.005	ppm (w/w)			
Chlorbufam	<0.005	ppm (w/w)			
Chlordane (cis & trans)	<0.005	ppm (w/w)			
Chlordimeform	<0.005	ppm (w/w)			
Chlorfenapyr	<0.005	ppm (w/w)			
Chlorfenson	<0.005	ppm (w/w)			
Chlorfenvinphos-e	<0.005	ppm (w/w)			
Chlorfenvinphos-z	<0.005	ppm (w/w)			
Chlorflurenol-methyl	<0.005	ppm (w/w)			
Chloridazon	<0.005	ppm (w/w)			
Chlormephos	<0.005	ppm (w/w)			
Chlorobenzilate	<0.005	ppm (w/w)			
Chlorobromuron	<0.005	ppm (w/w)			
Chloroneb	<0.005	ppm (w/w)			
Chloropropylate	<0.005	ppm (w/w)			

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COA Date	6/3/15
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TO:
Mr. Kushal Chandak
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World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Chlorothalonil	<0.005	ppm (w/w)			
Chlorpropham	<0.005	ppm (w/w)			
Chlorpyriphos	<0.005	ppm (w/w)			
Chlorpyriphos-methyl	<0.005	ppm (w/w)			
Chlorthal-dimethyl	<0.005	ppm (w/w)			
Chlorthiamid	<0.005	ppm (w/w)			
Chlorthion	<0.005	ppm (w/w)			
Chlorthiophos	<0.005	ppm (w/w)			
Chlozolinate	<0.005	ppm (w/w)			
Clomazone	<0.005	ppm (w/w)			
Coumaphos	<0.005	ppm (w/w)			
Crotoxyphos	<0.005	ppm (w/w)			
Crufomate	<0.005	ppm (w/w)			
Cyanazine	<0.005	ppm (w/w)			
Cyanophos	<0.005	ppm (w/w)			
Cycloate	<0.005	ppm (w/w)			
Cyfluthrin	<0.005	ppm (w/w)			
Cyhalothrin-lambda	<0.005	ppm (w/w)			
Cypermethrin	<0.005	ppm (w/w)			
Cyprazine	<0.005	ppm (w/w)			
Cyproconazole	<0.005	ppm (w/w)			
Cyprodinil	<0.005	ppm (w/w)			
Cyromazine	<0.005	ppm (w/w)			
DDD-op	<0.005	ppm (w/w)			
DDD-pp	<0.005	ppm (w/w)			
DDE-op	<0.005	ppm (w/w)			
DDE-pp	<0.005	ppm (w/w)			
DDT-op	<0.005	ppm (w/w)			
DDT-pp	<0.005	ppm (w/w)			
Deltamethrin	<0.005	ppm (w/w)			
Demeton-o	<0.005	ppm (w/w)			
Demeton-s	<0.005	ppm (w/w)			

