F). "Abnormal" laboratory measurements and examinations are often defined as those values lying outside the limits of the reference range. Determining what constitutes "normal" is more complex than simply comparing an individual value to a reference range derived from a sample of a representative population.

Laboratory tests are designed to *support* a clinical diagnosis based on the patient's history and clinical findings, with all of the information contributing to the final decision. Comparing clinically normal clone and comparator populations only on laboratory measurements, in the absence of disease or injury, is, at best, an exercise in attempting to identify subtle hazards that may be hypothesized to exist in animal clones. The statistical or biological significance of any value that may lie outside the comparison ranges available for this review in the absence of corroborating information on the health status of the individual animals or cohorts would be difficult to justify on scientific grounds.

Further, it is important to remember that the evaluation is only as good as the sample provided. One of the terms used to group the inconsistent outcomes that result from sample mishandling or processing errors is "artifact." Erroneous conclusions can result if the artifact is accepted as a true sample result. An artifact is suspected when the laboratory data are inconsistent with the clinical assessment or there is an inappropriate relationship between tests. For example, low blood glucose values can indicate hypoglycemia, with the accompanying clinical signs of lethargy or seizure. However, low blood glucose values in a blood test can also result from not separating the red cells from the serum in a timely fashion after drawing blood. In that case, the glucose level will be artifactually reduced. Other artifacts that can influence blood variables are lipemia (the presence of excess fats and fatty acids in the blood), hemolysis (the breakage of blood cells releasing their contents into the sample), poor collection technique, and storage for too long a time at an inappropriate temperature.

Therefore, a single value outside of a "normal range," or even a number of values outside a "normal range" in one animal does not necessarily mean (or even imply) that an animal's health is at risk. Rather, these values should serve as signals for the further investigation by experienced veterinarians and animal scientists who exercise professional judgment regarding that value in the context of weighing available evidence.

In the Analyte Evaluation, similarities and differences in analytes across animals and within age-matched cohorts were considered. One or two values outside the range could be considered normal and acceptable variation in the absence of other physiologically based evidence. Because this review attempts to use clinical values to identify potential hazards, even those few values outside the range were examined in the context of other physiological characteristics to determine if those values implied some anomalous trend. If more than two variables were out of

the comparator range, we returned to the animal's entire record in an attempt to understand those values in the context of the animal, and to attempt to determine if they represented a concern for the health of the animal and therefore the safety of edible products derived from it.

In the Animal Evaluation, similarities and differences within individual animals were evaluated. For each animal, we first determined the total number of analytes that were considered sufficiently out of range to imply clinical relevance, thereby triggering further scrutiny. Those analytes were evaluated for internal consistency with other values to rule out artifacts, and then considered within the context of the animal's health records for clinical consistency between the lab work and the clinical picture (based on available veterinary exam records) of the animal.

In the following sections, we have divided our analyses into the three age cohorts: within 24 hours of birth, 1-6 months, and 6-18 months. Results that are outside the comparator range are presented on an analyte and animal-specific basis. The exception to this format is the first sub-section that discusses growth-related phenomena that span age groups.

v. Growth-Related Phenomena

Because young animals are growing rapidly, measures of bone growth such as calcium, phosphate, and alkaline phosphatase might be expected to be elevated relative to adults. (Alkaline phosphatase is an enzyme that reflects a number of physiological parameters, and in young animals represents the activity of bone growth and development). This is, in fact, observed in the clones and comparators. Review of Charts E300 and E302 (6 to 18 months old), E200 and E202 (1 to 6 months old), and E100 and E102 (within 24 hours of birth) clearly indicates that all of the alkaline phosphatase levels, and a high proportion of calcium and phosphate levels, are elevated in both cohorts relative to the Cornell Reference range. Review of Charts E301, E201, and E101, however, reveals that clone alkaline phosphatase values are almost entirely within the range of the comparators (0/18 for 6 to 18 months, 8/46 for 1 to 6months, and 0/10 (within 24 hours of birth) values out of range). For those animals in the one to 6 month cohort, the increased levels of alkaline phosphatase occurred in the youngest animals, a finding consistent with higher rates of growth in younger animals relative to older animals.

Total protein, globulin, and albumin reflect, among other things, the immune status of the organism, which varies with age. Immediately after birth, globulin levels, which are largely comprised of immunoglobulins, are derived almost entirely from colostrum (the antibody rich first "milk" secreted by mammals). "Passive immunity" is conferred by the ingestion and intestinal absorption of immunoglobulin-rich maternal colostrum. In the two to four months after birth, a calf's own immune system begins to ramp up its production of immunoglobulins, as the circulating supply of maternally-derived immunoglobulins in milk wanes. This phenomenon can

be observed in Charts E200 and E202 (Clones: Reference Range (1 to 6 months), and Comparator Population: Reference Range). Clone and comparator calf globulin values are low relative to the Cornell lab reference range because that reference range is derived from adult animals. The clone and comparator calves have not fully started to produce antibodies from their own B-lymphocytes. Review of Chart E201 (Comparison of Clones to Comparator Population), however, indicates that there were few differences between the clone and comparator populations, reflecting the appropriate age-related lag between the decrease in passive acquired immunity and endogenous immunoglobulin production.

The globulin levels that are different between clones and comparators also reflect this age-related physiological phenomenon. Clones #72 and 73 were among the youngest in the 1 to 6 month old group, and thus would be expected to have lower globulin levels. For example, comparison of the globulin value for clone #100 (174 days of age, globulin of 4.6g/dL) with clone #72 (48 days of age and globulin level of 1.6 g/dL) clearly demonstrates the age-related changes in the analyte, and appropriately reflects the normal developmental increase in endogenous globulin production.

In summary, clones and comparators exhibited entirely appropriate developmental stage responses in those laboratory values that reflect age-specific alterations. At least with respect to this dataset, clones respond appropriately to the internal signals guiding normal development and maturation.

f. Animals with Measurements at Different Developmental Nodes

There is a small sub-cohort of seven clones for which laboratory values are available for both the earliest (neonatal) developmental group and early in the second developmental node group (1-6 months). The seven calves are 71, 72, 73, 78, 79, 119, and 132.

More variability was observed among the clinical chemistry values generated from six of seven of these clones relative to the comparators than in the hematology values (for one clone, #119, no differences were noted relative to the comparators). Compare Charts E101 vs. E201 for chemistry and Charts E111 vs. E211 for hematology. In particular, gamma glutamyl transferase (GGT) values appeared lower for four of the seven neonatal clones. This observation is entirely consistent with the difference in treatment that the animals received with respect to the timing of the blood draws. For clones, blood samples were drawn prior to the administration of colostrum, while the comparators had blood samples drawn following its administration. As colostrum has been shown to have high intrinsic GGT activity, the difference between the two groups could well be due to the reflection of absorbed colostrum by the comparators (Meyer and Harvey 2004). GGT values normalized by the second time of measurement for three of the clones. Calf

#73 continued to demonstrate slightly lower GGT activity (4U/L vs. comparator range of 5 - 32 U/L) at Day 48, but this value is unlikely to have clinical significance. We would have expected the globulin level to be lower also, because of the young age of this clone. There was one comparator calf with a low enough globulin level (1.3 g/dl) to allow all of the clone calf values to fall within the range, had it been included in establishing the range.

Six of the seven clones exhibited lower aspartate amino transferase (AST) values at birth relative to the comparators, but these values normalized by the time of the second blood draw (Chart E101 for neonates v. E201 for 1-6 months). Five of the seven clones had low bile acid or cholesterol levels at birth. All three of these analytes are produced by the liver, and their relatively low values may be a reflection of the changeover from fetal hepatic circulation (which bypasses much of the liver) to neonatal circulation in which the liver becomes more fully perfused. Bile acids normalized by the second measurement. The initial, relatively low creatine kinase (CK) (Clone #72), total iron binding capacity (TIBC) (Clone #73), and elevated iron (Clone #132) values resolved by the time of the second blood draw. The cholesterol level for clone #79 was low at birth, but was elevated relative to comparators in the 1-6 month blood sample.

A few measurements appeared elevated in five of the clones at the time of the second measurement. Glucose, alkaline phosphatase, phosphorus, creatinine, and the A/G ratios were elevated relative to the comparators, and anion gap, globulin and total protein were decreased relative to the comparators. These variations from the comparator range are discussed more fully in the Animal and Analyte Review portions of this Appendix.

For hematological data, complete blood count information is only available for four of the seven neonatal clones (Chart E111). Of those, only Calf #78 exhibited any values outside the range of the comparators. At birth, that animal exhibited decreased lymphocytes and decreased platelets, which normalized by the time of the second blood draw. The second blood sample (Chart E211) showed increased banded (immature) neutrophils, whose only biological significance here is that it demonstrates that the clone's bone marrow can produce normal immature neutrophils. The stimulus for the release of the banded neutrophils in this case is not known. No neonatal hematological values were available for clone #78. At the time of the second blood draw (Day 84) clone #79 exhibited decreased total protein as measured by refractometer (TP-ref), increased mean platelet volume (MPV) and decreased red cell distribution width (RDW) relative to the comparators. These variations (increase in bands for clone #78 and decreased total protein (TP) and RDW and increased MPV) are discussed in the animal and analyte review sections. Clone #79 was eventually culled (see discussion in Animal and Analyte Section).

In summary, with the exception of one clone (Clone #73, GGT), none of the values measured at birth that were out of range of the comparator group persisted into the second developmental cohort. Initial laboratory measurements taken at birth differed in clones versus comparators. Some of that difference was likely attributable to the difference in timing or source of colostrum administration between the two groups. Clones #71, 72, and 73 were derived from the same cell line. As discussed in the Animal and Analyte Review sections, most of the values that were out of range at the time of the second blood draw can either be attributed to the age of the animals or do not appear to have clinical significance.

vi. Age Range within 24 hours of birth (Charts E101 and E111)

There were 10 live clones and 17 live comparators in this age cohort.

***(c)* Analyte Evaluation**

Despite an expectation of substantial differences in laboratory measurements between clones and comparators at birth, Chart E101 shows 27 of the 33 analytes were very similar between the groups: they had either one difference or no differences. The remaining six analytes tended to be more variable between clones and comparators.

The values out of range in the four analytes related to liver function (AST, GGT, cholesterol, and bile acids (hBA)) were low relative to comparators. AST levels, in particular, were low in 9 of 10 animals. Although these parameters can indicate zinc or vitamin B_6 deficiencies, (Duncan and Prasse 2003, Meyer and Harvey 2004) have reported that *"reduced AST activities (below the reference range) are noted with relative frequency in dogs and rats during pre-clinical drug trials…."* We are uncertain whether similar observations have been made in cattle. Colostrum possesses an intrinsic high GGT activity (Meyer and Harvey 2004) that is passively transferred to neonates. Given that the clones did not receive colostrum until after blood samples were drawn, while comparators did, lower GGT levels in clones are not unexpected.

Low cholesterol is associated with porto-systemic shunts (abnormal liver blood circulation) in young animals. Fetal circulation provides for the bypass of the bulk of the liver tissue through a vessel called the *ductus venosus* in a loop including the placenta, umbilical vein, and the *ductus venosus.* At birth, the *ductus venosus* closes off; the liver is then fully perfused with blood from the hepatic artery and other components of the hepatic portal circulation. Were these low cholesterol levels to continue into the next developmental age group, there might be cause for concern. Given that the cholesterol levels appear to normalize, based on information from the seven calves that were sampled at both the neonatal and weaning time periods, and review of the overall 1-6 month cohort, there is little reason to think that the lower values in these very young

animals pose a health risk. The low levels at birth are more likely a reflection of the changeover from fetal to adult circulation, possibly exacerbated by the clones' unusually large umbilical vessels, which often required surgical correction (see 1-6 month cohort discussion). The lower bile acid values observed may also be related to the transition from fetal to neonatal circulation, and are not likely indicative of any disease state.

Table E-4: Summary of Laboratory Values from Subcohort of Clones with Laboratory Measurements Taken at Two Developmental Nodes

Calf ID#	Parameters	Charts E101/111: Birth	Age at Second Blood Draw (Days)	Chart E201/211: 1-6 Months	Current Status
78, Holstein ♀	Clinical Chemistry	↓AST, ↓GGT (pa)	54	↑glucose, ↑alk phos	Presumed healthy
	Hemogram	↓lymphocytes, ↓platelets		↑banding	
79, Holstein ♀	Clinical Chemistry	↓AST, ↓hBA	65	↑creatinine, ↓globulin, ↑A/G, ↑alk phos, ↑chol	Culled
	Hemogram	No data		↓rdw, ↑MPV, ↓TP-ref	
71, Holstein ♀	Clinical Chemistry	↓AST, ↓hBA, ↓GGT (pa)	48	↑P, ↑glucose, ↑alk phos	Presumed healthy
	Hemogram	within range		within range	
72, Holstein ♀	Clinical Chemistry	↓AST, ↓ hBA, ↓GGT, ↓CK	48	↓anion gap, ↑P, ↓TP, ↓glob, ↑A/G, ↑glu, ↑alk phos, ↑ lipemia	Presumed healthy
	Hemogram	No data		↑ MPV	
73, Holstein ♀	Clinical Chemistry	↓AST, ↓GGT (pa), ↓TIBC, ↓hBA, ↓cholesterol	48	↓anion gap, ↑P, ↓TP, ↓glob, ↑A/G, ↑glu, ↓GGT,	Presumed healthy
	Hemogram	within range		↑ MPV	
119, red Holstein ♂	Clinical Chemistry	within range	36	within range	Presumed healthy
	Hemogram	within range		within range	
132, Holstein ♂	Clinical Chemistry	↓AST, ↓chol, ↑iron, ↑ % saturation	Not available	within range	Presumed healthy
	Hemogram	No data		within range	

pa = presumed artifact
Other abbreviations as described in Appendix F: Comprehensive Veterinary Examination
Within range = within the range of values for the comparator population

The hemograms for the neonatal clones (Chart E111) also were very similar to the comparators: 15 of the 17 analytes had either no values out of range or just one value out of the comparator range. With the exception of clone #43, which was infected with rotavirus and died at one day of age, all red blood cell analytes were within the range of the comparator group. Three clones had lymphocyte counts lower than the comparator range.

(d) Animal Evaluation

In general, clones appeared to be more fragile perinatally than comparators. Review of Table E-2 indicates that many of the animals did not survive parturition. Of those that did survive, three were infected with rotavirus, and two, clones #43 and #80, died from rotavirus-induced diarrhea.[124] Clone #43 exhibited lower AST, cholesterol, GGT, and bile acids than the comparator range, and platelet counts higher than the comparator range. Clone #80 had sodium levels that slightly exceeded the comparator range (149 mg/dL, relative to the highest comparator value of 146 mg/dL), elevated iron, and relatively high percent saturation. The elevated sodium level may have been related to electrolyte disturbances that occur with diarrhea.

Calf #78, a Holstein heifer, also had WBC within comparator range at birth and developed normally through Day 54 of age. She had low lymphocytes and low platelets, but did not present clinically with infection, and survived. Low lymphocyte counts (lymphopenia) can result from severe systemic bacterial and viral infections, disruption of the lymphatic drainage (ruptured thoracic duct), or hereditary disorders in which the production of the lymphocytes is impaired. It may also be a function of suppressed immune function in calves. In the absence of additional information, we think that these data should not be overinterpreted. Of the three clones with lymphopenia, two died from infection, but the third survived, indicating that although perinatal lymphocyte count may be a useful parameter to monitor, it is not predictive of outcome.

Clones #71, 72, 73, 78, 79, 119, and 132 were discussed in aggregate in the preceding section of the subcohort with laboratory measurements taken at two time points. Clone #79 was a Holstein heifer that was culled for poor posture and gait at 54 days of age. In addition to low AST and low bile acids, she was noted to have "very thick withers, and a general build resembling a beef calf. Her left carpus was enlarged, and her left leg deviated laterally."

Clone #75 was a Holstein heifer with no follow-up data at a later age. She exhibited AST, cholesterol, GGT, and bile acid levels that were lower than the comparator range. Clone #132 was a Holstein heifer initially presented with AST and cholesterol levels lower than the

[124] Rotavirus is a common enteric pathogen in cattle to which many calves are exposed; some succumb. There is a commercial vaccine for the dam to increase immunity to rotavirus in the colostrum to passively immunize calves in order to protect them.

comparator range and iron and TIBC above the comparator range, but that appeared to be thriving at 50 days.

(e) Conclusions for Perinatal Period: Animal Safety

In general, clones appeared to be more fragile than comparators. Three of the ten calves died or were culled. Two of these died at one day of age of rotavirus infection, and one was culled for poor posture and gait. The major classes of adverse outcomes noted for neonates included stillbirth, umbilical bleeding/abscess/management, colostrum/passive transfer problems, and euthanasia for defects (renal, circulatory, tendon contracture, placental abnormalities, cardiac, abomasal, and ascites (increased fluid in the abdomen)). These problems also occur in conventional animals, although the incidence of the adverse outcomes appears to be higher in clones. Animals with these outcomes are readily identifiable.

The laboratory values indicated a variety of anomalies in the clones. The liver values (AST, GGT, cholesterol, bile acids (hBA)) were decreased in several animals, for reasons likely related to the placental/umbilical abnormalities. GGT levels were also low relative to the comparators, likely related to blood sampling prior to colostrum intake. Although both red and white blood cell counts are more variable than in older cohorts, both systems appear to be functioning normally in response to environmental stress (rotavirus).

Based on these data, it is not possible to use either a particular analyte or analyte profile to predict whether an individual animal, or indeed the entire cohort, will develop into normal, fully functioning healthy animals. The health and laboratory data are consistent with the hypothesis that animals that look and behave normally are most likely normal with respect to laboratory values.

(f) Food Safety

Healthy clones of this age are unlikely to be used for human food, given their potential value as breeding stock. It is also highly unlikely that clones of this age group would be fed to animals except through rendering of dead clones that occurred at parturition or by accident. In any event, the laboratory values do not appear to indicate that these animals are materially different from conventional newborns, but their physical condition at birth seems to indicate that they are more fragile than comparators, and by inference, other conventional animals.

vii. Age Range 1 to 6 months (Charts E201 and E211)

There were 46 clones and 47 comparators in this age cohort.

(g) Analyte Review

Chart E201 shows glucose values were higher for clones than comparators in six of the 42 accepted measurements (four of the values are so low as to be incompatible with life (< 2mg/dL) and thus were considered artifacts). The higher values (ranging from 88-123 mg/dL) may reflect stress responses caused by handling, dietary considerations (including proximity to a meal), or real differences in glucose metabolism. In order to determine whether the hyperglycemia was transient or sustained, urinalysis results were checked for these animals. The renal threshold (the blood level at which glucose spills over into the urine) in cattle is approximately 100 mg/dl. As none of the urinalyses tested positive for glucose, it is unlikely that the hyperglycemia observed in the blood had been sustained long enough to allow spillover from the blood into the urine. Further, no mention of increased water intake or urination was noted on any of the veterinary records of these clones, which are clinical signs of sustained hyperglycemia. Therefore, the most physiologically plausible interpretation of these elevated levels is transient hyperglycemia as a short-lived response to stress.

Total Protein (TP) is an analyte that contains globulin and albumin. Two animals had TP values that were outside the comparator range (Clone #72 and clone #73 were low). Three animals (Clones #94, 102, 128) had decreased levels of SDH relative to the comparators; three others (Clones # 56, 73, 116) exhibited lower GGT levels than the comparators. Although elevated blood levels of SDH and GGT may be indicative of liver disease, the relevance of decreased levels is unclear.

Evaluation of hemograms (Chart E211) indicated that there were no anemic animals. The one value out of range of the comparator group was an elevation, and not a decrease, in RBCs. Although other red cell indices such as mean cell hemoglobin (MCHC) concentration (4/44 clones had elevated levels relative to comparators) and red cell distribution width (RDW) (3/44 clones had lower levels than comparators) were out of comparator range, they are secondary indicators of red cell status. Hemoglobin (Hb) and hematocrit are the primary indicators of red cell status, and were effectively no different from comparators. No variables were consistently out of range for white blood cell evaluations. Four of the 44 clones had elevated basophil counts; the significance of these measurements is unclear. Twelve of the 41 clones had mean platelet volume (MPV) values that were elevated. See clone #102 below for a discussion of MPV.

(h) Animal Evaluation (1 to 6 months Age Group)

Clone #41, a 141 day old Holstein heifer, exhibited no clinical chemistry and one minor hematology value out of range of the comparators. Her health records, however, stated that she had umbilical surgery and harsh lung sounds. No further information is available on this animal.

Clone #58, a 161 day old Angus heifer had a normal veterinary exam, with indication of umbilical surgery. Four clinical chemistry values were out of the comparator range: creatinine, albumin, bile acids, and the A/G ratio were all low. Potential causes of low albumin levels include decreased production from chronic liver failure, or increased loss due to nephropathy (a kidney disease in which proteins are excreted), intestinal disease (enteropathy), or loss into a body cavity such as the thorax or abdomen. Chronic liver failure is accompanied by elevated bile acid levels; clone #58's bile acids were low. There were no other analyte or health measures indicating enteropathy or nephropathy. The low albumin level was also accompanied by a high globulin level, which could well be attributed to the umbilical abscess that was surgically removed, as the globulin response was appropriate to antigenic stimulation. The relevance of low creatinine is unknown. This calf also had four hemogram variables that differed from comparators. Hemoglobin (Hb), TP, and RDW were high, and the lymphocyte count was relatively low. The elevated Hb is consistent with the high hemolysis index of the sample, and is therefore probably not a reflection of the biology of the animal. The elevated TP was likely caused by the elevated globulin in response to antigenic stimulation discussed in the above.

Three Holstein calves (Clones #71, 72, and 73) were derived from the same cell line and were the same age at blood draw (48 days). All three presented with normal veterinary exams, elevated alkaline phosphatase levels, glucose, and phosphate levels. Clone #71 did not exhibit any other clinical values outside the comparator range. The elevated glucose measurements, as discussed above, appear to be transient and likely stress related. Clone #72, also presented with a normal veterinary exam. Her clinical chemistry measurements indicated low anion gap, TP, and globulin levels, and elevated phosphate, A/G ratio, glucose, and lipemia levels. Low anion gap is rare, and can be related to low albumin, which this animal did not exhibit. Its importance is unknown, and in this case, may simply be an anomaly. The low TP and globulin levels are likely age-related, as at this age calves are transitioning from maternal antibody to endogenous production, and there is often a lag in globulin concentration during this age. Plausible explanations for elevated phosphate, A/G, and glucose levels have been discussed previously. The lipemia level for clone #72 was 30U compared to 25U. As the lipemia index is relatively arbitrary, in the absence of corroborative health evidence, it is likely that this value has no real clinical significance. Clone #73 had low anion gap, TP, globulin, and GGT levels in addition to the elevated phosphorus, A/G, and glucose values. As previously discussed,

particularly considering the very young age and high genetic merit of these animals, the elevated phosphorus and alkaline phosphatase levels are not surprising. The influence of colostrum on GGT levels has been discussed previously, although its significance in this age group is not clear. Comparison of clone #41 to clone #73 shows that the former exhibited no laboratory values out of the range of the comparators, but did have health problems, while #73 exhibited many laboratory values outside the comparator range, but no health problems.

Clone #79 was a 65-day-old Holstein heifer at the time of the blood sampling. She was culled for poor posture and gait. Clinical chemistry indicated elevated creatinine, A/G, alkaline phosphatase, cholesterol, and reduced globulin levels.

Clones #87, 88, and 89 were all derived from the same Jersey cell line, and were, respectively, 141, 140, and 131 day old heifers at the time of blood draw. Another animal derived from the same cell line died at birth from LOS-related complications. All three had umbilical surgery and were dehorned. The differences in body weight in these animals illustrate the variability seen among clones derived from the same cell line. Clone #87, the oldest at 141 days, weighed 282 lbs; clone #88 (140 days) weighed 197 lbs; and the youngest (Clone #89 at 131 days) weighed 215 lbs.

Clone #100, a 174 day old Holstein bull, had an elevated WBC (26,500 cells), along with a history of umbilical abscess that was treated surgically. The elevated WBC is an appropriate response to an umbilical abscess.

Clone #102, a135 day old Holstein heifer also had umbilical surgery, reduced platelets (241×10^3), and an elevated MPV and MCHC relative to the comparators. By itself, the latter measurement has little relevance unless anemia is present. Based on the RBC counts, this calf did not have anemia. The relatively low platelet count also does not appear to be significant; for reference, the low end of the Cornell Reference Range is 232×10^3, or functionally the same number. Also, automated platelet counters may erroneously count platelets, as they tend to aggregate (clump together). The platelet smear listed platelets as adequate, corroborating that the platelet numbers were likely physiologically appropriate.

(i) Conclusion for 1 to 6 month old group: Animal Safety

The clones in this age cohort were mostly normal. Only one calf was culled for reasons of performance (poor conformation) and not animal health. Such calves are not selected for future breeding and their appearance (and subsequent culling) in a herd is not unique to clones. Culling occurs routinely in conventional breeding programs. The observation of poor conformation in a clone is interesting in that the animal providing the donor cell would likely have exhibited

acceptable conformation, raising the question of whether conformation of this animal is a function of its uterine environment or changes in gene expression. Clones from the same cell line showed considerable variation in their phenotype (see clones #87, 88, and 89 above with respect to weight).

Some of the clones had overt health problems. These included the increased incidence of umbilical problems (*e.g.,* enlargements, excessive bleeding, oomphalitis (navel infection)) tendon contracture, and cryptorchidism. Clones had umbilical extirpation (surgical removal of tissue) at a much higher rate than comparators. This increase represents a real risk to clones related to surgery. Surgical risks include complications that may arise from anesthesia and recovery from surgery, sepsis from manipulating an infected umbilicus, dehiscence (suture line not holding or infection of the suture line), and aspiration of stomach contents into the lungs. Contracted tendons also seemed to occur at a higher frequency than in conventional calves. (Tendon contracture can generally be treated successfully.) Three cases of cryptorchidism were identified. This condition is thought to be heritable, and is relatively uncommon in calves. The risk to the animal is that retained abdominal testicles can develop neoplasia (testicular cancer) in later age. The life cycle of food animals is such that bulls rarely live long enough for neoplasia to develop. In fact, the only food animals that would likely survive to develop such a condition would be breeding bulls. Given that a cryptorchid bull would fail its breeding soundness exam and would not be used for breeding stock *(i.e.,* would be castrated and sent to slaughter when the steer reached the appropriate weight), this eventuality is not likely to occur.

(j) Conclusion for 1 to 6 month old group: Food Safety

It is not likely that clones of this age group would be consumed for food, although there may be some circumstances in which culled clones might be sent into the food supply. When the results of the laboratory analyses are considered in the context of the Cyagra clones' clinical presentation, there were no consistent analyte or physical observations indicating a food safety concern. For example, although some calcium, phosphorus, alkaline phosphatase, and glucose levels fell above the comparator range, all of the elevations can be explained by the clones' stage of life or stress level, and the increased levels observed do not represent a food consumption risk. Further, the laboratory work is consistent with clinical presentation: Calf #100 presented with both umbilical abscess and a high WBC count. In the unlikely event that this animal was sent to slaughter with a large abscess, it would be detected on inspection. The carcass would be condemned if there was evidence of systemic involvement. The abscess would otherwise be cut out and the carcass processed normally. Healthy clones of this age group do not appear to be materially different from the comparators, and would not likely pose a food consumption risk different from conventional animals.

viii. Age Range: 6-18 Months (Charts E301 and E311)

There were 18 clones and 21 comparators in this age cohort.

(k) Analyte Analysis

Review of Chart 301 (Clone: Comparator Population Clinical Chemistry) indicates that there were very few differences between these two cohorts: 33 of the 33 analytes showed no or one value out of the range defined by the comparator population. Two analytes, on first impression appeared to exceed that range: estradiol-17β (E2) and insulin-like growth factor-1 (IGF-I). On further scrutiny, these values were judged to be of no clinical relevance. Because hormones are important from a physiological and food safety standpoint, their lack of clinical significance is discussed below.

IGF-I is a hormone produced by all mammals, whose presence is necessary for growth and development. Circulating levels of IGF-I have been linked to weight gain and growth rate, and higher levels have been used as a physiological marker for superior genetics in cattle, swine, sheep, and chickens (Davis and Simmen 2000). In this study, IGF-I levels tended to be higher in male clones than in females, and in three bull calves (Clone #24, 33, and 35) were slightly increased (less than 10 percent) relative to the comparator group (respective IGF-I levels of 924, 916, and 938 ng/mL relative to the comparator range of 33-875 ng/mL).

Basal circulating levels of IGF-I vary with a range of factors, and fluctuate dramatically among individual bovines in herds (Vega et al. 1991). In an analysis of 603 conventional Angus cattle conducted 42 days after weaning, the serum concentrations of IGF-I ranged from 17 to 883 ng/mL (Davis and Simmen 2000). Basal IGF-I levels also vary between males and females, with 12 month old bulls exhibiting higher concentrations of IGF-I than steers, heifers, or ovariectomized (animals whose ovaries have been surgically removed) heifers (Plouzek and Trenkle 1991 a,b). Plasma concentrations of IGF-I are also influenced by diet composition and intake, with basal IGF-I levels significantly lower in cattle during feed restriction compared to cattle that are fed to meet maximum growth or production potential. The primary nutritional determinants of basal IGF-I levels appear to be crude protein and total metabolizable energy[125] (Elsasser et al. 1989). Given that most non-transgenic clones are derived from animals of superior genetic merit for traits such as growth and development, the likelihood that their diets would be highly controlled, and the wide variability in normal IGF-I levels, the observed 10 percent elevations in IGF-I levels are of no clinical significance.

[125] Metabolizable energy is an estimate of the number of calories absorbed by the animal after digestion.

Of the five clones (# 24, 33, 35, 36, and 69) in the 6 to 18 month dataset that were identified as having plasma E2 levels above the comparators, all were bulls. These differences in E2 levels prompted closer scrutiny. The range in concentrations of these five bulls was 14.16 to 24.33 pg/mL. The range for all 18 clones in this age group was 4.28 to 24.33 pg/mL. The laboratory reference range is 10 to 40 pg/mL, while the comparator range was 4.1 to 11.41 pg/mL. As the laboratory reference range most likely included cycling females, we sought more specific information on E2 concentrations in bull plasma. We then compared the values to the Cornell Reference Range, derived from adult animals, and found that none were outside that range.

Although male mammals produce E2, little research effort has been devoted to studying the role, normal concentration, and fluctuation of endogenous estrogens in the bull. Estrogens are produced in the Sertoli cells of the testis, as well as in adipose tissue and the brain (Henney et al. 1990). Estradiol-17β (E2) is produced when testosterone binds to cells in the hypothalamus and is converted to E2 by the aromatase enzyme. Receptors for E2 have been identified in the urogenital tracts of growing and adult male mammals of several species, and may be necessary for normal structural and functional development of the male reproductive system (Nilsson et al. 2001). The ratio of E2 to testosterone may be an important factor in male sexual behavior and libido (Henney et al. 1990).

Henney et al. (1990) attempted to relate various hormone concentrations in plasma to libido in 18 Holstein bulls aged 4 to 5 years. Mean concentration of E2 in plasma of these bulls was 10.2 pg/mL, but ranged from 2.8 to 21.7 pg/mL. A more recent study by Sauerwein et al. (2000) measured fluctuations in plasma E2 in Simmental breeding bulls with an average age of 8.4 years with and without recombinant bovine somatotropin (rbST) treatment. Untreated controls (injected with vehicle only) and treated bulls exhibited fluctuations in E2 concentrations over the 25 week study. Concentrations of E2 in untreated bulls ranged from approximately 5 pg/mL to approximately 23 pg/mL, based on Figure 2 in this paper, with a mean pre-injection concentration of 12.0 ± 1.5 pg/mL. No papers were identified which discussed E2 concentration in young, growing bulls; however, given its possible role in normal development, increased levels of E2 in growing bulls of high genetic merit may be expected to have slightly elevated levels. Based on these ranges and those established by the reference laboratory, E2 concentrations of 24 pg/mL are not a concern, and should be considered within normal fluctuations for bulls.

Analysis of the hematological parameters for all of the clones and comparators (Chart E311) showed no remarkable findings. Sixteen of the 17 analytes measured for clones were within the range of the comparators, or had only one difference. No problems were identified with red blood cell measurements (*e.g.,* anemia or polycythemia (increase in the total mass of red blood

cells in the body)), or white blood cell problems (*e.g.* leukocytosis (increase in WBC count) or leukopenia (low WBC count)) were seen. Two animals (Clones #99 and #108) presented with a MCV below that of the comparators, but given the lack of corresponding evidence of anemia in these animals, these values have no clinical significance. Clone #108 was culled due to dwarfism.

(l) Animal Analysis

Unless specifically mentioned, no differences were observed between an individual clone's clinical chemistry or hematology values and the range presented by the comparators.

Clone #103 (Red Angus, 6.5 month old heifer) exhibited elevated potassium (K^+), asparagine transferase (AST), and creatine kinase (CK) levels relative to the comparators. None of the values in the hemogram exceed the range defined by the comparators. A physical exam conducted on the same day as the blood draws showed no abnormalities. The sample drawn from this calf had the highest hemolysis index (353) of all of the samples, indicating poor sample handling. Potassium is an electrolyte found mostly within the cell, and its elevation could be caused by sample hemolysis. Asparagine transferase (AST) is an enzyme normally found in liver or muscle tissue that can be released when liver or muscle is damaged. Creatine kinase is a muscle specific enzyme that is released when there is muscle damage. Although these values are elevated, they are low enough to imply only minor muscle damage, similar to that observed when an animal is recumbent for an extended period of time, struggling in a squeeze chute, or may be artifactual due to blood sample handling leading to hemolysis. Given that this animal exhibited no clinical abnormalities, even if these analyte levels are not due to artifact or poor sample handling, these changes would likely have no clinical significance.

Clone #108 was an Angus heifer that is characterized as a dwarf with frequent bloat. She was reported to have been severely deformed with abnormal gastro-intestinal (GI) motility. Interestingly, clinical chemistry results show only a decrease in TIBC compared to the comparator group. The hemogram indicated high RBC and slightly lower MCV relative to comparators. The hematocrit was within the range of the comparators. Despite the animal's obvious physical abnormalities, laboratory values were not significantly out of range.

(m) Conclusions for 6-18 Month Group: Animal Safety

Clones in this age group exhibited no differences from comparators with respect to their overall health, and were indistinguishable from the comparator group on the basis of clinical and laboratory tests. No residual health problems were noted in this group of animals, with the exception of the dwarf calf that was identified visually and culled. Based on these observations, there are no apparent health risks in this age group of animals.

(n) Conclusions for 6-18 Month Group: Food Safety

No material differences were observed between the six to eighteen month old clone cohort and their approximately age-matched, similarly reared comparators. In fact, the clones are indistinguishable from the comparators, and thus would be unlikely to pose any risk for consumption as human food or in animal feed above conventional animals now in the food supply.

5. Charts and Tables

The following Charts summarize the results of laboratory data derived from the Cyagra clones and corresponding non-clone comparators. In Charts 100, 102, 110, 112, 200, 202, 212, 300, 302, 310, and 312, the clones' laboratory data were compared to the Cornell veterinary laboratory data and to the approximately age- and breed- matched comparators' data. A laboratory value from a clone that exceeded the range of the Cornell Reference Range or comparators was initially flagged regardless of how much it was out of range. After all of the comparisons had been made (*i.e.,* clones to comparators, clones to reference range, and comparators to reference range), it became apparent that the most appropriate comparison for clinical relevance was clones to comparators. We then determined the clinical relevance of the out of range values. Clinical relevance was defined as laboratory value observed in the clones that was more than 10 percent out of the comparator range, or, one that based on veterinary clinical judgment, was likely to cause concern. The published literature was consulted for non-standard clinical chemistry endpoints such as IGF-I and estrogen. Laboratory values determined to be not clinically relevant are represented in the Charts as gray boxes. Clinical relevance is presented in charts 101, 111, 201, 211, 301, and 311.

Cyagra Data Chart Interpretations

Table 100 Summary of Clincal Chemistry Data for Cyagra Clones and Cornell Reference Range: Neonates

Animal	43	71	72	73	75	78	79	80	119	132	Summary[1]
Sodium	⇧	■	■	■	■	■	■	⇧	■	■	2/10
Potassium	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
Chloride	■	■	■	■	■	■	■	■	⇩	■	1/10
Bicarbonate	■	■	■	■	⇩	⇩	■	⇩	■	■	3/10
Anion Gap	■	■	■	■	⇧	⇧	⇧	⇧	⇧	■	5/10
Urea	■	■	■	■	■	■	■	■	■	■	0/10
Creatinine	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
Calcium	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
Phosphate	⇧	■	■	⇧	⇧	⇧	⇧	⇧	■	■	6/10
Mg - XB	■	■	■	■	■	■	■	■	⇧	■	1/10
Total Protein	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	10/10
Albumin-bulk	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	10/10
Globulin	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	10/10
A/G	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
Glucose	⇧	⇩	⇩	⇩	⇩	⇩	⇩	⇧	⇩	■	9/10
AST/P5P	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	9/10
SDH	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	9/10
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
GGT	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇧	⇩	10/10
∑ Bilirubin	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	9/10
Bilirubin-d	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	10/10
Bilirubin-i	■	⇧	⇧	⇧	■	⇧	■	■	⇧	⇧	6/10
Amylase											
Cholesterol	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	10/10
CK	■	■	⇩	■	■	■	■	■	⇧	■	2/10
Iron	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	■	8/10
TIBC	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	7/10
% Sat	⇩	⇩	⇩	⇩	⇩	■	⇩	■	⇩	■	7/10
hBA	*	⇩	⇩	⇩	⇩	⇩	⇩	■	■	*	6/9
Lipemia											
Icterus											
IGF-1	■	■	*	■	■	■	■	■	■	*	0/8
Estradiol	⇧	⇧	⇧	⇧	■	■	■	■	*	■	4/9
Summary[2]	20/30	21/30	22/29	22/30	22/30	23/30	21/30	19/30	20/29	15/28	

■ In Comparison Range

□ Outside the comparison range but not clinically relevant

⇧/⇩ Animal is above/below the clinically relevent range

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 101 Cyagra Clones and Comparator Population: neonates

Animal	43	71	72	73	75	78	79	80	119	132	Summary[1]
Sodium	■	■	■	■	■	■	■	⇧	■	■	1/10
Potassium	■	■	■	■	■	■	■	■	■	■	0/10
Chloride	□	■	■	■	■	■	■	■	□	■	0/10
Bicarbonate	■	■	■	■	■	■	■	■	■	■	0/10
Anion Gap	■	■	■	■	■	■	■	■	■	■	0/10
Urea	■	■	■	■	■	■	■	■	■	■	0/10
Creatinine	■	■	■	■	■	■	■	■	■	■	0/10
Calcium	■	■	■	■	■	■	■	■	■	■	0/10
Phosphate	■	■	■	■	■	■	■	■	■	■	0/10
Magnesium- XB	■	■	■	■	■	■	■	■	■	■	0/10
Total Protein	■	■	■	■	■	■	■	■	■	■	0/10
Albumin- bulk	■	■	■	■	■	■	■	■	■	■	0/10
Globulin	■	■	■	■	■	■	■	■	■	■	0/10
A/G	■	■	■	■	■	■	■	■	■	■	0/10
Glucose	■	□	■	■	□	□	■	■	■	■	0/10
AST/P5P	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	9/10
SDH	■	■	■	■	■	■	■	■	■	■	0/10
Alkaline Phos	■	■	■	■	■	■	■	■	■	■	0/10
GGT	⇩	⇩	⇩	⇩	⇩	⇩	■	■	■	■	1/5
Total Bilirubin	■	■	■	■	■	■	■	■	■	■	0/10
Direct Bilirubin	■	■	■	■	■	■	■	■	■	■	0/10
Indirect Bilirubin	■	■	■	■	■	■	■	■	■	■	0/10
Amylase	■	■	■	■	■	■	*	*	■	■	0/8
Cholesterol	⇩	□	□	⇩	⇩	■	■	■	■	⇩	4/10
Creatine Kinase	■	■	⇩	■	■	■	■	■	■	■	1/10
Iron	■	■	■	■	■	■	■	⇧	■	⇩	2/10
TIBC	■	□	□	⇩	■	□	□	■	■	■	1/10
% Saturation	■	■	■	■	■	■	■	⇧	■	■	1/10
hBA- Random	⇩	⇩	⇩	⇩	⇩	■	⇩	■	■	*	6/9
Lipemia	■	■	■	■	■	■	■	■	■	■	0/10
Icterus	■	■	■	■	■	■	■	■	■	■	0/10
IGF-1	■	■	*	■	■	■	■	■	■	*	0/8
Estradiol	■	■	■	■	■	■	■	■	*	■	0/9
Summary[2]	4/33	3/32	4/32	5/33	4/33	2/33	2/32	4/32	0/32	3/31	