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Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Demeton-s-methyl	<0.005	ppm (w/w)			
Desmetryn	<0.005	ppm (w/w)			
Diallate	<0.005	ppm (w/w)			
Diazinon	<0.005	ppm (w/w)			
Diazinon o-analogue	<0.005	ppm (w/w)			
Dichlobenil	<0.005	ppm (w/w)			
Dichlormid	<0.005	ppm (w/w)			
Dichlorvos	<0.005	ppm (w/w)			
Diclobutrazole	<0.005	ppm (w/w)			
Diclofenthion	<0.005	ppm (w/w)			
Diclofluanid	<0.005	ppm (w/w)			
Diclofop-methyl	<0.005	ppm (w/w)			
Dicloran	<0.005	ppm (w/w)			
Dicofol	<0.005	ppm (w/w)			
Dicrotophos	<0.005	ppm (w/w)			
Dieldrin	<0.005	ppm (w/w)			
Diethatyl-ethyl	<0.005	ppm (w/w)			
Dimethachlor	<0.005	ppm (w/w)			
Dimethoate	<0.005	ppm (w/w)			
Dimethomorph	<0.005	ppm (w/w)			
Dinitramine	<0.005	ppm (w/w)			
Dioxacarb	<0.005	ppm (w/w)			
Dioxathion	<0.005	ppm (w/w)			
Diphenamid	<0.005	ppm (w/w)			
Diphenylamine	<0.005	ppm (w/w)			
Disulfoton	<0.005	ppm (w/w)			
Disulfoton sulfone	<0.005	ppm (w/w)			
Edifenphos	<0.005	ppm (w/w)			
Endosulfan (alpha + beta)	<0.005	ppm (w/w)			
Endosulfan sulfate	<0.005	ppm (w/w)			
Endrin	<0.005	ppm (w/w)			
EPN	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
EPTC	<0.005	ppm (w/w)			
Erbon	<0.005	ppm (w/w)			
Esfenvalerate	<0.005	ppm (w/w)			
Etaconazole-b	<0.005	ppm (w/w)			
Ethalfluralin	<0.005	ppm (w/w)			
Ethion	<0.005	ppm (w/w)			
Ethofumasate	<0.005	ppm (w/w)			
Ethoprophos	<0.005	ppm (w/w)			
Ethylan	<0.005	ppm (w/w)			
Etridiazol	<0.005	ppm (w/w)			
Etrimfos	<0.005	ppm (w/w)			
Fenamidone	<0.005	ppm (w/w)			
Fenamiphos	<0.005	ppm (w/w)			
Fenamiphos sulfone	<0.013	ppm (w/w)			
Fenamiphos sulfoxide	<0.005	ppm (w/w)			
Fenarimol	<0.005	ppm (w/w)			
Fenbuconazole	<0.005	ppm (w/w)			
Fenchlorophos	<0.005	ppm (w/w)			
Fenfuram	<0.005	ppm (w/w)			
Fenhexamid	<0.005	ppm (w/w)			
Fenitrothion	<0.005	ppm (w/w)			
Fenpropathrin	<0.005	ppm (w/w)			
Fenpropimorph	<0.005	ppm (w/w)			
Fenson	<0.005	ppm (w/w)			
Fensulfothion	<0.005	ppm (w/w)			
Fenthion	<0.005	ppm (w/w)			
Fenvalerate	<0.005	ppm (w/w)			
Fipronil	<0.005	ppm (w/w)			
Flamprop-isopropyl	<0.005	ppm (w/w)			
Flamprop-methyl	<0.005	ppm (w/w)			
Fluchloralin	<0.005	ppm (w/w)			
Fludioxonil	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
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COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Flumetralin	<0.005	ppm (w/w)			
Fluorochloridone	<0.005	ppm (w/w)			
Fluorodifen	<0.005	ppm (w/w)			
Flusilazole	<0.005	ppm (w/w)			
Fluvalinate-tau	<0.005	ppm (w/w)			
Folpet	<0.012	ppm (w/w)			
Fonofos	<0.005	ppm (w/w)			
HCH-alpha	<0.005	ppm (w/w)			
HCH-beta	<0.005	ppm (w/w)			
HCH-delta	<0.005	ppm (w/w)			
HCH-gamma (Lindane)	<0.005	ppm (w/w)			
Heptachlor	<0.005	ppm (w/w)			
Heptachlor epoxide-endo	<0.005	ppm (w/w)			
Heptachlor epoxide-exo	<0.005	ppm (w/w)			
Heptanophos	<0.005	ppm (w/w)			
Hexachlorobenzene	<0.005	ppm (w/w)			
Hexaconazole	<0.005	ppm (w/w)			
Hexazinone	<0.005	ppm (w/w)			
3-Hydroxycarbofuran	<0.005	ppm (w/w)			
Imazalil	<0.005	ppm (w/w)			
Indoxacarb	<0.005	ppm (w/w)			
Iodofenphos	<0.005	ppm (w/w)			
Iprobenfos	<0.005	ppm (w/w)			
Iprodione	<0.005	ppm (w/w)			
Isazophos	<0.005	ppm (w/w)			
Isofenphos	<0.005	ppm (w/w)			
Isoprocarb	<0.005	ppm (w/w)			
Isopropalin	<0.005	ppm (w/w)			
Isoprothiolane	<0.005	ppm (w/w)			
Kresoxim-methyl	<0.005	ppm (w/w)			
Leptophos	<0.005	ppm (w/w)			
Linuron	<0.005	ppm (w/w)			

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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
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Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Malaoxon	<0.005	ppm (w/w)			
Malathion	<0.005	ppm (w/w)			
Mecarbam	<0.005	ppm (w/w)			
Metalaxyl	<0.005	ppm (w/w)			
Metazachlor	<0.005	ppm (w/w)			
Methamidophos	<0.005	ppm (w/w)			
Methidathion	<0.005	ppm (w/w)			
Methiocarb	<0.005	ppm (w/w)			
Methiocarb sulfoxide	<0.005	ppm (w/w)			
Methomyl	<0.005	ppm (w/w)			
Methoprotryne	<0.005	ppm (w/w)			
Methoxychlor	<0.005	ppm (w/w)			
Methyl pentachlorophenyl sulfide	<0.005	ppm (w/w)			
Methyl-trithion	<0.005	ppm (w/w)			
Metobromuron	<0.005	ppm (w/w)			
Metolachlor	<0.005	ppm (w/w)			
Metribuzin	<0.005	ppm (w/w)			
Mevinphos	<0.005	ppm (w/w)			
Mexacarbate	<0.005	ppm (w/w)			
Mirex	<0.005	ppm (w/w)			
Molinate	<0.005	ppm (w/w)			
Monocrotophos	<0.005	ppm (w/w)			
Monolinuron	<0.005	ppm (w/w)			
Myclobutanil	<0.005	ppm (w/w)			
Nitrapyrin	<0.005	ppm (w/w)			
Nitrofen	<0.005	ppm (w/w)			
Nitrothal-isopropyl	<0.005	ppm (w/w)			
Norflurazon	<0.005	ppm (w/w)			
Nuarimol	<0.005	ppm (w/w)			
Octhilinone	<0.005	ppm (w/w)			
Omethoate	<0.005	ppm (w/w)			
o-Phenyl phenol	<0.005	ppm (w/w)			