■ In Comparison Range

□ Outside the comparison range but not clinically relevant

⇧/⇩ Animal is above/below the clinically relevent range

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 102 Summary of Clinical Chemistry Data for Cyagra Comparison Population and Cornell Reference Range: neonates

Animal	140	141	135	136	137	138	139	186	187	188	189	190	191	192	193	194	195	Summary[1]
Sodium	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	1/17
Potassium	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	16/17
Chloride	■	⇩	⇩	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	3/17
Bicarbonate	⇩	■	⇩	⇧	⇩	■	■	■	■	⇩	■	■	■	■	■	■	■	5/17
Anion Gap	⇧	⇧	⇧	■	⇧	■	■	■	■	⇧	■	■	⇧	⇧	■	■	⇧	8/17
Urea	⇩	⇩	⇧	■	■	■	■	⇩	■	■	⇩	⇧	■	⇩	■	■	■	7/17
Creatinine	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	■	■	⇧	⇧	⇧	13/17
Calcium	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	16/17
Phosphate	■	■	⇧	■	⇧	■	■	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	■	9/17
Mg - XB	■	■	⇧	■	⇧	■	■	⇧	⇧	■	⇩	⇧	■	⇩	■	■	■	7/17
Total Protein	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	17/17
Albumin-bulk	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	16/17
Globulin	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	⇩	⇩	⇩	⇩	15/17
A/G	⇧	⇧	■	■	⇧	■	⇧	■	■	⇧	⇩	■	■	⇧	■	■	⇧	8/17
Glucose	■	■	⇩	⇧	⇧	■	■	■	■	⇧	■	■	⇧	⇧	■	■	⇩	7/17
AST/P5P	⇩	■	⇧	■	⇧	■	■	■	■	■	■	■	■	■	⇧	⇧	⇩	6/17
SDH	⇩	⇩	⇧	⇩	⇧	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	■	15/17
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	17/17
GGT	■	■	⇧	⇧	■	⇧	⇩	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇩	13/17
∑ Bilirubin	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	15/17
Bilirubin-d	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	17/17
Bilirubin-i	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	15/17
Amylase																		
Cholesterol	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	17/17
CK	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇩	⇧	■	⇧	⇧	⇧	15/17
Iron	■	■	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	14/17
TIBC	■	■	■	■	■	■	■	■	■	■	■	■	⇧	⇩	⇩	⇩	■	4/17
% Sat	■	■	⇩	⇩	■	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	13/17
hBA	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	1/17
Lipemia																		
Icterus																		
IGF-1	■	■	⇩	*	■	■	■	■	■	⇩	⇩	⇩	■	⇩	■	⇩	⇩	7/16
Estradiol	■	⇧	⇧	■	⇧	■	■	■	■	■	⇩	⇩	■	⇩	■	⇧	⇧	8/17
Summary[2]	17/30	18/30	26/30	17/29	18/30	18/30	16/30	19/30	18/30	19/30	18/30	20/30	20/30	22/30	19/30	20/30	21/30	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 111 Summary of Hemogram Data for Cyagra Clones and Comparator Population: neonates

Animal	43	71	72	73	75	78	79	80	119	132	Summary[1]
Hematocrit	⇩	■	*	■	■	■	*	■	■	*	1/7
Hemoglobin	■	■	*	■	■	■	*	■	■	*	0/7
RBC	⇩	■	*	■	■	■	*	■	■	*	1/7
MCV	■	■	*	■	■	■	*	■	■	*	0/7
MCH	⇩	■	*	■	■	■	*	■	■	*	1/7
MCHC	⇩	■	*	■	■	■	*	□	■	*	1/7
RDW	⇧	■	*	■	■	■	*	■	■	*	1/7
WBC	■	■	*	■	■	■	*	■	■	*	0/7
Seg. Neutr	■	■	*	■	■	■	*	■	■	*	0/7
Banded Neutr	⇧	■	*	■	■	■	*	■	■	*	1/7
Lymphocytes	⇩	■	*	■	■	⇩	*	⇩	■	*	3/7
Monocytes	■	■	*	■	■	■	*	■	■	*	0/7
Eosinophils	■	■	*	■	■	■	*	■	■	*	0/7
Basophils	■	■	*	■	■	■	*	■	■	*	0/7
Platelets	⇧	■	*	■	■	⇩	*	■	■	*	2/7
MPV	⇧	■	*	■	■	■	*	■	■	*	1/7
TP- Ref	■	■	*	□	■	■	*	■	■	*	0/7
Summary[2]	9/17	0/17		0/17	0/17	2/17		1/17	0/17		

■ In Comparison Range

□ Outside the comparison range but not clinically relevant

⇧/⇩ Animal is above/below the clinically relevent range

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health co

Table 112 Summary of Hemogram Data for Cyagra Comparison Population and Cornell Reference Range: neonates

Animal	140	141	135	136	137	138	139	186	187	188	189	190	191	192	193	194	195	Summary[1]
Hematocrit	⇧	⇧	⇩	■	*	⇧	⇧	⇧	⇧	⇧	⇩	*	*	⇧	*	⇧	■	11/13
Hemoglobin	■	⇧	⇩	⇩	*	■	■	■	■	■	⇩	*	*	■	*	■	⇩	5/13
RBC	■	⇧	⇩	■	*	⇧	⇧	■	■	■	⇩	*	*	■	*	■	■	5/13
MCV	■	■	■	■	*	■	■	■	■	■	■	*	*	■	*	■	■	0/13
MCH	■	⇩	■	⇩	*	■	■	■	⇩	⇩	⇩	*	*	■	*	⇩	⇩	7/13
MCHC	⇩	⇩	⇧	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	*	*	⇩	*	⇩	⇩	13/13
RDW	■	■	⇧	⇧	*	■	■	■	⇧	■	⇧	*	*	⇧	*	■	■	5/13
WBC	■	■	⇩	■	*	■	■	⇧	■	■	⇩	*	*	⇩	*	⇧	■	5/13
Seg. Neutr	⇧	⇧	■	■	*	⇧	■	⇧	⇧	■	⇩	*	*	■	*	⇧	■	7/13
Banded Neutr	■	■	■	■	*	■	■	■	■	■	■	*	*	■	*	■	■	0/13
Lymphocytes	■	⇩	■	⇩	*	⇩	⇩	■	■	■	■	*	*	⇩	*	⇩	■	6/13
Monocytes	■	■	■	■	*	■	■	■	■	■	■	*	*	■	*	■	■	0/13
Eosinophils	■	■	■	■	*	■	■	■	■	■	■	*	*	■	*	■	■	0/13
Basophils	■	■	■	■	*	■	■	■	■	■	■	*	*	■	*	■	■	0/13
Platlets	■	⇧	■	■	*	*	⇧	⇧	■	*	■	*	*	■	*	■	■	3/13
MPV	⇧	■	⇧	⇧	*	*	■	⇧	⇧	*	■	*	*	■	*	⇧	■	6/13
TP- Ref	⇩	⇩	■	■	*	⇩	⇩	⇩	■	⇩	■	*	*	⇩	*	⇩	⇩	9/13
Summary[2]	5/17	9/17	7/17	6/17		6/17	6/17	7/17	6/17	4/15	8/17			6/17		8/17	4/17	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

? Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

---

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health cons

Table 200 Summary of Clinical Chemistry Data for Cyagra Clones and Cornell Reference Range: 1-6 month cohort

Animal	39	40	41	42	56	58	71	72	73	74	76	78	79	81	82	83	85	87	88	89	90	93	94	96	100	101	102	106	110	111	114	115	116	117	118	119	120	121	124	126	127	128	129	130	131	132	Summary[1]
Sodium	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Potassium	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	■	⇧	■	■	■	⇧	⇧	■	⇧	■	■	■	⇧	⇧	■	■	⇧	■	⇧	■	⇧	⇧	⇧	■	⇧	30/46
Chloride	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Bicarbonate	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Anion Gap	■	■	■	■	■	■	■	⇩	⇩	■	⇧	■	■	■	■	■	■	⇧	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	5/46
Urea	⇩	⇩	■	■	■	■	⇩	⇩	⇩	■	■	■	■	⇩	■	■	■	■	■	■	■	⇩	■	■	⇩	■	■	■	■	■	⇩	■	■	⇩	■	⇩	■	⇩	■	⇩	■	⇩	⇩	⇩	⇩	⇩	18/46
Creatinine	■	■	■	■	■	⇩	■	■	■	■	■	■	⇧	■	■	■	■	■	⇩	⇩	⇩	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	■	■	8/46
Calcium	⇧	⇧	■	■	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	■	■	■	⇧	⇧	⇧	⇧	■	■	⇧	⇧	■	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	33/46
Phosphate	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	45/46
Mg - XB	■	■	■	■	■	⇩	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	4/46
Total Protein	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	■	■	⇩	⇩	■	⇩	■	■	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	35/46
Albumin-bulk	⇩	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	■	⇩	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	6/46
Globulin	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	■	⇩	■	■	■	⇩	■	⇩	■	■	■	■	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	■	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	29/46
A/G	⇧	⇧	⇧	■	⇧	⇩	⇧	⇧	⇧	⇧	■	⇧	⇧	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	⇧	⇧	■	⇧	⇧	■	■	■	⇧	■	⇧	■	⇧	■	⇧	⇧	⇧	■	⇧	23/46
Glucose	■	■	■	■	⇩	⇩	⇧	⇧	⇧	⇧	⇩	⇧	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇧	■	■	⇧	■	■	■	■	⇩	■	⇩	■	■	■	■	■	■	⇩	■	■	■	⇩	24/46
AST/P5P	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	3/46
SDH	■	■	⇩	■	■	⇩	■	■	⇩	■	⇩	■	■	■	⇩	⇩	⇩	■	■	■	⇩	■	⇩	⇩	■	■	⇩	■	■	■	⇩	■	■	⇧	■	■	⇩	■	■	⇩	■	⇩	⇩	⇩	■	⇩	19/46
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	46/46
GGT	■	■	⇩	⇩	⇩	⇩	■	⇩	⇩	■	■	■	■	⇩	⇩	■	⇩	■	⇩	⇩	⇩	■	⇩	⇩	■	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	■	⇩	■	⇩	■	⇩	■	⇩	■	⇩	■	■	26/46
∑ Bilirubin	⇧	⇧	■	■	■	⇧	⇧	⇧	⇧	■	■	⇧	⇧	⇧	⇧	⇧	■	■	■	■	⇧	■	■	■	■	■	■	⇧	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	⇧	■	■	16/46
Bilirubin-d	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3/46
Bilirubin-i	■	■	■	■	■	⇧	⇧	⇧	⇧	■	■	⇧	⇧	⇧	⇧	⇧	■	■	■	■	⇧	■	■	■	■	■	■	⇧	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	⇧	■	■	14/46
Amylase																																															
Cholesterol	■	■	■	⇩	■	⇩	■	■	■	■	■	■	■	⇩	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	■	⇩	⇩	⇩	■	■	■	■	■	■	■	9/46
CK	⇧	■	■	⇧	■	■	⇧	■	⇧	■	⇧	■	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	■	⇧	⇧	⇧	■	⇧	■	■	⇧	■	⇧	■	■	⇧	⇧	■	■	⇧	■	■	■	⇧	25/46
Iron	⇩	■	■	■	⇧	⇩	■	■	■	■	■	⇧	■	■	■	⇩	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	■	⇩	■	■	⇧	■	■	10/46
TIBC	■	■	⇩	■	■	⇩	⇧	⇧	⇧	⇧	■	⇧	■	■	■	⇩	■	■	⇩	⇩	■	⇩	■	■	■	⇩	■	■	⇩	⇩	■	■	■	■	⇩	■	⇩	■	■	■	■	■	■	⇧	■	■	17/46
% Sat	⇩	■	■	■	⇧	⇧	⇩	⇩	⇩		⇧	■	■	■	■	■	■	⇧	⇧	⇧	⇧	■	⇧	■	■	■	■	⇩	■	⇧	⇧	⇧	⇧	⇧	■	⇧	■	■	■	■	⇩	■	■	⇧	■	■	21/46
hBA	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Lipemia																																															
Icterus																																															
IGF-1	■	■	■	■	■	⇩	*	■	*	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/42
Estradiol	⇩	⇩	⇩	⇩	⇩	■	*	*	*	*	⇩	*	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	38/40
Summary[2]	16/30	21/30	9/30	9/30	12/30	19/30	15/28	15/29	13/28	8/29	11/30	12/28	12/30	12/30	11/30	14/30	10/30	9/30	11/30	13/30	13/30	9/30	12/30	7/30	6/30	7/30	8/30	13/28	9/30	11/30	13/30	10/30	9/30	9/30	13/30	12/30	8/30	10/30	8/30	12/30	6/30	13/30	10/30	17/30	6/30	13/30	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 201 Summary of Clinical Chemistry Data for Cyagra Clones and Comparator Population: 1-6 month cohort

Animal	39	40	41	42	56	58	71	72	73	74	76	78	79	81	82	83	85	87	88	89	90	93	94	96	100	101	102	106	110	111	114	115	116	117	118	119	120	121	124	126	127	128	129	130	131	132	Summary[1]
Sodium	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Potassium	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Chloride	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Bicarbonate	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Anion Gap	■	■	■	■	■	■	■	⇩	⇩	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/46
Urea	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Creatinine	■	■	■	■	■	⇩	■	■	■	■	■	■	⇧	■	■	■	■	■	⇩	⇩	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	■	■	7/46
Calcium	■	⇧	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	⇧	■	■	■	■	■	■	⇧	■	■	⇧	■	■	5/46
Phosphorus	■	□	■	■	□	■	⇧	⇧	⇧	□	■	■	■	■	■	■	■	⇧	□	■	■	■	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	6/46
Mg	■	■	■	□	■	■	■	■	■	■	□	■	■	■	□	■	■	■	■	■	□	■	□	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	0/46
Total Protein	■	■	■	■	■	■	■	⇩	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/46
Albumin- bulk	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/46
Globulin	■	■	■	■	■	□	■	⇩	⇩	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3/46
A/G	■	■	■	■	■	⇩	■	⇧	⇧	■	■	■	⇧	■	■	□	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	4/46
Glucose	□	■	■	■	■	■	⇧	⇧	⇧	⇧	■	⇧	■	X	X	X	■	■	X	■	■	■	■	■	□	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	6/42
AST/P5P	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
SDH	■	■	■	■	■	X	■	■	■	■	■	■	■	■	X	■	■	■	■	■	X	■	⇩	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	X	■	⇩	■	■	■	■	3/43
Alk Phos	■	⇧	■	■	■	□	⇧	⇧	□	⇧	■	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	8/46
GGT	■	■	■	■	⇩	X	■	■	⇩	■	■	■	■	■	X	■	■	■	■	X	X	■	X	X	■	■	X	■	■	■	■	■	⇩	■	■	■	■	■	■	X	■	■	■	■	■	■	3/38
∑ Bilirubin	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Bilirubin-d	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Bilirubin-i	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Amylase	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	□	□	■	■	■	■	■	■	■	■	0/46
Cholesterol	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	□	■	■	□	1/46
C K	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
Iron	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
TIBC	■	■	■	■	■	■	□	□	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
% Sat	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	□	⇧	■	■	■	■	■	■	■	■	■	■	■	⇧	□	■	■	■	■	■	■	■	■	■	■	■	■	■	2/46
hBA	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	1/46
Lipemia	■	■	■	■	□	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/46
Icterus	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/46
IGF-1	■	■	■	■	■	■	*	■	*	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/42
Estradiol	■	■	■	■	■	■	*	*	*	*	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/40
Summary[2]	0/33	2/33	0/33	0/33	1/33	4/31	3/31	8/32	7/31	2/32	0/33	2/31	5/33	0/30	0/30	1/32	0/33	1/33	2/32	2/32	1/31	0/33	1/32	0/32	1/33	0/33	1/32	2/33	1/33	1/33	0/33	2/33	1/33	1/33	0/33	0/33	0/33	0/33	0/33	1/31	1/33	1/33	0/33	3/33	0/33	0/33	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

□ Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 202 Summary of Clinical Chemistry for Cyagra Comparison Population and Cornell Reference Range: 1-6 month cohort

Animal	142	143	144	145	146	147	148	149	150	151	152	153	155	156	157	158	159	162	164	166	167	168	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	196	197	198	199	200	201	202	203	204	Summary[1]	Animal
Sodium	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/47	Sodium
Potassium	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	⇧	■	■	⇧	⇧	11/47	Potassium
Chloride	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/47	Chloride
Bicarbonate	⇩	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	■	■	■	■	■	■	■	⇩	■	■	■	■	5/47	Bicarbonate
Anion Gap	⇧	■	■	■	■	⇧	■	⇧	■	■	■	■	⇧	■	⇧	⇧	⇧	■	■	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	■	■	⇧	■	■	■	■	⇧	24/47	Anion Gap
Urea	■	■	■	■	■	⇩	■	■	■	⇧	■	■	■	⇩	■	■	⇩	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	⇩	⇩	⇩	⇩	10/47	Urea
Creatinine	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/47	Creatinine
Calcium	⇧	⇧	■	■	■	■	■	⇧	■	■	■	■	⇧	■	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	■	■	■	■	■	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	28/47	Calcium
Phosphate	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	■	■	⇧	⇧	⇧	⇧	⇧	40/47	Phosphate
Mg - XB	■	■	■	■	■	■	■	■	■	⇩	■	⇩	■	■	⇩	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	5/47	Magnesium- XB
Total Protein	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	■	⇩	■	⇩	■	⇩	■	⇩	⇩	⇩	⇩	⇩	■	⇩	■	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	■	■	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	35/47	Total Protein
Albumin-bulk	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	⇩	■	■	■	■	■	⇩	■	■	■	⇩	■	■	■	■	■	■	■	■	5/47	Albumin- bulk
Globulin	⇩	⇩	⇩	⇩	■	⇩	■	⇩	⇩	⇩	■	⇩	■	⇩	■	⇩	■	■	⇩	⇩	■	⇩	■	⇩	■	⇩	⇩	■	■	⇩	■	⇩	⇩	⇩	■	⇩	■	■	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	■	29/47	Globulin
A/G	⇧	⇧	■	■	■	■	■	■	⇧	■	■	⇧	■	■	■	■	■	■	⇧	⇧	■	■	■	⇧	■	■	⇧	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	⇧	⇧	⇧	⇧	■	13/47	A/G
Glucose	■	■	■	■	■	■	⇩	■	⇩	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	⇩	■	■	■	■	⇩	⇩	■	⇩	⇩	■	⇩	⇩	■	■	■	■	■	11/47	Glucose
AST/P5P	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	⇩	■	2/47	AST/P5P
SDH	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	⇧	■	■	■	⇩	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	5/47	SDH
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	47/47	Alkaline Phos
GGT	■	⇩	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	■	■	■	■	⇩	⇩	⇩	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	14/47	GGT
∑ Bilirubin	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	⇧	■	■	3/47	Total Bilirubin
Bilirubin-d	■	■	■	■	■	■	■	■	■	⇧	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3/47	Direct Bilirubin
Bilirubin-i	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	⇧	■	■	2/47	Indirect Bilirubin
Amylase																																																	Amylase
Cholesterol	■	■	■	■	⇩	■	■	■	■	⇩	⇩	■	⇩	⇩	■	⇩	⇩	⇩	■	⇩	■	⇩	■	■	■	■	■	■	■	■	■	⇩	⇩	■	⇩	■	■	⇩	⇩	⇩	⇩	⇩	■	■	■	■	■	18/47	Cholesterol
CK	■	■	■	⇧	■	■	⇧	⇧	■	⇧	■	■	■	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	■	■	■	■	■	■	■	■	■	⇧	■	■	■	⇧	■	■	■	■	⇧	■	■	■	⇩	■	■	⇧	15/47	Creatine Kinase
Iron	■	■	■	■	■	■	■	■	■	⇩	⇩	⇩	■	■	⇩	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	⇩	⇩	⇩	⇩	⇧	11/47	Iron
TIBC	⇧	■	■	■	⇩	■	⇩	■	■	⇩	■	■	■	⇩	■	⇧	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	⇩	■	⇩	■	⇧	⇧	⇧	⇧	⇩	15/47	TIBC
% Sat	■	■	■	■	■	■	■	■	■	⇩	■	⇩	■	⇧	⇩	■	■	⇧	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	⇧	■	■	⇩	⇩	⇩	⇩	■	12/47	% Saturation
hBA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/47	hBA- Random
Lipemia																																																	Lipemia
Icterus																																																	Icterus
IGF-1	*	*	*	*	*	*	*	*	*	*	*	*	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	⇩	■	■	⇩	⇩	⇩	⇩	■	■	■	■	■	7/35	IGF-1
Estradiol	*	*	*	*	*	*	*	*	*	*	*	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	■	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	31/35	Estradiol
Summary[2]	9/28	7/28	5/28	5/28	3/28	6/28	6/28	7/28	7/28	11/28	4/28	10/28	8/30	11/30	8/30	8/30	8/30	11/30	10/30	11/30	13/30	11/30	6/30	9/30	7/30	8/30	7/30	5/30	6/30	8/30	9/30	9/30	8/30	7/30	9/30	11/30	4/30	7/30	9/30	11/30	9/30	10/30	14/30	13/30	13/30	13/30	11/30		