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Supersedes:	MIN-37392850-0
COA Date	6/3/15
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4301 World Food Avenue
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Received From:	Turtle Lake, WI
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Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Oxadiazon	<0.005	ppm (w/w)			
Oxadixyl	<0.005	ppm (w/w)			
Oxamyl	<0.005	ppm (w/w)			
Oxycarboxin	<0.005	ppm (w/w)			
Oxychlordane	<0.005	ppm (w/w)			
Oxydemeton-methyl	<0.005	ppm (w/w)			
Oxyflurofen	<0.005	ppm (w/w)			
Paraoxon	<0.005	ppm (w/w)			
Parathion	<0.005	ppm (w/w)			
Parathion-methyl	<0.005	ppm (w/w)			
Pebulate	<0.005	ppm (w/w)			
Penconazole	<0.005	ppm (w/w)			
Pendimethalin	<0.005	ppm (w/w)			
Pentachlorbenzene	<0.005	ppm (w/w)			
Pentachloroaniline	<0.005	ppm (w/w)			
Pentachloronitrobenzene (Quintozene)	<0.005	ppm (w/w)			
Permethrin (cis + trans)	<0.005	ppm (w/w)			
Phenthoate	<0.005	ppm (w/w)			
Phorate	<0.005	ppm (w/w)			
Phorate sulfone	<0.005	ppm (w/w)			
Phosalone	<0.005	ppm (w/w)			
Phosmet	<0.005	ppm (w/w)			
Phosphamidon	<0.005	ppm (w/w)			
Piperonyl butoxide	<0.005	ppm (w/w)			
Pirimicarb	<0.005	ppm (w/w)			
Pirimiphos-ethyl	<0.005	ppm (w/w)			
Pirimiphos-methyl	<0.005	ppm (w/w)			
Prochloraz	<0.005	ppm (w/w)			
Procymidone	<0.005	ppm (w/w)			
Profenofos	<0.005	ppm (w/w)			
Profluralin	<0.005	ppm (w/w)			
Promecarb	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
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World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Prometon	<0.005	ppm (w/w)			
Prometryne	<0.005	ppm (w/w)			
Pronamide	<0.005	ppm (w/w)			
Propachlor	<0.005	ppm (w/w)			
Propamocarb	<0.005	ppm (w/w)			
Propanil	<0.005	ppm (w/w)			
Propargite	<0.005	ppm (w/w)			
Propazine	<0.005	ppm (w/w)			
Propetamphos	<0.005	ppm (w/w)			
Propham	<0.005	ppm (w/w)			
Propiconazole	<0.005	ppm (w/w)			
Propoxur	<0.005	ppm (w/w)			
Prothiofos	<0.005	ppm (w/w)			
Pymetrozine	<0.005	ppm (w/w)			
Pyracarbolid	<0.005	ppm (w/w)			
Pyraclostrobin	<0.005	ppm (w/w)			
Pyrazophos	<0.005	ppm (w/w)			
Pyridaben	<0.005	ppm (w/w)			
Pyriproxifen	<0.005	ppm (w/w)			
Quinalphos	<0.005	ppm (w/w)			
Quinomethionate	<0.005	ppm (w/w)			
Secbumeton	<0.005	ppm (w/w)			
Simazine	<0.005	ppm (w/w)			
Simetryn	<0.005	ppm (w/w)			
Sulfallate	<0.005	ppm (w/w)			
Sulfotep	<0.005	ppm (w/w)			
Sulprophos	<0.005	ppm (w/w)			
TCMTB	<0.006	ppm (w/w)			
Tebuconazole	<0.005	ppm (w/w)			
Tecnazene	<0.005	ppm (w/w)			
Terbacil	<0.005	ppm (w/w)			
Terbufos	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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Received From:	Turtle Lake, WI
Received Date:	9/11/14

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Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140703
Desc. 3: RDP1
Desc. 4: y0006

Laboratory ID: 348395383
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Terbumeton	<0.005	ppm (w/w)			
Terbutryne	<0.005	ppm (w/w)			
Terbutylazine	<0.005	ppm (w/w)			
Tetrachlorvinphos	<0.005	ppm (w/w)			
Tetradifon	<0.005	ppm (w/w)			
Tetraiodoethylene	<0.005	ppm (w/w)			
Tetramethrin	<0.005	ppm (w/w)			
Tetrasul	<0.005	ppm (w/w)			
Thiabendazole	<0.005	ppm (w/w)			
Thiobencarb	<0.005	ppm (w/w)			
Thiodicarb	<0.005	ppm (w/w)			
Thionazin	<0.005	ppm (w/w)			
Toclophos-methyl	<0.005	ppm (w/w)			
Tolylfluanid	<0.005	ppm (w/w)			
Tralomethrin	<0.005	ppm (w/w)			
Triadimefon	<0.005	ppm (w/w)			
Triadimenol	<0.005	ppm (w/w)			
Triallate	<0.005	ppm (w/w)			
Triazophos	<0.005	ppm (w/w)			
Tribufos	<0.005	ppm (w/w)			
Tricyclazole	<0.005	ppm (w/w)			
Trifloxystrobin	<0.005	ppm (w/w)			
Triflumizole	<0.005	ppm (w/w)			
Trifluralin	<0.005	ppm (w/w)			
Vernolate	<0.005	ppm (w/w)			
Vinclozolin	<0.005	ppm (w/w)			
Ochratoxin by HPLC	4.5	mcg/kg	AOAC 2000.03	9/22/14	CHG

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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1:	PURIS Pea 870	**Laboratory ID:**	348395394
Desc. 2:	lot # 140704	**Condition Rec'd:**	NORMAL
Desc. 3:	RDP1	**Temp Rec'd (°C):**	18.1
Desc. 4:	y0008		