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/ Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 210 Summary of Hemogram Data for Cyagra Clones and Cornell Reference Range:1-6 month cohort

Animal	39	40	41	42	56	58	71	72	73	74	76	78	79	81	82	83	85	87	88	89	90	93	94	96	100	101	102	106	110	111	114	115	116	117	118	119	120	121	124	126	127	128	129	130	131	132	Summary[1]
Hematocrit	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	43/44
Hemoglobin	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	⇧	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/44
RBC	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	41/44
MCV	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩		⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	43/44
MCH	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	44/44
MCHC	■	⇩	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	*	■	■	■	⇩	■	■	*	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	⇩	⇩	6/44
RDW	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	41/44
WBC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	⇧	*	■	■	■	■	■	■	*	⇧	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	⇧	■	■	■	■	5/44
Seg. Neut.	⇩	■	■	■	■	⇧	■	■	■	■	⇧	■	■	⇧	⇧	⇧	*	■	■	⇩	■	■	⇧	*	⇧	■	■	⇧	■	■	⇩	■	■	⇩	■	⇩	■	⇧	■	⇧	■	■	■	■	■	■	15/44
Banded Neut.	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/44
Lymphocytes	⇧	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	*	■	■	⇧	■	■	■	*	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	⇧	■	■	■	■	6/44
Monocytes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	2/44
Eosinophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
Basophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
Platelets	⇧	■	■	*	■	⇧	■	■	■	■	⇧	■	■	■	⇧	⇧	*	⇧	■	⇧	*	⇧	■	*	■	⇧	■	■	⇧	■	■	■	⇩	⇧	⇧	*	⇧	■	■	⇧	⇧	⇧	■	■	■	⇧	18/41
MPV	■	⇧	⇧	*	■	■	■	⇧	⇧	■	■	■	⇧	⇧	■	■	*	■	⇧	■	*	■	■	*	■	■	⇧	■	⇧	⇧	⇧	■	■	■	■	*	■	■	⇧	■	⇧	■	■	■	⇧	■	14/41
TP- Ref	■	■	■	■	■	⇧	⇩	⇩	⇩	■	■	■	⇩	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	5/44
Summary[2]	8/17	7/17	6/17	5/15	5/17	10/17	7/17	7/17	7/17	5/17	7/17	6/17	5/17?	7/17	9/17	8/17		6/17	6/17	8/17	6/15	6/17	6/17		9/17	5/17	6/17	6/17	7/17	4/17	7/17	5/17	6/17	6/17	6/17	6/15	6/17	7/17	5/17	7/17	8/17	9/17	5/17	5/17	6/17	7/17	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

For description of analytes and their relevance to assess animal health consult Appendix J

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

Table 211 Summary of Hemogram Data for Cyagra Clones and Comparator Population:1-6 month cohort

Animal	39	40	41	42	56	58	71	72	73	74	76	78	79	81	82	83	85	87	88	89	90	93	94	96	100	101	102	106	110	111	114	115	116	117	118	119	120	121	124	126	127	128	129	130	131	132	Summary[1]
Hematocrit	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
Hemoglobin	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/44
RBC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
MCV	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
MCH	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
MCHC	■	■	⇧	■	■	■	■	■	■	■	■	■	■	⇧	■	■	*	■	■	■	■	■	■	*	■	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	4/44
RDW	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	3/44
WBC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/44
Seg. Neut.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
Banded Neut.	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/44
Lymphocytes	■	■	■	■	■	⇩	■	■	■	■	▒	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/44
Monocytes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/44
Eosinophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	*	■	■	⇧	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/44
Basophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	*	⇧	■	■	■	⇧	■	■	■	⇧	■	■	■	■	■	■	⇧	■	■	■	■	■	■	4/44
Platelets	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	*	■	■	*	■	■	⇩	■	■	■	⇩	■	⇩	■	■	*	■	■	■	■	■	■	■	■	■	■	3/41
MPV	■	⇧	■	*	■	■	■	■	■	■	■	■	⇧	⇧	■	■	*	■	⇧	■	*	■	■	*	■	■	⇧	■	■	⇧	⇧	■	■	■	■	*	■	■	⇧	■	■	■	■	■	⇧	■	9/41
TP- Ref	■	■	■	■	■	⇧	■	■	■	■	■	■	⇩	■	■	■	*	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	2/44
Summary[2]	0/16	1/16	1/16	0/14	0/16	3/16	0/16	0/16	0/16	0/16	0/16	1/16	3/16	2/16	0/16	1/16		0/16	1/16	1/16	0/14	0/16	0/16		2/16	1/16	3/16	0/16	1/16	2/16	2/16	0/16	2/16	0/16	0/16	0/14	0/16	0/16	1/16	1/16	0/16	0/16	0/16	0/16	2/16	0/16	

■

▒ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

For description of analytes and their relevance to assess animal health consult Appendix J

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

Table 212 Summary of Hemogram Data for Cyagra Comparison Pop and Cornell Reference Range: 1-6 month cohort

Animal	142	143	144	145	146	147	148	149	150	151	152	153	155	156	157	158	159	162	164	166	167	168	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	196	197	198	199	200	201	202	203	204	213	214	Summary[1]
Hematocrit	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	*	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	■	⇧	⇧	⇧	■	⇧	⇧	42/45
Hemoglobin	■	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	⇩	■	⇩	■	⇩	■	■	3/45
RBC	⇧	⇧	*	⇧	⇧	■	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	*	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	42/45
MCV	⇩	■	*	⇩	■	■	⇩	■	⇩	■	*	■	■	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	⇩	⇩	⇩	■	■	*	*	⇩	⇩	⇩	■	■	⇩	⇩	■	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	■	28/45
MCH	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	45/45
MCHC	■	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	⇩	⇩	⇩	⇩	⇩	⇩	■	■	■	■	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	*	*	⇩	⇩	■	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	⇩	36/45
RDW	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	44/45
WBC	■	■	*	⇧	■	■	■	■	■	■	*	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	*	*	■	⇧	⇧	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	7/45
Seg. Neut.	■	■	*	■	■	■	■	■	■	■	*	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	⇧	■	■	■	⇩	■	⇧	■	⇩	■	■	■	■	■	■	5/45
Banded Neut.	■	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/45
Lymphocytes	■	⇧	*	⇧	■	■	■	■	■	⇧	*	■	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	⇧	■	⇧	⇧	■	*	*	■	⇧	■	■	⇧	⇧	■	■	■	■	■	■	■	■	■	■	■	⇧	12/45
Monocytes	⇧	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	4/45
Eosinophils	■	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/45
Basophils	■	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/45
Platelets	⇧	■	*	⇧	⇧	■	⇧	*	■	⇧	*	⇧	■	■	■	⇧	⇧	■	■	■	⇧	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	⇧	■	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	17/45
MPV	■	■	*	⇩	■	■	■	*	■	■	*	■	■	⇩	■	⇩	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	⇩	■	■	■	⇩	⇩	⇩	⇩	■	■	■	9/45
TP- Ref	■	■	*	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	*	*	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	1/45
Summary[2]	7/17	6/17		10/17	6/17	4/17	7/17	5/15	6/17	7/17		8/17	7/17	7/17	6/17	8/17	7/17	5/17	5/17	5/17	7/17	7/17	4/17	5/17	6/17	7/17	6/17	8/17	5/17	4/17			6/17	8/17	7/17	5/17	7/17	5/17	5/17	5/17	8/17	6/17	9/17	8/17	8/17	8/17	7/17	7/17	6/17	

■

In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

7 Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

For description of analytes and their relevance to assess animal health consult Appendix J

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

Table 300 Summary of Clinical Chemistry Data for Cyagra Clones and Cornell Reference Range: 6-18 month cohort

Animal	24	25	26	27	33	35	36	38	37	55	67	69	70	98	99	103[b]	104	108[b]	Summary[1]
Sodium	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	1/18
Potassium	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	⇧	⇧	⇧	4/18
Chloride	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bicarbonate	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Anion Gap	⇧	■	■	⇧	⇧	■	■	■	■	■	⇧	⇧	⇧	■	■	⇧	■	■	7/18
Urea	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	1/18
Creatinine	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	⇩	■	⇧	3/18
Calcium	■	■	■	⇧	■	■	■	■	■	⇧	⇧	■	⇧	■	■	⇧	⇧	⇧	7/18
Phosphate	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	17/18
Mg - XB	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Total Protein	■	⇩	⇩	■	■	■	■	⇩	⇩	⇩	⇩	■	■	⇩	■	⇩	⇩	⇩	10/18
Albumin-bulk	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	1/18
Globulin	■	⇩	■	■	■	■	■	■	⇩	⇩	⇩	■	■	⇩	■	⇩	⇩	⇩	8/18
A/G	■	■	■	■	■	■	■	■	⇧	⇧	■	■	■	■	■	■	■	⇧	3/18
Glucose	⇧	■	⇧	⇧	■	■	⇧	⇧	⇧	■	■	■	⇧	⇧	⇧	⇩	■	⇩	11/18
AST/P5P	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
SDH	■	■	■	■	■	■	■	■	⇩	⇩	■	■	■	■	■	⇩	⇩	■	4/18
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	18/18
GGT	■	■	■	■	■	■	■	■	⇩	⇩	■	■	■	■	■	⇩	⇩	■	4/18
∑ Bilirubin	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bilirubin-d	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bilirubin-i	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Amylase																			
Cholesterol	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
CK	■	⇧	■	■	■	■	■	■	⇧	■	⇧	■	⇧	■	■	⇧	⇧	■	6/18
Iron	■	■	■	■	■	■	■	⇩	■	⇧	■	■	■	■	■	■	⇧	■	3/18
TIBC	■	■	⇩	■	■	■	■	⇩	■	■	■	■	■	■	⇩	■	■	⇩	4/18
% Sat	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	⇧	⇧	3/18
hBA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	⇩	■	2/18
Lipemia																			
Icterus																			
IGF-1	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	■	⇧	■	⇧	■	■	■	■	⇩	11/17
Estradiol	■	■	■	■	■	■	■	⇩	*	⇩	■	■	■	⇩	⇩	⇩	⇩	⇩	7/17
Summary[2]	5/30	6/30	6/30	6/30	5/30	3/30	3/30	8/30	10/28	12/30	8/30	4/30	8/30	6/30	5/30	14/30	13/30	13/30	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 301 Summary of Clinical Chemistry Data for Cyagra Clones and Comparator Population: 6-18 month cohort

Animal	24	25	26	27	33	35	36	38	37	55	67	69	70	98	99	103	104	108	Summary[1]
Sodium	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	0/18
Potassium	■	■	■	■	■	■	■	□	■	■	■	■	■	□	■	⇧	□	■	1/18
Chloride	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bicarbonate	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Anion Gap	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Urea	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Creatinine	□	□	□	■	□	■	■	□	■	■	■	■	■	■	■	□	■	□	0/18
Calcium	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Phosphate	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	□	■	■	0/18
Mg - XB	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Total Protein	■	■	■	■	□	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Albumin-bulk	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Globulin	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
A/G	■	■	■	■	■	■	■	■	■	□	■	□	■	■	■	■	■	■	0/18
Glucose	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
AST/P5P	■	■	■	■	■	■	■	■	■	■	■	■	■	□	□	⇧	□	■	1/18
SDH	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	1/18
Alk Phos	□	■	■	■	□	■	□	■	■	■	■	■	■	■	■	■	■	□	0/18
GGT	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
∑ Bilirubin	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bilirubin-d	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Bilirubin-i	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Amylase	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Cholesterol	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
CK	■	■	■	■	■	■	□	■	■	■	■	■	■	■	■	⇧	■	■	1/18
Iron	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	1/18
TIBC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	⇩	1/18
% Sat	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
hBA	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Lipemia	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Icterus	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
IGF-1	□	■	■	■	□	□	■	■	*	■	■	■	■	■	■	■	■	□	0/18
Estradiol	□	■	■	■	□	□	□	■	*	■	■	□	■	■	■	■	■	■	0/18
Summary[2]	0/33	0/33	0/33	0/33	0/33	0/33	0/33	1/33	1/31	0/33	0/33	0/33	0/33	0/33	0/33	3/33	0/33	1/33	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 302 Summary of Clinical Chemistry Data for Cyagra Comparison Pop and Cornell Reference Range: 6-18 month cohort

Animal	135	154	206	160	161	162	163	165	169	205	207	208	209	210	211	212	215	216	217	218	219	Summary[1]
Sodium	■	■	■	⇧	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	2/21
Potassium	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	■	■	■	2/21
Chloride	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	■	■	■	■	1/21
Bicarbonate	⇩	■	■	■	■	■	⇩	⇩	■	■	■	■	■	■	■	■	⇩	⇩	⇩	⇩	⇩	8/21
Anion Gap	■	■	■	⇧	⇧	■	⇧	⇧	⇧	■	■	■	■	■	■	■	⇧	⇧	⇧	⇧	⇧	10/21
Urea	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
Creatinine	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/21
Calcium	■	⇧	⇧	■	⇧	■	⇧	⇧	⇧	⇧	■	■	■	■	■	⇧	⇧	■	■	■	■	9/21
Phosphate	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	19/21
Mg - XB	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/21
Total Protein	⇩	⇩	⇩	■	⇩	⇩	■	⇩	■	■	⇩	⇩	⇩	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	16/21
Albumin-bulk	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
Globulin	⇩	⇩	■	⇩	⇩	⇩	■	⇩	■	■	⇩	■	■	■	■	■	⇩	⇩	⇩	⇩	⇩	12/21
A/G	■	⇧	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	⇧	⇧	⇧	5/21
Glucose	■	⇧	⇧	■	■	⇩	■	⇩	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	⇧	■	■	⇧	13/21
AST/P5P	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/21
SDH	⇩	■	■	■	■	■	■	■	■	■	⇩	⇩	■	■	■	■	⇩	■	■	■	■	4/21
Alk Phos	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	21/21
GGT	⇩	■	■	■	■	⇩	■	■	⇩	■	■	⇩	■	■	■	■	⇩	⇩	⇩	⇩	⇩	9/21
∑ Bilirubin	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
Bilirubin-d	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/21
Bilirubin-i	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
Amylase																						0
Cholesterol	■	■	■	■	■	⇩	■	■	■	■	■	⇩	⇩	■	⇩	■	■	■	■	■	■	4/21
CK	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	■	■	⇧	⇧	⇧	■	⇧	5/21
Iron	■	■	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
TIBC	■	■	■	■	■	⇩	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
% Sat	■	■	■	■	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/21
hBA	⇩	■	■	■	■	■	■	■	■	■	■	⇩	■	■	⇩	■	■	■	■	■	■	3/21
Lipemia																						0
Icterus																						0
IGF-1	*	■	■	■	■	■	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	■	■	■	■	7/20
Estradiol	*	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	⇩	■	■	■	■	⇩	■	⇩	⇩	⇩	⇩	⇩	14/20
Summary[2]	8/29	10/30	7/30	6/30	7/30	11/30	5/30	12/30	6/30	6/30	6/30	9/30	6/30	5/30	9/30	6/30	11/30	10/30	10/30	9/30	10/30	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 310 Summary of Hemogram Data for Cyagra Clones and Cornell Reference Range: 6-18 month cohort

Animal	24	25	26	27	33	35	36	38	37	55	67	69	70	98	99	103[b]	104	108[b]	Summary[1]
Hematocrit	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	18/18
Hemoglobin	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	⇧	1/18
RBC	■	■	■	■	■	■	■	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	■	⇧	8/18
MCV	■	■	■	■	■	■	■	■	■	⇩	■	⇩	⇩	⇩	⇩	■	■	⇩	6/18
MCH	■	■	■	■	■	■	■	■	■	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	7/18
MCHC	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	■	■	⇩	⇩	⇩	■	■	■	■	■	11/18
RDW	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	17/18
WBC	■	⇧	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	1/18
Seg. Neut.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Banded Neut.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Lymphocytes	■	■	■	■	■	⇧	■	■	■	⇧	■	■	■	■	■	■	■	■	2/18
Monocytes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Eosinophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Basophils	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Platelets	■	■	*	*	■	*	■	*	■	*	*	⇧	⇧	■	⇧	■	⇧	■	4/12
MPV	■	■	*	*	■	*	■	*	⇧	*	*	■	■	■	⇩	⇧	■	⇧	4/12
TP- Ref	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Summary[2]	3/17	4/15	3/15	3/15	3/17	4/15	3/17	3/15	4/17	6/15	5/15	7/17	7/17	5/17	7/17	3/17	3/17	6/17	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 311 Summary of Hemogram Data for Cyagra Clones and Comparator Population: 6-18 month cohort

Animal	24	25	26	27	33	35	36	38	37	55	67	69	70	98	99	103	104	108	Summary[1]
Hematocrit	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Hemoglobin	■	■	■	■	■	■	□	□	■	■	■	□	■	■	■	■	■	■	0/18
RBC	■	■	■	□	■	■	■	□	■	■	■	■	■	■	■	■	■	⇧	1/18
MCV	□	■	■	■	■	■	■	■	■	■	■	■	■	■	⇩	■	■	⇩	2/18
MCH	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
MCHC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
RDW	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
WBC	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Seg. Neut.	■	■	■	■	□	■	■	■	□	□	■	■	■	□	■	■	■	■	0/18
Banded Neut.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Lymphocytes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Monocytes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Eosinophils	■	■	■	■	■	■	■	■	■	■	□	■	■	■	■	■	■	■	0/18
Basophils	■	■	■	■	■	■	■	■	■	■	■	■	■	□	■	■	■	□	0/18
Platelets	■	■	*	*	■	*	■	*	■	*	*	■	■	■	■	■	■	■	0/12
MPV	■	■	*	*	■	*	■	*	■	*	*	■	■	■	■	■	■	■	0/12
TP- Ref	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	0/18
Summary[2]	0/17	0/17	0/15	0/15	0/15	0/15	0/17	0/15	0/17	0/15	0/15	0/17	0/17	0/17	1/17	0/17	0/17	2/17	