Analyte	Result	Units	Method Reference	Test Date	Loc.
Multi Residue Pesticide Screen			EN15662/CFIA PMR-001	9/19/14	CHG
Compounds Detected					
(none detected)					
Compounds Not Detected					
Acephate	<0.005	ppm (w/w)			
Acetamiprid	<0.005	ppm (w/w)			
Acibenzolar-s-methyl	<0.005	ppm (w/w)			
Alachlor	<0.005	ppm (w/w)			
Aldicarb	<0.005	ppm (w/w)			
Aldicarb sulfone	<0.005	ppm (w/w)			
Aldicarb sulfoxide	<0.005	ppm (w/w)			
Aldrin	<0.005	ppm (w/w)			
Allethrin/Bioallethrin	<0.005	ppm (w/w)			
Allidochlor	<0.005	ppm (w/w)			
Ametryn	<0.005	ppm (w/w)			
Aminocarb	<0.005	ppm (w/w)			
Aramite	<0.005	ppm (w/w)			
Aspon	<0.005	ppm (w/w)			
Atrazine	<0.005	ppm (w/w)			
Atrazine-desethyl	<0.005	ppm (w/w)			
Azinphos-ethyl	<0.005	ppm (w/w)			
Azinphos-methyl	<0.005	ppm (w/w)			
Azoxystrobin	<0.005	ppm (w/w)			
Benalaxyl	<0.005	ppm (w/w)			
Bendiocarb	<0.005	ppm (w/w)			
Benfluralin	<0.005	ppm (w/w)			
Benodanil	<0.005	ppm (w/w)			
Bensulide	<0.005	ppm (w/w)			
Benzoylprop-ethyl	<0.005	ppm (w/w)			
Bifenox	<0.005	ppm (w/w)			
Bifenthrin	<0.005	ppm (w/w)			
Biphenyl	<0.005	ppm (w/w)			

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COA Date	6/3/15
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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Boscalid	<0.005	ppm (w/w)			
Bromacil	<0.005	ppm (w/w)			
Bromophos	<0.005	ppm (w/w)			
Bromophos-ethyl	<0.005	ppm (w/w)			
Bromopropylate	<0.005	ppm (w/w)			
Bufencarb	<0.005	ppm (w/w)			
Bupirimate	<0.005	ppm (w/w)			
Buprofezine	<0.005	ppm (w/w)			
Butachlor	<0.005	ppm (w/w)			
Butralin	<0.005	ppm (w/w)			
Butylate	<0.005	ppm (w/w)			
Captan and metabolites	<0.005	ppm (w/w)			
Carbaryl	<0.005	ppm (w/w)			
Carbetamide	<0.005	ppm (w/w)			
Carbofenthion	<0.005	ppm (w/w)			
Carbofuran	<0.005	ppm (w/w)			
Carboxin	<0.005	ppm (w/w)			
Chlorbenside	<0.005	ppm (w/w)			
Chlorbufam	<0.005	ppm (w/w)			
Chlordane (cis & trans)	<0.005	ppm (w/w)			
Chlordimeform	<0.005	ppm (w/w)			
Chlorfenapyr	<0.005	ppm (w/w)			
Chlorfenson	<0.005	ppm (w/w)			
Chlorfenvinphos-e	<0.005	ppm (w/w)			
Chlorfenvinphos-z	<0.005	ppm (w/w)			
Chlorflurenol-methyl	<0.005	ppm (w/w)			
Chloridazon	<0.005	ppm (w/w)			
Chlormephos	<0.005	ppm (w/w)			
Chlorobenzilate	<0.005	ppm (w/w)			
Chlorobromuron	<0.005	ppm (w/w)			
Chloroneb	<0.005	ppm (w/w)			
Chloropropylate	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Chlorothalonil	<0.005	ppm (w/w)			
Chlorpropham	<0.005	ppm (w/w)			
Chlorpyriphos	<0.005	ppm (w/w)			
Chlorpyriphos-methyl	<0.005	ppm (w/w)			
Chlorthal-dimethyl	<0.005	ppm (w/w)			
Chlorthiamid	<0.005	ppm (w/w)			
Chlorthion	<0.005	ppm (w/w)			
Chlorthiophos	<0.005	ppm (w/w)			
Chlozolinate	<0.005	ppm (w/w)			
Clomazone	<0.005	ppm (w/w)			
Coumaphos	<0.005	ppm (w/w)			
Crotoxyphos	<0.005	ppm (w/w)			
Crufomate	<0.005	ppm (w/w)			
Cyanazine	<0.005	ppm (w/w)			
Cyanophos	<0.005	ppm (w/w)			
Cycloate	<0.005	ppm (w/w)			
Cyfluthrin	<0.005	ppm (w/w)			
Cyhalothrin-lambda	<0.005	ppm (w/w)			
Cypermethrin	<0.005	ppm (w/w)			
Cyprazine	<0.005	ppm (w/w)			
Cyproconazole	<0.005	ppm (w/w)			
Cyprodinil	<0.005	ppm (w/w)			
Cyromazine	<0.005	ppm (w/w)			
DDD-op	<0.005	ppm (w/w)			
DDD-pp	<0.005	ppm (w/w)			
DDE-op	<0.005	ppm (w/w)			
DDE-pp	<0.005	ppm (w/w)			
DDT-op	<0.005	ppm (w/w)			
DDT-pp	<0.005	ppm (w/w)			
Deltamethrin	<0.005	ppm (w/w)			
Demeton-o	<0.005	ppm (w/w)			
Demeton-s	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
Mr. Kushal Chandak
Food Scientist
World Food Proce ing LLC A kaloo a
4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1:	PURIS Pea 870	**Laboratory ID:**	348395394
Desc. 2:	lot # 140704	**Condition Rec'd:**	NORMAL
Desc. 3:	RDP1	**Temp Rec'd (°C):**	18.1
Desc. 4:	y0008		