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Table 312 Summary of Hemogram Data for Cyagra Comparison Population and Cornell Reference Range: 6-18 month cohort

Animal	135	154	206	160	161	162	163	165	169	205	207	208	209	210	211	212	215	216	217	218	219	Summary[1]	Animal
Hematocrit	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	20/20	Hematocrit
Hemoglobin	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	⇧	■	■	⇧	■	2/20	Hemoglobin
RBC	■	⇧	⇧	■	⇧	⇧	⇧	⇧	⇧	■	■	*	⇧	⇧	■	⇧	⇧	⇧	■	⇧	⇧	14/20	RBC
MCV	■	⇩	⇩	■	■	■	■	⇩	⇩	■	■	*	■	■	■	■	■	■	■	■	⇩	5/20	MCV
MCH	■	⇩	⇩	■	⇩	⇩	⇩	⇩	⇩	■	■	*	⇩	⇩	■	⇩	■	■	■	■	■	10/20	MCH
MCHC	⇩	■	■	■	⇩	⇩	⇩	⇩	⇩	■	■	*	⇩	⇩	■	⇩	⇩	■	⇩	⇩	■	12/20	MCHC
RDW	■	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	■	■	*	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	17/20	RDW
WBC	■	■	■	■	■	⇧	⇧	⇧	■	■	■	*	■	■	■	■	■	■	■	■	■	3/20	WBC
Seg. Neut.	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	0/20	Seg. Neut.
Banded Neut.	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	0/20	Banded Neut.
Lymphocytes	⇩	■	⇧	■	⇧	⇧	⇧	⇧	■	⇧	■	*	■	■	■	■	■	■	■	■	■	7/20	Lymphocytes
Monocytes	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	0/20	Monocytes
Eosinophils	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	0/20	Eosinophils
Basophils	■	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	0/20	Basophils
Platelets	⇧	■	⇧	■	■	■	■	■	■	■	*	*	*	⇩	■	■	■	⇧	■	■	■	4/18	Platelets
MPV	⇧	■	⇩	■	■	■	■	■	■	⇧	*	*	*	■	■	■	■	■	■	■	■	3/18	MPV
TP- Ref	⇧	■	■	■	■	■	■	■	■	■	■	*	■	■	■	■	■	■	■	■	■	1/20	TP- Ref
Summary[2]	6/17	5/17	8/17	2/17	6/17	7/17	7/17	8/17	6/17	3/17	1/17	/17	5/17	6/17	2/17	5/17	5/17	4/17	3/17	5/17	4/17		

■ In Comparison Range

⇧ ⇩ Animal is above/below the clinically relevent range

/Outside the comparison range but not clinically relevant

* No numerical value was provided

X = Presumed artifact

[b] = Animal culled

[1] = # of animals with outcomes outside comparator range/total animals

[2] = # of outcomes outside range/total outcomes per animal

For description of analytes and their relevance to assess animal health consult Appendix J

Cyagra Raw Data

Calf #	Sex	Breed	Birth Date	Birth Wt (kg)	Birth	Current Status	Age 03/24/03 (mos)	Age at Death (d)	Cause of Death	Glucose Req'd	Thermoreg. Prob.	Calf #	Oxygen Req'd	Umbilicus (Probs.)	Umbilicus Hernia/ Infection	Umbilical Surgery	Noted Minor Problems	Major Problems
1	F	NP	4-Aug-01	45.5	NP	alive	19.9	NA	NA	NP	NP	1	NP	NP	NP	NP	NP	NP
2	F	NP	5-Aug-01	54.5	NP	alive	19.9	NA	NA	NP	NP	2	NP	NP	NP	NP	NP	NP
3	F	NP	29-Sep-01	NP	NP	dead	NA	0	stillborn	NP	NP	3	NP	NP	NP	NP	NP	abn dev
4	F	NP	28-Sep-01	NP	NP	alive	18.1	NA	NA	NP	NP	4	NP	NP	NP	NP	not clone of donor	NP
5	M	NP	7-Nov-01	NP	NP	alive	16.7	NA	NA	NP	NP	5	NP	NP	NP	NP	NP	NP
6	M	NP	7-Nov-01	NP	NP	dead	NA	16	accident	NP	NP	6	NP	NP	NP	NP	NP	calf hung in stall
7	M	NP	8-Nov-01	NP	NP	alive	16.7	NA	NA	NP	NP	7	NP	NP	NP	NP	NP	NP
8	M	NP	7-Nov-01	NP	NP	alive	16.7	NA	NA	NP	NP	8	NP	NP	NP	yes	scouring	NP
9	M	NP	7-Nov-01	NP	NP	alive	16.7	NA	NA	NP	NP	9	NP	NP	NP	NP	fever	NP
10	M	NP	7-Nov-01	NP	NP	alive	16.7	NA	NA	NP	NP	10	NP	NP	NP	NP	NP	NP
11	M	NP	7-Nov-01	NP	NP	dead	NA	0	euthanized	NP	NP	11	NP	NP	NP	NP	NP	abn dev
12	M	NP	17-Nov-01	NP	NP	dead	NA	0	stillborn	NP	NP	12	NP	NP	NP	NP	NP	recip ruptured uterus
13	M	NP	19-Nov-01	NP	NP	dead	NA	0	unknown	NP	NP	13	NP	NP	NP	NP	NP	appeared normal
14	NP	AN	12-Jan-02	33.2	C-section	dead	NA	13	septicemia/umbilicus	no	no	14	yes	no	no	no	infection, oxygenation	contracture
15	NP	AN	12-Jan-02	37.3	C-section	alive	14.5	NA	NA	no	no	15	no	no	no	no	infection, heart murmur	NP
16	NP	AN	15-Jan-02	50	C-section	dead	NA	2	failure to trans to neonat circ	no	no	16	yes	yes	no	no	slack abdomen	breathing
17	NP	AN	16-Feb-02	44.5	Natural	alive	13.4	NA	NA	no	no	17	no	no	no	no	NP	NP
18	NP	AN	28-Feb-02	68.2	Natural	dead	NA	0	stillborn	NP	NP	18	NP	NP	NP	NP	NP	polycystic kidneys
19	NP	AN	28-Feb-02	69.1	Natural	dead	NA	0	stillborn	NP	NP	19	NP	yes	NP	NP	NP	flaccid abdomen
20	M	HO	25-Nov-01	NP	C-section	dead	NA	0	euthanized	NP	NP	20	NP	NP	NP	NP	NP	abn dev
21	M	HO	28-Nov-01	41.8	C-section	alive	16	NA	NA	no	no	21	yes	no	no	no	NP	NP
22	M	HO	28-Nov-01	NP	C-section	alive	16	NA	NA	no	no	22	yes	no	no	no	low PCV	NP
23	M	HO	30-Nov-01	45.5	C-section	dead	NA	0	euthanized	yes	NP	23	yes	yes	NP	NP	NP	abn dev, int. bleeding
24	M	HO	30-Nov-01	31.8	C-section	alive	16	NA	NA	yes	no	24	yes	no	no	no	NP	NP
25	M	HO	12-Dec-01	54.5	C-section	alive	15.6	NA	NA	yes	NP	25	NP	NP	no	NP	NP	NP
26	M	HO	18-Dec-01	NP	C-section	alive	15.4	NA	NA	no	NP	26	NP	NP	no	NP	NP	NP
27	M	HO	22-Dec-01	NP	C-section	alive	15.2	NA	NA	no	NP	27	NP	NP	no	NP	NP	NP
28	M	HO	25-Nov-01	NP	C-section	dead	NA	0	stillborn	NP	NP	28	NP	NP	NP	NP	NP	NP
29	M	HO	27-Nov-01	NP	C-section	dead	NA	0	euthanized	NP	NP	29	NP	yes	NP	NP	NP	abn dev
30	M	HO	4-Dec-01	72.3	C-section	alive	15.8	NA	NA	NP	yes	30	yes	no	no	no	hyperthermia, mild contracture	NP
31	M	HO	5-Dec-01	76.8	C-section	dead	NA	0	euthanized	NP	NP	31	NP	no	NP	NP	NP	abn (renal) dev
32	M	HO	11-Dec-01	54.5	C-section	alive	15.6	NA	NA	no	no	32	yes	no	no	no	mild contracture	NP
33	M	HO	17-Dec-01	57.7	C-section	alive	15.4	NA	NA	yes	no	33	yes	no	no	no	NP	NP
34	M	HO	27-Nov-01	NP	C-section	dead	NA	0	stillborn	NP	NP	34	NP	NP	NP	NP	NP	NP
35	M	HO	7-Feb-02	41.8	C-section	alive	13.7	NA	NA	yes	no	35	yes	no	no	no	immature lungs	NP
36	M	HO	8-Feb-02	52.7	C-section	alive	13.6	NA	NA	no	no	36	no	no	no	no	NP	NP
37	M	HO	NP	NP	NP	alive	NA	NA	NA	NP	NP	37	NP	NP	NP	NP	NP	NP
38	M	HO	19-Feb-02	67.3	C-section	alive	13.3	NA	NA	NP	NP	38	NP	no	no	no	anemia, slight forelimb contracture	NP
39	F	HO	19-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	39	NP	NP	NP	yes	NP	NP
40	F	HO	24-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	40	NP	NP	NP	yes	NP	NP
41	F	HO	3-Dec-02	NP	C-section	alive	3.7	NA	NA	yes	no	41	yes	yes	yes	yes	contracture/splinting	NP
42	F	HO	10-Nov-02	NP	C-section	alive	4.5	NA	NA	yes	no	42	yes	large	yes	NP	NP	NP
43	F	HO	10-Mar-02	NP	NP	dead	NA	1	rotavirus	NP	NP	43	NP	NP	NP	NP	diarrhea	rotavirus
44	F	HO	29-Jan-02	45.5	C-section	alive	14	NA	NA	no	no	44	yes	yes	no	no	slight int. bleeding	NP
45	F	HO	29-Jan-02	NP	C-section	alive	14	NA	NA	no	no	45	no	yes	no	no	slight int. bleeding	NP
46	F	HO	24-Feb-02	51.4	C-section	alive	13.1	NA	NA	no	no	46	yes	no	no	no	NP	NP
47	F	HO	31-Jan-02	NP	C-section	dead	NA	0	stillborn	NP	NP	47	NP	NP	NP	NP	NP	NP
48	F	HO	1-Feb-02	54.5	C-section	dead	NA	0	stillborn	NP	NP	48	NP	NP	NP	NP	NP	NP
49	F	HO	1-Feb-02	NP	C-section	dead	NA	0	stillborn	NP	NP	49	NP	NP	NP	NP	NP	NP
50	F	HO	8-Mar-02	59.5	C-section	alive	12.7	NA	NA	no	no	50	no	yes	no	yes	NP	flaccid abdomen
51	F	HO	15-Mar-02	NP	C-section	dead	NA	0	stillborn	NP	NP	51	NP	yes	NP	NP	NP	flaccid abdomen, bulldog
52	F	HO	17-Mar-02	NP	Fetotomy	dead	NA	0	stillborn	NP	NP	52	NP	NP	NP	NP	NP	NP
53	F	HO	2-Apr-02	56.8	C-section	alive	11.9	NA	NA	no	no	53	no	yes	NP	yes	NP	NP
54	F	HO	4-Jun-02	59.1	C-section	dead	NA	0	euthanized	NP	NP	54	NP	NP	NP	NP	reverted to fetal circulation	cardian, neurological problems
55	F	HO	6-Jun-02	54.5	C-section	alive	9.7	NA	NA	no	no	55	yes	yes	yes	yes	large abdomen	NP
56	F	AN	11-Nov-02	NP	C-section	alive	4.4	NA	NA	yes	no	56	yes	no	no	no	NP	NP
57	F	AN	12-Nov-02	NP	induced/vaginal	dead	NA	23	ruptured abomasum	no	no	57	yes	no	no	no	NP	ruptured abdomen
58	F	AN	13-Nov-02	NP	C-section	alive	4.4	NA	NA	no	no	58	yes	yes	no	yes	lost blood	NP
59	F	Longhorn	21-May-02	27.3	C-section	alive	10.2	NA	NA	no	no	59	no	no	no	no	NP	NP

Calf #	Sex	Breed	Birth Date	Birth Wt (kg)	Birth	Current Status	Age 03/24/03 (mos)	Age at Death (d)	Cause of Death	Glucose Req'd	Thermoreg. Prob.	Calf #	Oxygen Req'd	Umbilicus (Probs.)	Umbilicus Hernia/ Infection	Umbilical Surgery	Noted Minor Problems	Major Problems
60	F	Longhorn	22-May-02	19.5	C-section	alive	10.2	NA	NA	no	no	60	no	yes	no	yes	NP	NP
61	F	Longhorn	22-May-02	23.6	C-section	alive	10.2	NA	NA	no	no	61	no	no	no	no	NP	NP
62	F	Longhorn	23-May-02	27.3	Natural	alive	10.2	NA	NA	no	no	62	no	yes	no	yes	NP	NP
63	F	Longhorn	7-Jul-02	NP	Natural	dead	NA	60	euth/ failure to thrive	no	no	63	no	no	no	no	NP	loss of hair, appetite, muscle
64	M	HO	25-Jun-02	59.1	C-section	alive	9.1	NA	NA	yes	yes	64	no	no	no	no	contracted tendons	NP
65	M	HO	27-Jun-02	61.4	C-section	dead	NA	3	GI transit/adhesions from umbilical bleeding	no	yes	65	yes	NP	NP	NP	NP	lethargic
66	M	HO	30-Jun-02	54.6	C-section	dead	NA	149	Bloat/ GI motility problems	yes	no	66	no	large	yes	yes	contracted tendons	recurring bloat
67	M	HO	26-Jul-02	NP	2WP	alive	8	NA	NA	no	no	67	no	yes	yes	yes	leathery placenta	NP
68	M	HO	29-Jul-02	NP	2WP	dead	NA	0	unable to determine	yes	yes	68	yes	no	no	no	thick placenta	pericarditis
69	M	HO	15-Aug-02	49.5	C-section	alive	7.4	NA	NA	yes	no	69	yes	proud flesh	no	yes	oxygenation, glucose	NP
70	M	HO	16-Aug-02	NP	C-section	alive	7.3	NA	NA	no	no	70	no	small hernia	yes	yes	NP	NP
71	F	HO	6-Mar-03	NP	NP	NP	NP	NP	NP	NP	NP	71	NP	NP	NP	NP	NP	NP
72	F	HO	6-Mar-03	NP	NP	NP	NP	NP	NP	NP	NP	72	NP	NP	NP	NP	NP	NP
73	F	HO	6-Mar-03	NP	NP	NP	NP	NP	NP	NP	NP	73	NP	NP	NP	NP	NP	NP
74	F	HO	NP	NP	NP	alive			NP	NP	NP	74	NP	NP	NP	NP	NP	NP
75	F	HO	NP	NP	NP	alive	NA	NA	NP	NP	NP	75	NP	NP	NP	NP	NP	NP
76	F	HO	12-Dec-02	NP	C-section	alive	3.4	NA	NA	yes	no	76	yes	pus, healing	yes	NP	NP	NP
77	F	HO	9-Dec-02	NP	C-section	dead	NA	47	severe contracture/unresp to therapy	yes	no	77	yes	yes	yes	yes	NP	severe contracture
78	F	HO	28-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	78	NP	NP	NP	NP	NP	NP
79	F	HO	3-Mar-03	NP	NP	cull	NP	NP	NP	NP	NP	79	NP	NP	NP	NP	poor gait, posture	NP
80	F	HO	3-Mar-03	NP	NP	dead	NA	1	rotavirus	NP	NP	80	NP	NP	NP	NP	diarrhea	rotavirus
81	F	HO	17-Dec-02	NP	C-section	alive	3.2	NA	NA	yes	no	81	yes	ripped vessels	no	NP	required transfusion	NP
82	F	HO	17-Dec-02	NP	C-section	alive	3.2	NA	NA	yes	no	82	yes	proud flesh, pus	yes	NP	NP	NP
83	F	HO	18-Dec-02	NP	C-section	alive	3.2	NA	NA	yes	no	83	yes	proud flesh, pus	yes	NP	NP	NP
84	F	HO	19-Dec-02	NP	C-section	alive	3.2	NA	NA	yes	no	84	yes	proud flesh, pus	yes	yes	NP	NP
85	F	HO	19-Dec-02	NP	C-section	alive	3.2	NA	NA	yes	no	85	yes	proud flesh, pus	yes	yes	NP	NP
86	F	JE	2-Dec-02	NP	C-section	dead	NA	0	euthanized	NP	NP	86	NP	NP	NP	NP	NP	severe contracture, fluid filled belly
87	F	JE	3-Dec-02	NP	C-section	alive	3.7	NA	NA	yes	no	87	yes	no	no	yes	NP	NP
88	F	JE	4-Dec-02	NP	C-section	alive	3.7	NA	NA	yes	no	88	yes	proud flesh	no	yes	NP	NP
89	F	JE	5-Dec-02	NP	C-section	alive	3.6	NA	NA	yes	no	89	yes	proud flesh	no	yes	NP	NP
90	F	HO	12-Dec-02	NP	C-section	alive	3.4	NA	NA	yes	no	90	yes	no	no	no	NP	NP
91	F	HO	12-Dec-02	NP	C-section	alive	3.4	NA	NA	yes	no	91	yes	moist, pus	yes	NP	depressed	NP
92	F	HO	12-Dec-02	NP	C-section	dead	NA	0	unable to determine	yes	no	92	yes	pus, moist	yes	NP	depressed	NP
93	F	HO	16-Dec-02	NP	C-section	alive	3.3	NA	NA	yes	no	93	yes	no	no	no	NP	NP
94	F	HO	16-Dec-02	NP	C-section	alive	3.3	NA	NA	yes	no	94	yes	no	no	no	NP	NP
95	F	HO	16-Dec-02	NP	C-section	dead	NA	0	euthanized	NP	NP	95	NP	NP	NP	NP	NP	severe contracture
96	F	HO	16-Dec-02	NP	C-section	alive	3.3	NA	NA	yes	no	96	yes	large internal stump	no	NP	slight contracture	NP
97	F	HO	16-Dec-02	NP	C-section	dead	NA	0	euthanized	NP	NP	97	NP	NP	NP	NP	NP	severe contracture, fluid filled belly
98	F	HO	1-Sep-02	34.1	Natural	alive	6.8	NA	NA	no	yes	98	no	no	no	no	thermoregulation	NP
99	F	HO	1-Sep-02	34.1	Natural	alive	6.8	NA	NA	no	yes	99	no	yes	no	yes	thermoregulation	NP
100	M	HO	7-Nov-02	NP	C-section	alive	4.6	NA	NA	yes	no	100	yes	pus, proud flesh	yes	yes	NP	NP
101	F	HO	9-Dec-02	NP	C-section	alive	3.5	NA	NA	yes	no	101	yes	proud flesh, swollen	no	NP	mild contracture	NP
102	F	HO	9-Dec-02	NP	C-section	alive	3.5	NA	NA	yes	no	102	yes	large, proud flesh	no	yes	NP	NP
103	F	AR	17-Oct-02	NP	C-section	alive	5.3	NA	NA	no	no	103	no	yes	no	no	NP	NP
104	F	AR	18-Oct-02	NP	C-section	alive	5.2	NA	NA	no	no	104	no	no	no	no	NP	NP
105	F	AR	5-Nov-02	45.5	C-section	dead	NA	0	euthanized	NP	NP	105	NP	NP	NP	NP	NP	severe torticollis, arthrogryphosis
106	F	BS	7-Mar-03	NP	NP	NP	NP	NP	NP	NP	NP	106	NP	NP	NP	yes	NP	NP
107	F	HO	23-Oct-02	NP	C-section	dead	NA	2	euthanized	yes	no	107	yes	NP	NP	NP	NP	hypoxemia, rapid deterioration
108	F	AN	31-Oct-02	NP	Natural	alive	4.8	NA	NA	yes	no	108	yes	pus, proud flesh	yes	yes	NP	diarrhea
109	F	AN	5-Nov-02	NP	C-section	dead	NA	0	euthanized	NP	NP	109	NP	NP	NP	NP	NP	abn dev
110	F	AN	18-Nov-02	NP	C-section	alive	4.2	NA	NA	yes	no	110	yes	some pus	yes	no	NP	NP
111	F	AN	18-Nov-02	NP	C-section	alive	4.2	NA	NA	yes	no	111	yes	no	no	no	NP	NP
112	F	AN	21-Nov-02	NP	C-section	alive	4.1	NA	NA	NP	NP	112	NP	NP	NP	NP	NP	NP
113	M	Red HO	8-Jan-02	NP	C-section	dead	NA	22	pyelonephritis/umbilicus	no	no	113	yes	proud flesh, moist	no	no	NP	nephritis
114	M	Red HO	9-Jan-02	NP	C-section	alive	2.5	NA	NA	no	no	114	yes	no	no	no	NP	NP
115	M	Red HO	2-Feb-03	NP	Natural	alive	1.7	NA	NA	no	no	115	yes	no	NP	NP	NP	NP
116	M	Red HO	6-Feb-03	NP	C-section	alive	1.5	NA	NA	yes	no	116	yes	large	NP	NP	NP	NP
117	M	Red HO	10-Feb-03	NP	C-section	alive	1.4	NA	NA	yes	no	117	yes	no	NP	NP	contracture	NP
118	M	Red HO	13-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	118	NP	NP	NP	yes	NP	NP
119	M	Red HO	1-Apr-03	NP	NP	NP	NP	NP	NP	NP	NP	119	NP	NP	NP	NP	NP	NP
120	M	HO	2-Jan-03	NP	C-section	alive	2.7	NA	NA	yes	no	120	yes	large and nasty	NP	NP	abcess on side of neck (IV side)	NP