Analyte	Result	Units	Method Reference	Test Date	Loc.
Demeton-s-methyl	<0.005	ppm (w/w)			
Desmetryn	<0.005	ppm (w/w)			
Diallate	<0.005	ppm (w/w)			
Diazinon	<0.005	ppm (w/w)			
Diazinon o-analogue	<0.005	ppm (w/w)			
Dichlobenil	<0.005	ppm (w/w)			
Dichlormid	<0.005	ppm (w/w)			
Dichlorvos	<0.005	ppm (w/w)			
Diclobutrazole	<0.005	ppm (w/w)			
Diclofenthion	<0.005	ppm (w/w)			
Diclofluanid	<0.005	ppm (w/w)			
Diclofop-methyl	<0.005	ppm (w/w)			
Dicloran	<0.005	ppm (w/w)			
Dicofol	<0.005	ppm (w/w)			
Dicrotophos	<0.005	ppm (w/w)			
Dieldrin	<0.005	ppm (w/w)			
Diethatyl-ethyl	<0.005	ppm (w/w)			
Dimethachlor	<0.005	ppm (w/w)			
Dimethoate	<0.005	ppm (w/w)			
Dimethomorph	<0.005	ppm (w/w)			
Dinitramine	<0.005	ppm (w/w)			
Dioxacarb	<0.005	ppm (w/w)			
Dioxathion	<0.005	ppm (w/w)			
Diphenamid	<0.005	ppm (w/w)			
Diphenylamine	<0.005	ppm (w/w)			
Disulfoton	<0.005	ppm (w/w)			
Disulfoton sulfone	<0.005	ppm (w/w)			
Edifenphos	<0.005	ppm (w/w)			
Endosulfan (alpha + beta)	<0.005	ppm (w/w)			
Endosulfan sulfate	<0.005	ppm (w/w)			
Endrin	<0.005	ppm (w/w)			
EPN	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
Received Date:	9/11/14

Location of Test: (except where noted)
Minnetonka, MN

Analytical Results

Desc. 1:	PURIS Pea 870	**Laboratory ID:**	348395394
Desc. 2:	lot # 140704	**Condition Rec'd:**	NORMAL
Desc. 3:	RDP1	**Temp Rec'd (°C):**	18.1
Desc. 4:	y0008		

Analyte	Result	Units	Method Reference	Test Date	Loc.
EPTC	<0.005	ppm (w/w)			
Erbon	<0.005	ppm (w/w)			
Esfenvalerate	<0.005	ppm (w/w)			
Etaconazole-b	<0.005	ppm (w/w)			
Ethalfluralin	<0.005	ppm (w/w)			
Ethion	<0.005	ppm (w/w)			
Ethofumasate	<0.005	ppm (w/w)			
Ethoprophos	<0.005	ppm (w/w)			
Ethylan	<0.005	ppm (w/w)			
Etridiazol	<0.005	ppm (w/w)			
Etrimfos	<0.005	ppm (w/w)			
Fenamidone	<0.005	ppm (w/w)			
Fenamiphos	<0.005	ppm (w/w)			
Fenamiphos sulfone	<0.013	ppm (w/w)			
Fenamiphos sulfoxide	<0.005	ppm (w/w)			
Fenarimol	<0.005	ppm (w/w)			
Fenbuconazole	<0.005	ppm (w/w)			
Fenchlorophos	<0.005	ppm (w/w)			
Fenfuram	<0.005	ppm (w/w)			
Fenhexamid	<0.005	ppm (w/w)			
Fenitrothion	<0.005	ppm (w/w)			
Fenpropathrin	<0.005	ppm (w/w)			
Fenpropimorph	<0.005	ppm (w/w)			
Fenson	<0.005	ppm (w/w)			
Fensulfothion	<0.005	ppm (w/w)			
Fenthion	<0.005	ppm (w/w)			
Fenvalerate	<0.005	ppm (w/w)			
Fipronil	<0.005	ppm (w/w)			
Flamprop-isopropyl	<0.005	ppm (w/w)			
Flamprop-methyl	<0.005	ppm (w/w)			
Fluchloralin	<0.005	ppm (w/w)			
Fludioxonil	<0.005	ppm (w/w)			

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CERTIFICATE OF ANALYSIS

COA No:	MIN-38049305-0
Supersedes:	MIN-37392850-0
COA Date	6/3/15
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TO:
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4301 World Food Avenue
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Received From:	Turtle Lake, WI
Received Date:	9/11/14

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Minnetonka, MN

Analytical Results

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Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Flumetralin	<0.005	ppm (w/w)			
Fluorochloridone	<0.005	ppm (w/w)			
Fluorodifen	<0.005	ppm (w/w)			
Flusilazole	<0.005	ppm (w/w)			
Fluvalinate-tau	<0.005	ppm (w/w)			
Folpet	<0.012	ppm (w/w)			
Fonofos	<0.005	ppm (w/w)			
HCH-alpha	<0.005	ppm (w/w)			
HCH-beta	<0.005	ppm (w/w)			
HCH-delta	<0.005	ppm (w/w)			
HCH-gamma (Lindane)	<0.005	ppm (w/w)			
Heptachlor	<0.005	ppm (w/w)			
Heptachlor epoxide-endo	<0.005	ppm (w/w)			
Heptachlor epoxide-exo	<0.005	ppm (w/w)			
Heptanophos	<0.005	ppm (w/w)			
Hexachlorobenzene	<0.005	ppm (w/w)			
Hexaconazole	<0.005	ppm (w/w)			
Hexazinone	<0.005	ppm (w/w)			
3-Hydroxycarbofuran	<0.005	ppm (w/w)			
Imazalil	<0.005	ppm (w/w)			
Indoxacarb	<0.005	ppm (w/w)			
Iodofenphos	<0.005	ppm (w/w)			
Iprobenfos	<0.005	ppm (w/w)			
Iprodione	<0.005	ppm (w/w)			
Isazophos	<0.005	ppm (w/w)			
Isofenphos	<0.005	ppm (w/w)			
Isoprocarb	<0.005	ppm (w/w)			
Isopropalin	<0.005	ppm (w/w)			
Isoprothiolane	<0.005	ppm (w/w)			
Kresoxim-methyl	<0.005	ppm (w/w)			
Leptophos	<0.005	ppm (w/w)			
Linuron	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
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Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Malaoxon	<0.005	ppm (w/w)			
Malathion	<0.005	ppm (w/w)			
Mecarbam	<0.005	ppm (w/w)			
Metalaxyl	<0.005	ppm (w/w)			
Metazachlor	<0.005	ppm (w/w)			
Methamidophos	<0.005	ppm (w/w)			
Methidathion	<0.005	ppm (w/w)			
Methiocarb	<0.005	ppm (w/w)			
Methiocarb sulfoxide	<0.005	ppm (w/w)			
Methomyl	<0.005	ppm (w/w)			
Methoprotryne	<0.005	ppm (w/w)			
Methoxychlor	<0.005	ppm (w/w)			
Methyl pentachlorophenyl sulfide	<0.005	ppm (w/w)			
Methyl-trithion	<0.005	ppm (w/w)			
Metobromuron	<0.005	ppm (w/w)			
Metolachlor	<0.005	ppm (w/w)			
Metribuzin	<0.005	ppm (w/w)			
Mevinphos	<0.005	ppm (w/w)			
Mexacarbate	<0.005	ppm (w/w)			
Mirex	<0.005	ppm (w/w)			
Molinate	<0.005	ppm (w/w)			
Monocrotophos	<0.005	ppm (w/w)			
Monolinuron	<0.005	ppm (w/w)			
Myclobutanil	<0.005	ppm (w/w)			
Nitrapyrin	<0.005	ppm (w/w)			
Nitrofen	<0.005	ppm (w/w)			
Nitrothal-isopropyl	<0.005	ppm (w/w)			
Norflurazon	<0.005	ppm (w/w)			
Nuarimol	<0.005	ppm (w/w)			
Octhilinone	<0.005	ppm (w/w)			
Omethoate	<0.005	ppm (w/w)			
o-Phenyl phenol	<0.005	ppm (w/w)			

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COA No:	MIN-38049305-0
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Food Scientist
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4301 World Food Avenue
Oskaloosa, IA 52577

Received From:	Turtle Lake, WI
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Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Oxadiazon	<0.005	ppm (w/w)			
Oxadixyl	<0.005	ppm (w/w)			
Oxamyl	<0.005	ppm (w/w)			
Oxycarboxin	<0.005	ppm (w/w)			
Oxychlordane	<0.005	ppm (w/w)			
Oxydemeton-methyl	<0.005	ppm (w/w)			
Oxyflurofen	<0.005	ppm (w/w)			
Paraoxon	<0.005	ppm (w/w)			
Parathion	<0.005	ppm (w/w)			
Parathion-methyl	<0.005	ppm (w/w)			
Pebulate	<0.005	ppm (w/w)			
Penconazole	<0.005	ppm (w/w)			
Pendimethalin	<0.005	ppm (w/w)			
Pentachlorbenzene	<0.005	ppm (w/w)			
Pentachloroaniline	<0.005	ppm (w/w)			
Pentachloronitrobenzene (Quintozene)	<0.005	ppm (w/w)			
Permethrin (cis + trans)	<0.005	ppm (w/w)			
Phenthoate	<0.005	ppm (w/w)			
Phorate	<0.005	ppm (w/w)			
Phorate sulfone	<0.005	ppm (w/w)			
Phosalone	<0.005	ppm (w/w)			
Phosmet	<0.005	ppm (w/w)			
Phosphamidon	<0.005	ppm (w/w)			
Piperonyl butoxide	<0.005	ppm (w/w)			
Pirimicarb	<0.005	ppm (w/w)			
Pirimiphos-ethyl	<0.005	ppm (w/w)			
Pirimiphos-methyl	<0.005	ppm (w/w)			
Prochloraz	<0.005	ppm (w/w)			
Procymidone	<0.005	ppm (w/w)			
Profenofos	<0.005	ppm (w/w)			
Profluralin	<0.005	ppm (w/w)			
Promecarb	<0.005	ppm (w/w)			