Calf #	Sex	Breed	Birth Date	Birth Wt (kg)	Birth	Current Status	Age 03/24/03 (mos)	Age at Death (d)	Cause of Death	Glucose Req'd	Thermoreg. Prob.	Calf #	Oxygen Req'd	Umbilicus (Probs.)	Umbilicus Hernia/ Infection	Umbilical Surgery	Noted Minor Problems	Major Problems
121	M	HO	2-Jan-03	NP	C-section	alive	2.7	NA	NA	yes	no	121	yes	no	NP	NP	NP	NP
122	M	HO	6-Jan-03	NP	C-section	alive	2.6	NA	NA	yes	no	122	yes	proud flesh, moist	NP	NP	contracture, req'd phys therapy	transfusion needed
123	M	HO	28-Jan-03	NP	C-section	dead	NA	9	pyelonephritis/umbilicus	yes	no	123	yes	NP	NP	NP	contracted front fetlocks	NP
124	M	HO	28-Jan-03	NP	C-section	alive	1.8	NA	NA	yes	no	124	yes	large and moist	no	NP	NP	NP
125	M	HO	6-Feb-03	NP	C-section	dead	NA	0	euthanized	NP	NP	125	NP	NP	NP	NP	NP	severe contracture, rotation
126	M	HO	10-Feb-03	NP	C-section	alive	1.4	NA	NA	yes	no	126	yes	ripped vessels	no	NP	large cotyledons, normal	NP
127	M	HO	10-Feb-03	NP	C-section	alive	1.4	NA	NA	yes	no	127	yes	NP	NP	NP	NP	NP
128	M	HO	12-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	128	NP	NP	NP	yes	cryptorchid	NP
129	M	HO	13-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	129	NP	NP	NP	yes	NP	NP
130	M	HO	16-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	130	NP	NP	NP	NP	right testicle not descended	NP
131	M	HO	21-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	131	NP	NP	NP	yes	left testicle not descended	NP
132	M	HO	24-Feb-03	NP	NP	NP	NP	NP	NP	NP	NP	132	NP	NP	NP	NP	NP	NP
133	M	HO	26-Apr-03	NP	NP	NP	NP	NP	NP	NP	NP	133	NP	NP	NP	NP	NP	NP
134	M	HO	26-Apr-03	NP	NP	NP	NP	NP	NP	NP	NP	134	NP	NP	NP	NP	NP	NP
KEY																		
NP= Not Provided																		
2WP= Two Weeks Premature																		

Table E-6: Assay Dates (6-18 month calves)

	Calf #	Breed	Sex	DOB	Assay Date	Age (Days)	
Clones	10	Holstein	F	6-Jun-02	15-Apr-03	313	
	98	Holstein	F	2-Sep-02	30-Apr-03	240	
	99	Holstein	F	2-Sep-02	30-Apr-03	240	
	103	Red Angus	F	17-Oct-02	7-May-03	202	
	104	Red Angus	F	18-Oct-02	23-Apr-03	187	
	108	Angus	F	31-Oct-02	7-May-03	188	
	60	Texas Lon	F	22-May-02	23-Apr-03	336	
	24	Holstein	M	30-Nov-01	10-Jun-03	557	
	25	Holstein	M	12-Dec-01	10-Jun-03	545	
	26	Holstein	M	18-Dec-01	10-Jun-03	539	
	27	Holstein	M	21-Dec-01	10-Jun-03	536	
	33	Holstein	M	17-Dec-01	10-Jun-03	540	
	35	Holstein	M	7-Feb-02	10-Jun-03	488	
	36	Holstein	M	8-Feb-02	10-Jun-03	487	
	38	Holstein	M	20-Feb-02	10-Jun-03	475	
	67	Holstein	M	26-Jul-02	10-Jun-03	319	
	69	Holstein	M	15-Aug-02	10-Jun-03	299	
	70	Holstein	M	16-Aug-02	10-Jun-03	298	

Individual animal clinical chemistry data at birth

Birth	Blood Chem	Sodium	Potassium	Chloride	Bicarbonate	Anion Gap	Urea	Creatine-rb	Calcium	Phosphate	Magnesium-xb	Total Protein	Albumin-bulk	Globulin	A/G	Glucose	AST/P5P	SDH	Alk. Phos.
	Ref Low	134	3.9	94	22	17	10	0.4	8.3	4.2	1.7	7.2	3.2	3.5	0.6	31	53	10	23
	Ref High	145	5.3	105	30	24	25	1	10.4	7.7	2.2	9.4	4.2	5.8	1.2	77	162	50	78
	Units	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mg/dL	mg/dL	mg/dL	mg/dL	mEq/L	g/dL	g/dL	g/dL		mg/dL	U/L	U/L	U/L
Controls	**140**	145	5.3	100	21	29	8	2.4	12.4	6.7	2.1	4.2	2.7	1.5	1.8	60	47	4	348
	141	141	5.8	93	27	27	8	2.6	11.8	5.9	2	4.1	2.7	1.4	1.93	58	54	4	418
	135	142	7.8	86	16	48	43	5	15.1	12.3	4.6	4.5	2.4	2.1	1.14	12	386	145	882
	136	134	7.3	93	31	17	11	0.9	10.4	6.7	1.7	5.8	2.5	3.3	0.76	87	162	<2	229
	137	141	8.5	99	15	36	25	2.5	13.9	13.3	3	4.6	3.2	1.4	2.29	182	182	211	379
	138	140	6.2	96	28	22	10	1.4	11.5	6.9	2	4.7	2.5	2.2	1.14	75	109	<2	840
	139	142	7.2	101	24	24	13	2.2	11.5	7.3	1.8	4	2.7	1.3	2.08	66	63	<2	126
	186	138	9.6	97	28	23	8	1.5	11.6	8.4	2.3	5.4	2.6	2.8	0.93	73	123	4	628
	187	138	6.5	94	28	23	10	1.7	11.2	7.8	2.3	5.7	2.4	3.3	0.73	69	137	4	1415
	188	140	8.3	95	19	34	10	2.6	12.9	9.9	2.2	4.3	2.8	1.5	1.87	248	76	6	564
	189	141	5.8	100	24	23	9	0.6	11.2	5.8	1.5	6.3	2.3	4	0.58	60	66	5	136
	190	144	6.2	101	25	24	30	1.2	11.8	9.1	2.4	6.3	2.8	3.5	0.8	65	53	0	143
	191	146	6.4	103	24	25	12	0.8	11.1	8.3	1.8	5.2	2.8	2.4	1.17	84	79	3	343
	192	142	6.7	98	26	25	5	0.9	11.4	8.1	1.5	4.5	2.6	1.9	1.37	81	72	10	225
	193	138	7.2	97	29	19	15	1.8	10.6	7.8	2	5.3	2.5	2.8	0.89	44	166	6	707
	194	140	6.5	99	27	21	10	1.7	11.3	7.4	1.9	5	2.4	2.6	0.92	60	170	2	487
	195	140	5.6	98	22	26	25	1.5	12.6	7.2	1.8	4.3	2.8	1.5	1.87	17	51	21	103
Clones	**43**	146	7.1	104	27	22	16	1.4	13	7.9	1.9	4.5	2.8	1.7	1.65	98	46	4	154
	71	140	6	99	25	22	17	2.1	12.8	7.2	1.9	4.2	2.5	1.7	1.47	7	18	3	215
	72	142	5.8	100	26	22	17	1.9	12.8	6.8	1.9	4.2	2.5	1.7	1.47	25	15	<2	214
	73	142	5.7	101	24	23	20	3.1	12.5	8.2	2	4.1	2.6	1.5	1.73	12	22	3	241
	75	143	5.5	97	21	31	20	2.2	13.3	8	2	4.4	2.6	1.8	1.44	5	15	4	204
	78	143	5.4	100	19	29	13	2.4	13.3	7.9	2	4.4	2.6	1.8	1.44	10	15	<2	355
	79	141	5.5	98	22	27	17	3.3	13.2	7.8	2.1	4.5	2.8	1.7	1.65	17	40	5	323
	80	149	5.7	101	19	35	13	2.5	13.5	8.5	2	4.5	2.9	1.6	1.81	69	22	6	372
	119	138	5.9	90	25	29	15	3.5	12.8	6	2.6	5.1	3	2.1	1.43	30	150	13	798
	132	139	5.4	94	27	23	17	1.7	12.6	7.3	2	4.4	2.9	1.5	1.93	42	17	3	378

Birth	Blood Chem	GGT	Total Bilirubin	Dir. Bilirubin	Ind. Bilirubin	Amylase	Cholesterol	CK	Iron	TIBC	% Saturation	hBA-random	Lipemia	Hemolysis	Icterus	IGF-1	Estradiol
	Ref Low	11	0	0	0		73	77	113	362	28	9				34.7	10
	Ref High	39	0.1	0	0.1		280	265	226	533	48	455				472.27	40
	Units	U/L	mg/dL	mg/dL	mg/dL	U/L	mg/dL	U/L	ug/dL	ug/dL	%	umol/L				ng/ml	pg/ml
Controls	**140**	21	0.3	0.1	0.2	53	22	331	136	421	32		16	39	0	203.57	29.3
	141	21	0.6	0.1	0.5	48	26	551	156	375	42	12	15	43	1	137.4	52.73
	135	691	0.8	0.2	0.6	40	20	11033	54	373	14	54.3	9	20	1	0.065	59.44
	136	1217	1.7	0.1	1.6	31	37	731	70	450	16	18.1	22	53	2	nes	27.66
	137	12	0.1	0.1	0	68	15	559	148	473	31	58.5	17	44	0	113.51	103.76
	138	1413	1	0.1	0.9	29	34	501	88	365	24	10.5	21	117	1	141.01	17.33
	139	8	1	0.1	0.9	19	28	356	104	367	28	13.7	21	75	1	87.77	25.5
	186	1012	0.3	0.1	0.2	24	24	379	53	397	13	9.5	25	55	0	145.61	28.53
	187	1829	0.9	0.1	0.8	39	27	768	82	392	21	12.7	5	66	1	57.12	33.99
	188	19	0.1	0.1	0	14	25	1209	57	411	14	16.2	0	114	1	3.07	37.99
	189	893	1.5	0.1	1.4	62	59	111	24	378	6	26.3	15	22	2	6.75	6.14
	190	391	0.8	0.1	0.7	60	37	65	29	411	7	7.6	16	35	1	11.79	9.81
	191	268	1.7	0.1	1.6	62	47	462	60	536	11	10	0	162	3	41.82	20.58
	192	383	0.9	0.1	0.8	33	45	87	44	348	13	21.7	2	15	1	16.69	6.18
	193	3213	1	0.2	0.8	48	44	513	47	354	13	15.2	21	251	1	127.94	18.79
	194	1623	1.2	0.1	1.1	42	29	929	48	337	14	16.6	26	33	2	29.67	42.88
	195	5	0.9	0.1	0.8	49	27	637	79	376	21	28.2	7	20	1	6.89	50.45
Clones	**43**	<3	0.2	0.1	0.1	33	10	125	48	532	9	0	0	293	0	92.06	46.04
	71	3	0.9	0.1	0.8	20	14	209	66	314	21	5	13	24	1	106.85	61.51
	72	3	0.7	0.1	0.6	20	14	61	65	318	20	2.4	13	29	1		44.54
	73	<3	0.4	0.1	0.3	14	11	106	52	264	20	2	10	122	0	128.66	48.06
	75	<3	0.2	0.1	0.1	15	12	118	33	342	10	1.1	25	7	0	71.67	23.34
	78	<3	0.3	0.1	0.2	28	16	179	112	331	34	8.2	20	21	0	97.68	35.42
	79	5	0.3	0.2	0.1		24	201	38	312	12	3.3	8	19	0	82.2	17.16
	80	6	0.1	0.1	0		18	186	164	343	48	12.3	0	13	0	149.44	27.38
	119	845	0.4	0.2	0.2	59	18	711	93	509	18	15.9	14	5	0	187.12	
	132	5	0.3	0.1	0.2	35	12	91	163	383	43		22	28	0		31.03

Individual animal hematology data at adulthood

Hemogram		Hematocrit (HCT)	Hemoglobin (HB)	RBC	MCV	MCH	MCHC	RDW	WBC	Seg. Neut.	Band. Neut.	Lymphocytes	Monocytes	Eosinophils	Basophils
	Ref Low	23	8.6	5.4	36	14	36	16.2	5.6	1.8	0	1.9	0	0	0
	Ref High	25	13.2	8.2	49	19	40	19.7	13.7	7.7	0	7.4	1.2	1.4	0.3
	Units	%	g /dL	mill/uL	fL	pg	g /dL	%	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL
Controls	**135**	33	11.8	7.5	44	16	35	18.4	6	3.7	0	1.7	0.1	0.5	0
	154	28	11	8.4	33	13	40	20.7	8.5	2.4	0	6.1	0	0	0
	206	28	10.8	8.9	32	12	39	23.3	13.2	5	0	7.5	0.7	0	0
	160	30	11.8	7.9	38	15	39	19.8	12.4	6	0	6.2	0.2	0	0
	161	34	11.4	8.6	39	13	34	22.2	13.4	3.1	0	10.1	0.3	0	0
	162	35	10.3	8.4	42	12	29	31.4	14.4	2.7	0	10.8	0.7	0	0.1
	163	34	10.3	9.4	37	11	30	28.3	14.6	4.5	0	9.9	0.1	0	0
	165	34	11.6	9.6	35	12	35	31.1	24.9	5.2	0	19.2	0.5	0	0
	169	33	11.5	9.7	34	12	35	21.1	12.2	4.5	0	7	0.2	0.5	0
	205	30	11.4	6.8	44	17	38	17.4	12.7	3.9	0	8.3	0.1	0.3	0.1
	207	29	11	7.3	39	15	38	18.4	8.6	2.6	0	5.8	0.1	0.1	0.1
	208														
	209	32	10.5	8.7	37	12	33	33.1	11.3	4.4	0	6.7	0.2	0	0
	210	34	10.6	9	38	12	31	32.1	10	4.4	0	5.1	0.4	0.1	0
	211	28	10.7	7.8	36	14	38	22.7	9.8	3.7	0	5.8	0.1	0.2	0
	212	34	10.5	8.6	39	12	31	30.2	12.5	5.1	0	6.8	0.6	0	0
	215	46	14.8	10.1	46	15	32	34.6	9.6	4.1	0	5.4	0	0.1	0
	216	32	12.7	9	36	14	40	24.1	8.4	2.8	0	5.5	0.1	0	0
	217	38	12.7	8	47	16	34	23.1	13.6	6.9	0	6.4	0.1	0.1	0
	218	42	13.8	10.2	42	14	33	36	9.9	2.6	0	6.8	0.4	0	0.1
	219	31	12.2	9	34	14	40	22.3	12.4	6.9	0	4.8	0.5	0	0.1
Clones	**24**	33	11	6.9	48	16	33	20.2	11.6	6.4	0	4.8	0.5	0	0
	25	32	10.7	6.9	46	16	34	23.8	13.9	6.1	0	7.2	0.6	0	0
	26	32	10.6	6.8	47	16	34	21.4	9.5	2.4	0	6.7	0.2	0.2	0
	27	32	10.5	6.7	47	16	33	20.5	7.8	2.5	0	4.8	0.3	0.2	0
	33	33	10.7	7.7	43	14	32	33	10.2	2.1	0	7	0.5	0.4	0.1
	35	34	11.1	7.7	44	15	33	33.9	10.9	2.7	0	7.7	0.2	0.1	0.1
	36	30	9.9	6.9	44	14	33	32.2	9.2	3	0	5.9	0.1	0.1	0.1
	38	31	9.7	6.6	46	15	32	28.3	10.5	4.7	0	5.4	0	0.4	0
	37	35	12.2	8.7	40	14	35	20.1	8.1	2.3	0	5.2	0.6	0.1	0
	55	30	11.1	8.6	35	13	37	21.7	10.5	2.1	0	7.6	0.5	0.3	0
	67	34	11.1	9.5	36	12	32	32.4	9.5	4.8	0	3.8	0.3	0.6	0
	69	31	10.1	9.5	33	11	33	29.5	8.2	2.5	0	5.4	0.1	0.2	0
	70	33	10.8	9.9	34	11	32	31.7	8.2	2.5	0	5.2	0.1	0.3	0
	98	28	10.8	8.9	32	12	38	22.6	8.1	2.1	0	5.4	0.2	0.1	0.3
	99	28	10.6	9.3	30	12	38	20.4	8.5	2.4	0	5.7	0.4	0	0
	103	28	10.5	7.2	40	15	37	21.6	8.6	3.5	0	4.9	0.2	0	0
	104	28	10.9	7.4	38	15	39	19.9	8.8	5.5	0	3	0.2	0.2	0
	108	37	13.8	11.9	31	12	37	19.4	8.2	3.5	0	3.9	0.3	0.2	0.2

Notes:

NSA	No Significant Abnormalities
NS	None Seen
N	Normal
SCM	Smudged Cells-Moderate