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Analytical Results

Desc. 1: PURIS Pea 870
Desc. 2: lot # 140704
Desc. 3: RDP1
Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Prometon	<0.005	ppm (w/w)			
Prometryne	<0.005	ppm (w/w)			
Pronamide	<0.005	ppm (w/w)			
Propachlor	<0.005	ppm (w/w)			
Propamocarb	<0.005	ppm (w/w)			
Propanil	<0.005	ppm (w/w)			
Propargite	<0.005	ppm (w/w)			
Propazine	<0.005	ppm (w/w)			
Propetamphos	<0.005	ppm (w/w)			
Propham	<0.005	ppm (w/w)			
Propiconazole	<0.005	ppm (w/w)			
Propoxur	<0.005	ppm (w/w)			
Prothiofos	<0.005	ppm (w/w)			
Pymetrozine	<0.005	ppm (w/w)			
Pyracarbolid	<0.005	ppm (w/w)			
Pyraclostrobin	<0.005	ppm (w/w)			
Pyrazophos	<0.005	ppm (w/w)			
Pyridaben	<0.005	ppm (w/w)			
Pyriproxifen	<0.005	ppm (w/w)			
Quinalphos	<0.005	ppm (w/w)			
Quinomethionate	<0.005	ppm (w/w)			
Secbumeton	<0.005	ppm (w/w)			
Simazine	<0.005	ppm (w/w)			
Simetryn	<0.005	ppm (w/w)			
Sulfallate	<0.005	ppm (w/w)			
Sulfotep	<0.005	ppm (w/w)			
Sulprophos	<0.005	ppm (w/w)			
TCMTB	<0.006	ppm (w/w)			
Tebuconazole	<0.005	ppm (w/w)			
Tecnazene	<0.005	ppm (w/w)			
Terbacil	<0.005	ppm (w/w)			
Terbufos	<0.005	ppm (w/w)			

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Desc. 4: y0008

Laboratory ID: 348395394
Condition Rec'd: NORMAL
Temp Rec'd (°C): 18.1

Analyte	Result	Units	Method Reference	Test Date	Loc.
Terbumeton	<0.005	ppm (w/w)			
Terbutryne	<0.005	ppm (w/w)			
Terbutylazine	<0.005	ppm (w/w)			
Tetrachlorvinphos	<0.005	ppm (w/w)			
Tetradifon	<0.005	ppm (w/w)			
Tetraiodoethylene	<0.005	ppm (w/w)			
Tetramethrin	<0.005	ppm (w/w)			
Tetrasul	<0.005	ppm (w/w)			
Thiabendazole	<0.005	ppm (w/w)			
Thiobencarb	<0.005	ppm (w/w)			
Thiodicarb	<0.005	ppm (w/w)			
Thionazin	<0.005	ppm (w/w)			
Toclophos-methyl	<0.005	ppm (w/w)			
Tolylfluanid	<0.005	ppm (w/w)			
Tralomethrin	<0.005	ppm (w/w)			
Triadimefon	<0.005	ppm (w/w)			
Triadimenol	<0.005	ppm (w/w)			
Triallate	<0.005	ppm (w/w)			
Triazophos	<0.005	ppm (w/w)			
Tribufos	<0.005	ppm (w/w)			
Tricyclazole	<0.005	ppm (w/w)			
Trifloxystrobin	<0.005	ppm (w/w)			
Triflumizole	<0.005	ppm (w/w)			
Trifluralin	<0.005	ppm (w/w)			
Vernolate	<0.005	ppm (w/w)			
Vinclozolin	<0.005	ppm (w/w)			
Ochratoxin by HPLC	3.5	mcg/kg	AOAC 2000.03	9/22/14	CHG

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CERTIFICATE OF ANALYSIS

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Received From:	Turtle Lake, WI
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Minnetonka, MN

Analytical Results

(b) (6)

Nigel Nagassar Laboratory Director

Noted Test Locations: CHG-Silliker, Inc. Illinois Laboratory, 3600 Eagle Nest Drive, North Building, Crete, IL 60417

World Food Processing LLC.
Attn: Kushal Chandak
4301 World Food Ave
Oskaloosa, Iowa- 52577

May 14, 2015

RE: Review of Gras Documentation for PURIS*Pea*

On February 26, 2015, Silliker was asked by World Food Processing to review documents related to a GRAS submission for PURIS*Pea* (pea protein) as a food additive. The package consists of a GRAS submission letter and technical documentation to support GRAS status. The documents presented were reviewed with FDA positions on food additives and GRAS status as a central focus point. FDA states that "for a substance to be GRAS, the scientific data and information about the use of a substance must be widely known and there must be a consensus among qualified experts that those data and information establish that the substance is safe under the conditions of its intended use. GRAS determinations made in this manner are said to be made through scientific procedures." We were presented with a data package that includes product specifications and methods to address common contaminants such as bacteria, fungal toxins, chemical contaminants including pesticide and heavy metals.

This product is intended to be used as a direct food additive. FDA clearly states their position on food additive safety for manufacturers.

"It is your responsibility to ensure that substances added to foods you manufacture or distribute, including non-dietary ingredients in dietary supplements, comply with all applicable regulatory requirements for substances added to food." - FDA guidance document – January 2014

The technical document characterizes the, physical, chemical, microbiological, nutritional and functional properties of pea protein derived from *Pisum Sativum L*. In various forms, this product has been safely consumed for thousands of years. It has many functional properties and uses. It is also very similar to other vegetable protein products that are currently considered GRAS.

After an extensive review, it is our conclusion that the data presented by World Food Processing supports the eventual GRAS designation of PURIS*Pea*.

The technical document provided by World Food Processing was reviewed for background knowledge and accuracy. To verify the data presented, we spent time researching other information to form our

opinion of the product. Our research highlighted 1 minor area. *Pisum Sativum L* can be found in the Food Allergy Research and Resource database.

There is anecdotal evidence in literature of pea proteins as allergens. However searches of CDC data yielded no documented cases of reactions in the United States. Peas are also not included in the Big 8 allergens. The history of use and safe consumption would support a GRAS designation.

The documents provided by World Food Processing had a great deal of information regarding the potential GRAS classification of pea protein. Our goal was to review those documents and add any significant commentary regarding the product's GRAS status. The review took into account the products intrinsic qualities and external factors that could influence overall safe use. We reviewed the manufacturing process for pea protein. The conversion process creates no hazardous changes in the product and could be consumed safely.

Intended product use was also considered. We reviewed multiple external resources related to food safety and health to add depth to our third party review of the GRAS package. Safety was assessed by reviewing data related to the biological, chemical and physical safety of pea protein. Our risk assessment includes a review of processing parameters and deals with the product in its finished form.

The assessment category descriptions are below along with a list of research references.

Biological – Microbiological hazards that are intrinsic to the product and can chronic or acute illness.

Chemical – Chemical hazards include intrinsic factors like protein allergenicity. Extrinsic factors would include heavy metal contamination, pesticide residues and endocrine disruptors/disruption.

Physical – Physical hazard are normally extrinsic and include common and frequent foreign material contamination.
Our external document review was done through multiple food safety and public health related sources.

Centers for Disease Control

CDC is an excellent source of historical data for product safety. CDC's extensive epidemiological data provides a basis to understand any effects of pea protein use. Outbreak data provided CDC was analyzed to determine if there were any food safety illnesses from pea protein. The CDC's Morbidity and Mortality weekly report (MMWR) was also used to assess potential risk of pea protein use in the general population. This document provides excellent public epidemiological data.

Food and Drug Administration

The FDA provides access data to search for any issues relating to food safety and recalls on a global scale. It allows you to determine if there were any recalls, import alerts or detention notes related to domestic or imported products.

World Health Organization

WHO data was used to determine overall consumption patterns for this and similar items. WHO is widely respected as highly credible source of extensive data related to health, nutrition, food safety and food security.

WHO Databases

Foscollab - The group of databases contains globally relevant

JMPR - The database contains basic information (ADI, ARID, CAS number etc.) for all pesticides evaluated by the Joint Meeting on Pesticide Residues (JMPR) as well as the available publications (reports and monograph) for each compound.

JECFA - The database contains basic information (ADI, dietary exposure… etc.) for all chemicals evaluated by the Joint Committee on Food Additives and Contaminants (JECFA) as well as the available publications (reports and monograph) for each compound.

IPCS INCHEM Database - Searchable database of all JECFA Monographs and other IPCS Risk Assessment documents. Provides extensive chemical compound data.

GEMS/Food contaminants database - The GEMS/Food Contaminants Database Dashboard enables users select a particular contaminant and view the average levels of detection by commodity, the total number of samples and the percentage of commodities that make up the total. User may also filter the results by food name, food origin and WHO Region.

GEMS/Food consumption database - As part of its dietary exposure assessment mandate, GEMS/Food has developed supra-national model diets which are currently used for predicting dietary intake of various chemicals according to internationally accepted methodologies (EHC 40). The GEMS/ Food Cluster diets - 2012 Dashboard displays a map of countries as well as consumption data for all 17 GEMS/Cluster diets. Users can select a cluster to view both the countries comprising the cluster as well as the grams/person/day consumption data for the selected cluster.

Food Allergy Research and Resource Program

The Food Allergy Research and Resource Program (FAARP) provides extensive data on allergies and related issues. This is an extensive source of global allergen information. It is the most extensive resource on global allergen patterns and susceptibility that can be found.

Electronic Data Resources

1. http://ec.europa.eu/food/safety/index_en.htm
2. http://www.who.int/foodsafety/databases/en/
3. https://extranet.who.int/sree/Reports?op=vs&path=/WHO_HQ_Reports/G7/PROD/EXT/CIFOCOSS_Country&userid=G7_ro&password=inetsoft123
4. http://apps.who.int/pesticide-residues-jmpr-database/Home/Range/0-9
5. https://farrp.unl.edu/resources/farrp-databases
6. http://www.cdc.gov/outbreaks/index.html
7. http://www.cdc.gov/mmwr/index2015.html
8. http://www.accessdata.fda.gov/cms_ia/countrylist.html

The data presented and our supplemental review support the appeal for GRAS status. The analytical data results presented in the World Food Processing documents are typical of this category. There are no parameters that indicate an issue with the product's safety. The nutritional component data is satisfactory. As always GRAS status and product safety depend on the product application guidelines and the product being used as intended. In closing, World Food Processing's data package accurately characterizes the intrinsic properties and risks of PURIS*Pea* and supports their petition for GRAS product status.

Sincerely

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Mark Carter is the owner of MC Squared Enterprises Inc (MC2E Inc.) an independent consulting firm with in-depth expertise in food safety and technology development and deployment. MC2E works with organizations that are focused on improving public health.

Mark's has extensive international business and technical experience. He most recently served as CEO of QC Laboratories and has previously held positions as Corporate Vice-President of R&D at Silliker Group Corporation (Merieux Nutrisciences), Section Manager for Microbiology and Food Safety at Kraft Foods and Corporate Laboratory Group Leader at McKee Foods Corporation.

Mark has 20+ years of industry experience in various technical, quality and business functions and is an active member of IFT, IAFP AOAC and ASM (American Society for Microbiology).Mark has also committed time to serving on the advisory boards' of the food science and nutrition departments at both Cornell and Tuskegee University.

Mr. Carter is a graduate of University of Georgia with a B.S. in Microbiology and he also holds an M.S.A. from Columbus State University. Mark is a registered clinical and public health microbiologist with the American Academy of Microbiologists.