Hemogram		Platelet Smear	Platelets	MPV	TP-Ref	RBC Morphology	Acanthocytes	Anisocytosis	Echinocytes	Poikilocytes	Schistocytes	Parasites	WBC Exam	Plasma Appearance
	Ref Low		232	5.6	5.9									
	Ref High		596	8.2	8.1									hemolysis
	Units		thou/uL	fL	g /dL									
Controls	**135**	Incr.	812	16.8	8.3	NSA						NS	NSA	Moderate
	154	Adeq.	391	5.8	6.7			Mild				NS	NSA	N
	206	Incr. (*1)	601	5.5	6.8	NSA						NS	NSA	N
	160	Adeq.	259	6.6	7.3	NSA						NS	NSA	N
	161	Adeq.	391	7.4	7				Moderate			NS	NSA	N
	162	Adeq.	487	6.8	6.5				Moderate			NS	NSA	N
	163	Adeq.	515	6.3	7.2				Many			NS	NSA	N
	165	Adeq.	279	6.2	6.8	NSA						NS	Few	N
	169	Adeq.(*1)	559	5.9	7.2	NSA						NS	NSA	N
	205	Adeq.	309	10.7	7	NSA						NS	NSA	Slight
	207	Adeq.(*1)			6.6	NSA						NS	NSA	Slight
	208													
	209	Adeq.(*1)			7			Mild				NS	NSA	Slight
	210	Adeq.(*1)	117	6.4	7.3		Few					NS	NSA	Slight
	211	Adeq.	414	7.3	7			Mild				NS	NSA	N
	212	Adeq.	351	6.5	7.4	NSA						NS	NSA	N
	215	Adeq.(*1)	242	5.9	7.5	NSA						NS	NSA	Slight
	216	Incr.	671	6.3	6.7	NSA						NS	NSA	Slight
	217	Adeq.	468	6.3	6.5			Mild				NS	NSA	Slight
	218	Adeq.	422	6	6.9	NSA						NS	NSA	Slight
	219	Adeq.	583	6.3	7			Mild	Few			NS	NSA	Slight
Clones	**24**	Adeq.	398	7.2	7.3	NSA						NS	NSA	Slight
	25	Adeq.	313	6.7	6.8	NSA						NS	NSA	N
	26	Adeq.(*1)			7.2	NSA						NS	NSA	Slight
	27	Adeq.(*1)			7.2	NSA						NS	NSA	N
	33	Adeq.	392	5.8	7.8	NSA						NS	NSA	N
	35	Adeq.(*1)			7.4	NSA						NS	NSA	Slight
	36	Adeq.	335	6.6	7.4	NSA						NS	NSA	N
	38	Adeq.(*1)			7.5	NSA						NS	NSA	Slight
	37	Adeq.	328	12.4	7.5	NSA						NS	NSA	Slight
	55	Adeq.(*1)			6.8	NSA								Slight
	67	Adeq.(*1)			6.9	NSA						NS	NSA	Slight
	69	Incr.	658	5.9	7.7	NSA						NS	NSA	N
	70	Incr.	605	6	7.3	NSA						NS	NSA	N
	98	Adeq. (*1)	395	6.8	6.7			Mild				NS	NSA	N
	99	Incr.(*1)	622	5.5	7.4			Mild				NS	NSA	N
	103	Adeq.	337	11	6.8				Mod			NS	NSA	N
	104	Incr.	745	6.4	7.4	NSA						NS	NSA	N
	108	Adeq.	399	14.4	6.8				Few			NS	NSA	Slight

0-6 months	Blood Chem.	Sodium	Potassium	Chloride	Bicarbonate	Anion Gap	Urea	Creatine-rb	Calcium	Phosphate	Magnesium-xb	Total Protein	Albumin-bulk	Globulin	A/G	Glucose	AST/P5P	SDH	Alk. Phos.	GGT
	Ref Low	134	3.9	94	22	17	10	0.4	8.3	4.2	1.7	7.2	3.2	3.5	0.6	31	53	10	23	11
	Ref High	145	5.3	105	30	24	25	1	10.4	7.7	2.2	9.4	4.2	5.8	1.2	77	162	50	78	39
	Units	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mg/dL	mg/dL	mg/dL	mg/dL	mEq/L	g/dL	g/dL	g/dL		mg/dL	U/L	U/L	U/L	U/L
Controls	**142**	138	5.1	97	21	25	21	0.6	10.8	9.3	2	6.5	3.9	2.6	1.5	66	64	21	156	11
	143	142	5	100	23	24	13	0.4	10.7	9.6	2.1	5.9	3.6	2.3	1.57	65	80	18	184	9
	144	139	4.6	100	21	23	16	0.9	9.8	8.6	1.7	6.6	3.2	3.4	0.94	41	105	50	298	18
	145	139	5	98	22	24	18	0.6	10.2	8	1.7	6.7	3.5	3.2	1.09	38	100	26	184	17
	146	139	4.6	98	22	24	17	0.5	9.7	6.9	1.9	7.7	3.3	4.4	0.75	40	94	24	115	22
	147	143	4.5	98	25	25	7	0.6	10.4	8.5	1.8	7	3.7	3.3	1.12	39	73	34	238	14
	148	139	5.3	98	22	24	23	0.6	10.2	9.3	1.7	6.9	3.3	3.6	0.92	25	77	22	96	17
	149	143	5.2	97	26	25	11	0.6	10.7	10.1	1.8	6.9	3.6	3.3	1.09	66	93	32	235	11
	150	143	4.9	100	24	24	16	1.1	10.3	8.4	1.9	6.3	3.6	2.7	1.33	30	65	17	102	12
	151	138	5	98	22	23	27	0.6	9.7	6.9	1.6	6.9	3.5	3.4	1.03	34	118	26	101	13
	152	139	5.2	99	22	23	19	0.6	10.1	7.8	1.7	7.6	3.2	4.4	0.73	55	80	22	311	19
	153	138	5.2	98	23	22	18	0.6	9.5	7.3	1.6	6.2	3.4	2.8	1.21	5	62	15	117	18
	155	137	5.4	92	24	26	11	0.6	11	8.5	1.9	7.4	3.5	3.9	0.9	42	93	46	163	22
	156	139	4.9	97	24	23	9	0.5	10	8.4	1.9	5.9	2.9	3	0.97	42	93	33	138	7
	157	141	5.2	95	23	28	10	0.5	10.9	7.9	1.5	7.4	3.4	4	0.85	47	67	13	181	14
	158	141	4.8	96	23	27	11	0.6	10.3	10.1	1.9	7	3.7	3.3	1.12	52	106	38	307	18
	159	139	5.7	98	22	25	9	0.5	10.7	7.2	1.9	7.2	3.3	3.9	0.85	45	83	50	349	24
	162	137	6.7	98	27	19	12	0.5	10.5	9.1	1.8	6.9	3.4	3.5	0.97	53	104	7	449	7
	164	139	6.5	100	27	19	14	0.5	11.2	9.2	2	6.3	3.6	2.7	1.33	67	101	10	441	8
	166	140	6.3	103	25	18	15	0.5	10.7	9.9	2	6.2	3.6	2.6	1.38	49	100	21	415	10
	167	137	6.8	96	29	19	13	0.5	10.3	8.6	1.6	6.5	3	3.5	0.86	37	159	130	230	32
	168	135	7	96	27	19	9	0.6	10.7	9	1.8	6.8	3.5	3.3	1.06	59	105	10	439	8
	170	143	4.6	95	23	30	15	0.6	10.5	8.4	1.8	7.2	3.7	3.5	1.06	38	75	17	245	10
	171	145	5.1	98	23	29	15	0.5	10.9	9.1	1.8	6.4	3.6	2.8	1.29	38	91	24	232	10
	172	143	4.8	97	22	29	16	0.6	11.1	9.6	1.9	7.4	3.9	3.5	1.11	44	91	7	347	5
	173	144	5.1	100	23	26	12	0.6	10.7	8.8	1.9	6.8	3.7	3.1	1.19	36	71	23	201	8
	174	144	4.6	96	25	28	21	0.7	11.2	9.7	1.7	6.4	3.7	2.7	1.37	31	70	21	351	13
	175	142	4.5	96	25	26	14	0.7	10.9	9	1.9	7.6	3.6	4	0.9	38	91	29	199	14
	176	142	4.8	97	26	24	15	0.5	10	9	1.8	7	3	4	0.75	29	100	26	176	12
	177	143	5.1	95	23	30	16	0.7	11	9.9	2.1	6.8	3.5	3.3	1.06	18	85	23	248	16
	178	143	5	97	21	30	19	0.6	10.2	9.3	1.8	6.8	3.3	3.5	0.94	40	90	6	249	5
	179	142	4.9	97	22	28	17	0.7	10.4	8.9	1.9	6.7	3.4	3.3	1.03	52	83	11	237	8
	180	140	5.1	97	22	26	13	0.6	10.2	9.3	2	6.5	3.6	2.9	1.24	60	66	15	194	10
	181	143	4.5	96	24	28	15	0.5	10	10.2	1.8	6.9	3.5	3.4	1.03	31	84	21	171	13
	182	142	5.3	96	20	31	15	0.5	10.1	7.4	1.6	7.5	3.1	4.4	0.7	7	89	11	173	16
	183	142	5.1	95	23	29	12	0.5	10.7	8.8	2.1	6.8	3.6	3.2	1.13	26	103	31	305	7
	184	141	5.3	94	23	29	15	0.6	11.2	9.8	1.8	7.2	3.7	3.5	1.06	32	65	15	263	14
	185	141	5.2	94	26	26	15	0.5	11.3	9.3	1.8	8.3	3.3	5	0.66	24	85	23	249	16
	196	139	4.8	100	23	21	13	0.5	10.2	8.3	2	5.9	2.9	3	0.97	27	73	35	217	14
	197	141	5.2	97	25	24	17	0.7	10.5	8.7	2.1	6.6	3.5	3.1	1.13	42	76	33	444	16
	198	139	4.9	97	23	24	12	0.6	10.5	7.6	1.8	7.4	3.3	4.1	0.8	20	65	24	303	14
	199	142	5.5	95	28	25	20	0.7	10.8	7.2	1.9	6.5	3.5	3	1.17	12	94	37	239	14
	200	138	5.5	101	21	22	7	0.6	10.7	9	1.7	5.4	3.5	1.9	1.84	42	89	174	339	22
	201	142	5	100	26	21	7	0.6	10.6	9.1	1.7	6.1	3.4	2.7	1.26	61	48	12	338	16
	202	142	5.3	100	23	24	8	0.7	10.5	10.6	1.8	5.9	3.9	2	1.95	52	67	22	402	14
	203	141	5.7	99	27	21	7	0.6	11	9.1	1.8	6.1	3.4	2.7	1.26	60	41	23	419	20
	204	140	5.9	97	24	25	8	0.6	10.9	9.9	1.9	7.1	3.2	3.9	0.82	44	80	46	419	16
Clones	**39**	141	5.8	100	28	19	8	0.6	10.8	8.5	1.9	5.6	3.1	2.5	1.25	69	48	11	392	19
	40	141	5.6	100	27	20	9	0.7	11.7	10.8	1.9	5.7	3.5	2.2	1.59	62	72	11	549	20
	41	141	5.3	100	27	19	11	0.5	10.3	8.4	1.9	6.4	3.7	2.7	1.37	56	77	8	157	10
	42	141	5.9	100	26	21	11	0.5	10.4	9.7	2.2	6.6	3.6	3	1.2	64	81	15	220	10
	56	140	5.4	96	26	23	19	0.7	10.9	10.7	2.1	6.3	3.6	2.7	1.33	15	119	13	239	4

	58	133	6.8	93	25	22	11	<0.1	9.2	7.4	1.6	7.9	2.2	5.7	0.39	9	118	<2	87	<3
		Sodium	**Potassium**	**Chloride**	**Bicarbonate**	**Anion Gap**	**Urea**	**Creatine-rb**	**Calcium**	**Phosphate**	**Magnesium-xb**	**Total Protein**	**Albumin-bulk**	**Globulin**	**A/G**	**Glucose**	**AST/P5P**	**SDH**	**Alk. Phos.**	**GGT**
Clones	**71**	140	5.7	102	21	23	9	0.6	10.7	11.2	1.9	5.5	3.6	1.9	1.89	105	64	12	579	12
	72	140	5.5	102	30	14	7	0.5	10.9	11.3	1.9	5.1	3.5	1.6	2.19	121	64	14	616	10
	73	142	6.2	105	28	15	9	0.6	11	11.4	1.8	5.2	3.5	1.7	2.06	123	72	7	474	4
	74	139	4.7	98	29	17	10	0.7	11	10.9	1.7	5.6	3.5	2.1	1.67	113	54	16	531	12
	76	140	5.9	97	24	25	12	0.6	10	9.6	2.2	6.9	3.5	3.4	1.03	22	102	6	191	12
	78	140	5.7	101	27	18	14	0.6	11.2	9.8	2	6.2	3.8	2.4	1.58	119	76	31	627	16
	79	142	6.2	99	25	24	11	1.2	11.1	10.2	1.5	5.4	3.6	1.8	2	51	64	12	511	13
	81	141	5.7	98	25	24	8	0.5	10.9	8.6	2.1	7	3.5	3.5	1	<2	104	14	189	6
	82	140	6.5	100	24	23	11	0.4	10.8	8.3	2.2	7.9	3.2	4.7	0.68	2	110	<2	163	<3
	83	138	6.3	96	25	23	11	0.5	10.1	8.9	1.9	7.6	2.8	4.8	0.58	<2.1	82	9	159	11
	85	142	6	101	26	21	11	0.6	11.2	9	2	6.6	3.5	3.1	1.13	25	80	9	145	8
	87	141	6.1	95	27	25	14	0.4	10.6	11.1	1.9	7.4	3.3	4.1	0.8	17	139	26	222	15
	88	139	6.1	94	27	24	12	0.3	10.2	10.7	1.9	7.2	3.3	3.9	0.85	4	177	15	176	8
	89	137	6.5	95	27	22	11	0.2	10.4	10.1	2	7.1	3.1	4	0.78	22	142	22	212	<3
	90	138	5.3	98	22	23	11	0.3	10.3	8.4	2.2	6.7	3.4	3.3	1.03	14	141	<2	226	<3
	93	137	5.2	94	22	26	9	0.6	10.6	10.4	1.9	7.8	3	4.8	0.63	13	62	13	148	12
	94	139	5.7	99	24	22	11	0.4	10.5	9.5	2.3	6.9	3.4	3.5	0.97	9	116	2	177	<3
	96	137	5.2	95	25	22	17	0.5	10.6	10.3	2.2	7.5	3.7	3.8	0.97	51	85	6	223	<3
	100	135	5.3	96	24	20	6	0.5	10.8	9.1	2.1	8	3.4	4.6	0.74	78	67	11	265	22
	101	140	5.2	100	27	18	10	0.5	10	8.9	1.8	7.2	3.1	4.1	0.76	53	131	30	154	7
	102	138	5.4	96	26	21	15	0.4	10.3	9.5	1.7	6.9	3.3	3.6	0.92	32	110	5	158	<3
	106	138	6.2	101	26	17	10	0.7	10.9	9	1.8	5.9	3.6	2.3	1.57	88	69	11	670	10
	110	140	5.3	99	23	23	16	0.8	10.5	11.3	1.8	6.1	3.5	2.6	1.35	45	103	15	170	6
	111	140	5.4	99	24	22	17	1.1	10.1	11.8	1.8	6.5	3.5	3	1.17	35	94	25	124	14
	114	138	5.3	97	26	20	9	0.7	10.8	9.1	2	6.2	3.7	2.5	1.48	31	95	6	242	6
	115	143	5.2	102	26	20	12	0.6	11.6	9.9	1.9	5.8	3.8	2	1.9	60	79	35	336	10
	116	141	5.2	99	26	21	11	0.7	10	9.6	1.9	6.7	3.5	3.2	1.09	30	131	37	246	3
	117	142	5.4	101	27	19	9	0.4	11.6	9.8	1.8	6.9	3.3	3.6	0.92	38	92	84	261	11
	118	138	5.8	100	23	21	10	0.5	10.5	9.1	1.9	7.1	3.3	3.8	0.87	27	96	11	202	6
	119	138	5	96	28	19	9	0.8	11.3	9.6	1.6	5.7	3.5	2.2	1.59	59	59	25	379	21
	120	137	5	98	24	20	11	0.5	10.5	9	2	7.4	3.3	4.1	0.8	45	80	9	186	8
	121	141	5.5	102	23	22	8	0.6	10.4	9	1.9	6.1	3.8	2.3	1.65	42	81	15	277	11
	124	140	5.2	98	28	19	14	0.6	11.2	9.1	1.8	6.7	3.3	3.4	0.97	43	108	26	254	12
	126	141	6.3	102	24	21	8	0.3	10.9	9.6	2.2	5.9	3.5	2.4	1.46	33	86	<2	261	<3
	127	137	4.7	96	25	21	10	0.6	11.5	8.5	1.8	8	3.2	4.8	0.67	40	70	27	226	12
	128	140	5.5	98	24	24	8	0.4	10.9	9	1.9	6.5	3.6	2.9	1.24	13	94	2	232	10
	129	139	5.5	98	27	20	8	0.5	10.9	9.4	2.1	5.9	3.6	2.3	1.57	60	53	6	251	13
	130	142	5.9	102	25	21	9	0.3	11.7	9.2	2	5.4	3.5	1.9	1.84	60	73	7	693	6
	131	140	5	99	25	21	7	0.6	11.2	8.2	1.8	6.9	3.4	3.5	0.97	38	60	15	270	12
	132	143	5.5	100	25	24	7	0.7	10.7	8.8	2.1	5.9	3.7	2.2	1.68	23	44	9	258	20

0-6 months	Blood Chem.	Total Bilirubin	Dir. Bilirubin	Ind. Bilirubin	Amylase	Cholesterol	CK	Iron	TIBC	% Saturation	hBA-random	Lipemia	Hemolysis	Icterus	IGF-1	Estradiol
	Ref Low	0	0	0		73	77	113	362	28	9				34.7	10
	Ref High	0.1	0	0.1		280	265	226	533	48	455				472.27	40
	Units	mg/dL	mg/dL	mg/dL	U/L	mg/dL	U/L	ug/dL	ug/dL	%	umol/L				ng/ml	pg/ml
Controls	142	0.1	0	0.1	35	106	124	210	584	36	45.3	25	18	0		
	143	0	0	0	38	110	244	184	432	43	18.7	0	31	0		
	144	0.1	0	0.1	37	130	225	147	374	39	49.5	25	1	0		
	145	0.1	0	0.1	36	119	287	145	370	39	28.4	24	12	0		
	146	0	0	0	26	65	207	149	341	44	12.8	18	14	0		
	147	0.1	0	0.1	37	75	256	141	412	34	29.7	12	13	0		
	148	0.1	0	0.1	26	78	272	158	350	45	25.9	15	16	0		
	149	0	0	0	18	92	268	180	438	41	14.9	5	49	w2		
	150	0	0	0	86	88	197	156	411	38	26.2	14	8	0		
	151	0.1	0.1	0	35	68	373	85	336	25	26.2	16	23	0		
	152	0.1	0.1	0	28	66	185	138	371	37	52	15	2	0		
	153	0.2	0.1	0.1	22	90	103	45	370	12	70.2	8	9	0		
	155	0.1	0	0.1	20	72	213	120	369	33	43.4	19	6	0	114.97	>4.00
	156	0.1	0	0.1	32	63	261	182	335	54	29.7	15	46	0	61.68	7.46
	157	0.1	0	0.1	20	73	134	112	420	27	13.7	20	17	0	203.71	4.47
	158	0.1	0	0.1	15	67	217	194	550	35	78.8	15	20	0	278.97	4.29
	159	0.1	0	0.1	29	71	292	147	422	35	33.5	19	16	0	157.34	4
	162	0.1	0	0.1	30	63	700	208	389	53	24.5	6	99	0	49.29	5.34
	164	0.1	0	0.1	38	73	308	209	475	44	28.5	0	65	0	104.91	5.52
	166	0.1	0	0.1	36	59	285	180	431	42	38.8	0	55	0	232.32	4.75
	167	0	0	0	29	86	346	88	340	26	42.3	5	31	0	17.99	2.47
	168	0.1	0	0.1	26	71	1427	135	403	33	26.6	11	28	0	96.89	6.84
	170	0.1	0	0.1	33	78	168	209	449	47	14.2	6	16	0	220.82	7.78
	171	0.1	0	0.1	37	84	249	211	459	46	27.8	5	23	0	282.16	4.07
	172	0.1	0	0.1	41	81	169	187	487	38	17.5	8	93	0	255.05	3.12
	173	0.1	0	0.1	41	78	161	184	449	41	14.1	11	12	0	127.16	8.1
	174	0.1	0	0.1	44	74	183	215	511	42	28.2	3	7	0	408.27	10.63
	175	0.1	0	0.1	32	76	180	186	417	45	21.1	0	13	0	136.19	7.06
	176	0.1	0	0.1	27	83	215	187	391	48	17.6	5	21	0	146.96	7.23
	177	0.1	0	0.1	47	96	248	186	423	44	27.1	1	8	0	283.27	4.48
	178	0.1	0	0.1	29	81	258	142	345	41	11.7	6	78	0	125.93	6.91
	179	0.1	0	0.1	52	60	299	202	467	43	14.6	14	55	0	369.11	7.05
	180	0.1	0	0.1	47	68	147	176	411	43	9.7	4	32	0	205.57	12.31
	181	0.1	0	0.1	33	91	248	195	386	51	27.1	1	8	0	82.3	4.74
	182	0	0	0	35	53	161	129	422	31	11.6	6	19	0	478.03	2.92
	183	0.1	0	0.1	12	82	426	199	437	46	24	15	14	0	1.76	5.29
	184	0.1	0	0.1	40	80	168	167	424	39	12.8	2	7	0	257.93	14.87
	185	0.1	0	0.1	29	37	183	145	395	37	17.6	0	17	0	159.15	2.89
	196	0.1	0	0.1	30	50	213	136	316	43	79.5	18	11	0	17.29	18.48
	197	0.1	0	0.1	26	58	373	243	442	55	43.1	10	39	0	28.12	7.03
	198	0.2	0	0.2	34	54	126	130	337	39	40	15	15	0	25.95	4.82
	199	0.1	0	0.1	49	38	233	139	494	28	38.9	11	17	0	8.41	4.17
	200	0.1	0	0.1	16	123	184	27	540	5	33.5	17	0	0	108.21	4.82
	201	0.1	0	0.1	33	109	72	90	564	16	24.1	17	19	0	204.5	6.29
	202	0.2	0	0.2	22	93	165	29	620	5	18.2	20	6	0	216.46	8
	203	0.1	0	0.1	24	89	96	22	600	4	21.7	6	14	0	192.22	5.39
	204	0.1	0	0.1	32	99	16832	591	5	37.2	15	7	0	0	269.77	8.44
Clones	39	0.2	0.1	0.1	19	86	281	81	432	19	15.4	0	16	0	113.37	4.73
	40	0.1	0	0.1	22	116	230	180	511	35	37.7	9	36	0	252.12	7.04
	41	0.1	0	0.1	26	98	243	155	353	44	37	7	51	0	114.43	4.24
	42	0.1	0	0.1	28	65	540	188	426	44	17.9	13	18	0	274.83	9.34
	56	0.1	0	0.1	18	109	238	244	441	55	18.2	26	67	0	270.54	5.4

	58	0.2	0	0.2	14	52	243	106	209	51	0	17	424	0	7.64	17.99
		Total Bilirubin	**Dir. Bilirubin**	**Ind. Bilirubin**	**Amylase**	**Cholesterol**	**CK**	**Iron**	**TIBC**	**% Saturation**	**hBA-random**	**Lipemia**	**Hemolysis**	**Icterus**	**IGF-1**	**Estradiol**
Clones	**71**	0.2	0	0.2	18	116	375	113	632	18	15.7	18	38	0		
	72	0.2	0	0.2	15	122	189	114	642	18	14.7	30	45	0	109.3	
	73	0.3	0	0.3	16	119	751	145	584	25	12.3	25	103	0		
	74	0.1	0	0.1	15	113	158	153	555	28	30.1	21	21	0	204.52	
	76	0.1	0	0.1	51	94	662	214	384	56	24.1	11	97	0	196.87	7.2
	78	0.2	0	0.2	29	99	209	273	640	43	39	9	27	0		
	79	0.2	0	0.2	28	153	208	131	465	28	19.9	22	58	0	149.6	<4
	81	0.2	0	0.2	23	66	1228	157	376	42	36.4	5	43	0	81.54	8.52
	82	0.2	0	0.2	23	90	505	169	379	45	28.2	14	114	0	92.21	6.01
	83	0.2	0	0.2	17	62	353	83	296	28	32.3	9	19	0	66.45	5.72
	85	0.1	0	0.1	29	77	340	140	416	34	34.6	3	37	0	60.33	10.38
	87	0.1	0	0.1	20	94	1215	203	391	52	17.1	8	9	0	150.05	5.21
	88	0.1	0	0.1	20	105	1265	187	321	58	20.7	10	115	0	110.26	7.77
	89	0.1	0	0.1	18	100	442	243	330	74	16	3	112	0	119.66	5.06
	90	0.2	0	0.2	24	90	2642	209	403	52	14	27	156	0	248.1	7.33
	93	0.1	0	0.1	23	74	151	159	337	47	16.6	16	5	0	124.6	5.14
	94	0.1	0	0.1	26	80	510	193	373	52	25.5	10	111	0	191.99	6.23
	96	0.1	0	0.1	29	74	282	190	465	41	10.5	11	125	0	294.68	5.25
	100	0.1	0	0.1	10	99	110	170	474	36	24.6	10	42	0	436.09	<4
	101	0.1	0	0.1	17	84	1225	164	340	48	17.3	9	102	0	67.59	6.34
	102	0.1	0	0.1	25	98	287	152	407	37	13.1	13	137	0	135.97	4.55
	106	0.2	0	0.2	24	121	556	118	449	26	45.2	17	88	0		
	110	0.1	0	0.1	20	98	238	168	361	47	53.9	2	56	0	256.46	6
	111	0.1	0.1	0	12	76	515	156	320	49	28.4	5	17	0	85.33	9.94
	114	0.1	0	0.1	29	72	234	238	429	55	11	0	70	0	213.19	5.47
	115	0.1	0	0.1	42	95	127	295	459	64	17.8	7	30	0	435	8.37
	116	0.1	0	0.1	35	83	1974	217	388	56	19.3	6	151	0	114.68	4.36
	117	0.1	0	0.1	32	109	127	208	382	54	31.7	21	96	0	260.65	3.63
	118	0.2	0	0.2	38	71	319	162	351	46	35.6	5	107	0	64.08	9.05
	119	0.2	0	0.2	35	121	125	217	431	50	18.1	25	32	0	227.89	<4
	120	0.1	0	0.1	8	71	217	170	358	47	43.1	7	57	0	155.03	5.88
	121	0.1	0	0.1	9	68	685	171	476	36	24.9	4	47	0	244.45	7.11
	124	0.1	0	0.1	31	50	841	143	384	37	103.1	22	33	0	143.7	<4
	126	0.1	0	0.1	24	107	129	204	467	44	27.7	14	253	0	253.54	5.51
	127	0.1	0	0.1	25	84	217	93	424	22	72.9	5	20	0	295.63	<4
	128	0.1	0	0.1	25	135	1056	196	459	43	17.3	8	161	0	113.91	6.71
	129	0.1	0	0.1	24	133	140	187	443	42	32.5	0	42	0	121.47	9.98
	130	0.2	0	0.2	18	127	110	283	547	52	15.4	5	153	0	387.73	8.32
	131	0.1	0	0.1	25	113	152	151	437	35	52.4	0	19	0	216.38	5.21
	132	0.1	0	0.1	28	136	492	197	466	42	24.7	8	24	0	96.56	8.45

Adult	Blood Chem.	Sodium	Potassium	Chloride	Bicarbonate	Anion Gap	Urea	Creatine-rb	Calcium	Phosphate	Magnesium-xb	Total Protein	Albumin-bulk	Globulin	A/G	Glucose	AST/P5P	SDH
	Ref Low	134	3.9	94	22	17	10	0.4	8.3	4.2	1.7	7.2	3.2	3.5	0.6	31	53	10
	Ref High	145	5.3	105	30	24	25	1	10.4	7.7	2.2	9.4	4.2	5.8	1.2	77	162	50
	Units	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mg/dL	mg/dL	mg/dL	mg/dL	mEq/L	g/dL	g/dL	g/dL		mg/dL	U/L	U/L
Controls	**135**	140	4.5	103	21	21	11	0.6	9.6	8.6	2	6.8	3.4	3.4	1	71	120	5
	154	138	4.7	98	27	18	12	0.7	10.9	8.1	2.1	6.7	3.7	3	1.23	88	68	18
	206	136	4.7	97	24	20	5	0.6	10.7	9.6	1.7	6.9	3.4	3.5	0.97	90	83	17
	160	147	5.9	101	23	29	21	0.9	10.1	9.3	1.9	7.3	3.9	3.4	1.15	31	84	23
	161	143	4.7	97	22	29	18	0.7	10.5	9.4	2	6.8	3.7	3.1	1.19	38	88	22
	162	140	4.8	98	23	24	16	0.7	9.7	8.5	1.8	6.4	3.1	3.3	0.94	8	65	13
	163	144	4.8	99	15	35	15	0.7	10.5	9	1.9	7.4	3.5	3.9	0.9	44	86	16
	165	146	4.9	99	18	34	16	0.7	10.6	8.7	1.8	7	3.9	3.1	1.26	22	100	18
	169	143	4.7	96	22	30	13	0.5	11	8.8	1.8	7.3	3.8	3.5	1.09	32	72	25
	205	139	4.5	95	26	23	15	0.8	10.7	8.3	1.8	7.8	3.3	4.5	0.73	81	88	15
	207	137	4.9	95	26	21	10	0.7	10.4	7.7	2	6.6	3.6	3	1.2	83	72	7
	208	139	4.5	96	27	21	10	0.4	10.2	8.9	1.9	7	3.4	3.6	0.94	95	77	4
	209	139	4.8	94	27	23	12	0.6	9.9	9.2	1.8	7	3.2	3.8	0.84	87	109	34
	210	140	4.8	96	26	23	13	0.8	10.1	7.7	2.1	7.1	3.5	3.6	0.97	92	98	15
	211	138	4.3	93	26	23	10	0.6	10.3	8.1	2	7	3.2	3.8	0.84	92	85	19
	212	142	5.5	98	26	24	13	0.6	10.7	8.1	2.1	7.5	3.4	4.1	0.83	90	79	30
	215	141	5.2	100	19	27	16	0.9	10.6	8.8	2	7	3.8	3.2	1.19	49	109	8
	216	143	4.6	101	21	26	18	0.8	9.5	9.5	1.8	6.5	3.5	3	1.17	80	99	25
	217	143	4.6	100	20	28	12	0.7	9.4	10.1	1.8	6.2	3.4	2.8	1.21	74	98	23
	218	141	4.7	99	21	26	18	0.7	10.3	9.7	1.9	6.6	3.7	2.9	1.28	58	74	23
	219	141	4.6	99	21	26	14	0.9	10	9.7	1.9	6.7	3.7	3	1.23	89	88	26
Clones	**24**	140	4.7	96	24	25	18	1	10.4	8	1.9	7.2	3.6	3.6	1	78	86	13
	25	141	4.3	96	25	24	12	1	10.4	8.1	1.8	6.8	3.6	3.2	1.13	72	95	16
	26	139	4.5	95	25	24	17	1	10	8.6	1.8	7	3.4	3.6	0.94	80	97	19
	27	139	5.2	94	25	25	13	0.9	10.5	8.7	1.9	7.2	3.5	3.7	0.95	78	100	14
	33	143	4.7	98	25	25	14	1.2	10.4	8.3	1.9	7.9	3.6	4.3	0.84	73	68	11
	35	143	4.7	98	26	24	14	0.9	10.2	8.1	2	7.6	3.4	4.2	0.81	75	73	14
	36	140	4.3	96	27	21	12	0.9	10	7.7	1.9	7.6	3.5	4.1	0.85	81	67	15
	38	139	4.2	96	25	22	15	1	9.7	9.1	1.9	7.1	3.4	3.7	0.92	88	75	15
	37	140	5	100	26	19	6	0.5	10.3	8.4	2	6.5	3.6	2.9	1.24	88	92	3
	55	140	5.4	99	25	21	13	0.6	10.8	9.9	2	6.6	3.8	2.8	1.36	45	81	7
	67	145	5	99	23	28	17	0.6	10.6	10.6	1.9	6.9	3.5	3.4	1.03	70	103	15
	69	144	4.8	97	26	26	14	0.7	10	9.3	1.7	7.5	3.1	4.4	0.7	73	85	22
	70	147	4.9	100	27	25	15	0.6	10.7	9.9	2.1	7.2	3.7	3.5	1.06	81	82	20
	98	136	4.2	96	27	17	11	0.6	10	8.5	1.8	6.8	3.7	3.1	1.19	91	59	15
	99	135	4.5	96	23	21	10	0.6	9.4	8.5	1.8	7.4	3.4	4	0.85	92	62	13
	103	144	6.6	100	23	28	13	0.2	10.7	10.2	2.1	7.1	3.7	3.4	1.09	12	133	7
	104	143	6.3	100	27	22	17	0.5	10.8	9.9	2	6.9	3.5	3.4	1.03	32	122	5
	108	137	5.5	97	24	22	18	1.1	10.6	9.2	1.9	6.7	3.7	3	1.23	24	97	15

Adult	Blood Chem.	Alk. Phos.	GGT	Total Bilirubin	Dir. Bilirubin	Ind. Bilirubin	Amylase	Cholesterol	CK	Iron	TIBC	% Saturation	hBA-random	Lipemia	Hemolysis	Icterus	IGF-1	Estradiol
	Ref Low	23	11	0	0	0		73	77	113	362	28	9				34.7	10
	Ref High	78	39	0.1	0	0.1		280	265	226	533	48	455				472.27	40
	Units	U/L	U/L	mg/dL	mg/dL	mg/dL	U/L	mg/dL	U/L	ug/dL	ug/dL	%	umol/L				ng/ml	pg/ml
Controls	**135**	121	5	0.1	0	0.1	82	86	176	167	364	46	3.2	20	71	1		
	154	173	15	0.2	0	0.2	32	113	170	164	428	38	50.9	8	10	0	312.99	>4.0
	206	231	11	0.1	0	0.1	44	102	227	212	450	47	28.4	14	45	0	278.28	4.2
	160	182	15	0.1	0	0.1	38	113	153	183	476	38	34.2	5	32	0	324.29	11.14
	161	292	12	0.1	0	0.1	26	95	196	205	493	42	14.6	5	4	0	332.05	8
	162	167	9	0.1	0	0.1	23	69	141	224	343	65	20.4	0	26	0	43.75	4.1
	163	276	11	0.1	0	0.1	36	74	217	157	406	39	27.5	13	19	0	193.53	4.48
	165	191	14	0.1	0	0.1	48	88	207	239	494	48	28.6	12	42	0	291.66	6.93
	169	280	10	0.1	0	0.1	43	74	243	200	508	39	17.7	24	0	0	153.69	5.77
	205	134	16	0.1	0	0.1	45	105	176	114	411	28	15.1	25	14	0	732.75	9.15
	207	193	11	0.1	0	0.1	43	90	117	195	435	45	21.3	13	39	0	752.54	11.41
	208	178	<3	0.1	0	0.1	39	66	242	194	439	44	7.8	24	202	0	793.84	10.36
	209	151	23	0.1	0	0.1	23	67	150	156	410	38	15.1	5	25	0	732.63	10.35
	210	168	18	0.1	0	0.1	33	86	465	170	439	39	32.7	18	64	0	816.99	10.53
	211	169	20	0.1	0	0.1	29	58	168	164	482	34	7.9	17	24	0	861.08	7.91
	212	169	22	0.1	0	0.1	14	77	165	151	529	29	13.5	12	6	0	875.72	12.44
	215	158	<3	0.1	0	0.1	24	172	936	167	403	41	18.9	33	119	1	155.44	>4.0
	216	213	8	0.1	0	0.1	44	141	421	192	407	47	18	15	33	1	215.93	>4.0
	217	197	6	0	0	0	45	181	328	182	401	45	19.5	2	23	1	253.77	4.3
	218	127	8	0.1	0	0.1	44	160	253	180	376	48	20.9	7	41	2	218.14	5.26
	219	254	10	0.1	0	0.1	30	155	640	161	433	37	26.8	9	27	1	338.43	>4.0
Clones	**24**	109	13	0.1	0	0.1	46	104	181	132	409	32	17.1	16	8	0	924.04	14.16
	25	174	15	0.1	0	0.1	33	113	884	142	388	37	29.4	18	3	0	769.08	11.94
	26	151	13	0.1	0	0.1	34	113	161	130	359	36	20.2	15	2	0	381.04	10.62
	27	163	14	0.1	0	0.1	39	122	205	143	401	36	16.5	15	28	0	618.84	12.02
	33	104	16	0.1	0	0.1	34	81	145	150	470	32	31.5	14	9	0	915.45	24.33
	35	132	13	0.1	0	0.1	34	77	188	192	488	39	16.6	12	10	0	937.54	23.92
	36	113	16	0.1	0	0.1	35	78	103	155	479	32	12.3	11	5	0	875.68	15.4
	38	164	15	0.1	0	0.1	33	125	121	101	353	29	24.9	6	9	0	622.08	7.62
	37	136	3	0.1	0	0.1	37	85	432	179	478	37	14.4	22	84	1		
	55	184	7	0.1	0	0.1	43	129	177	230	466	49	27.9	28	60	0	414.52	9.6
	67	186	17	0.1	0	0.1	29	86	426	193	455	42	12.3	5	34	0	691.78	12.4
	69	138	22	0.1	0	0.1	27	88	263	156	385	41	10.7	25	0	0	445.23	15.82
	70	148	22	0.1	0	0.1	31	99	448	183	464	39	14.3	8	1	0	548.43	10.06
	98	231	11	0.1	0	0.1	39	91	196	132	363	36	23.5	5	8	0	279.26	>4.0
	99	192	11	0.1	0	0.1	37	96	217	129	331	39	20.8	9	5	0	217.88	4.28
	103	182	<3	0.1	0	0.1	33	122	1222	165	390	42	7.7	20	353	0	169.03	6.91
	104	179	<3	0.1	0	0.1	35	108	313	230	430	53	7.3	18	262	0	331.99	7.07
	108	111	12	0.1	0	0.1	33	111	227	165	304	54	29.5	20	30	0	33.25	7.5

Hemogram		Hematocrit (HCT)	Hemoglobin (HB)	RBC	MCV	MCH	MCHC	RDW	WBC	Seg. Neut.	Band. Neut.	Lymphocytes	Monocytes	Eosinophils	Basophils
	Ref Low	23	8.6	5.4	36	14	36	16.2	5.6	1.8	0	1.9	0	0	0
	Ref High	25	13.2	8.2	49	19	40	19.7	13.7	7.7	0	7.4	1.2	1.4	0.3
	Units	%	g /dL	mill/uL	fL	pg	g /dL	%	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL	thou/uL
Controls	**135**	33	11.8	7.5	44	16	35	18.4	6	3.7	0	1.7	0.1	0.5	0
	154	28	11	8.4	33	13	40	20.7	8.5	2.4	0	6.1	0	0	0
	206	28	10.8	8.9	32	12	39	23.3	13.2	5	0	7.5	0.7	0	0
	160	30	11.8	7.9	38	15	39	19.8	12.4	6	0	6.2	0.2	0	0
	161	34	11.4	8.6	39	13	34	22.2	13.4	3.1	0	10.1	0.3	0	0
	162	35	10.3	8.4	42	12	29	31.4	14.4	2.7	0	10.8	0.7	0	0.1
	163	34	10.3	9.4	37	11	30	28.3	14.6	4.5	0	9.9	0.1	0	0
	165	34	11.6	9.6	35	12	35	31.1	24.9	5.2	0	19.2	0.5	0	0
	169	33	11.5	9.7	34	12	35	21.1	12.2	4.5	0	7	0.2	0.5	0
	205	30	11.4	6.8	44	17	38	17.4	12.7	3.9	0	8.3	0.1	0.3	0.1
	207	29	11	7.3	39	15	38	18.4	8.6	2.6	0	5.8	0.1	0.1	0.1
	208														
	209	32	10.5	8.7	37	12	33	33.1	11.3	4.4	0	6.7	0.2	0	0
	210	34	10.6	9	38	12	31	32.1	10	4.4	0	5.1	0.4	0.1	0
	211	28	10.7	7.8	36	14	38	22.7	9.8	3.7	0	5.8	0.1	0.2	0
	212	34	10.5	8.6	39	12	31	30.2	12.5	5.1	0	6.8	0.6	0	0
	215	46	14.8	10.1	46	15	32	34.6	9.6	4.1	0	5.4	0	0.1	0
	216	32	12.7	9	36	14	40	24.1	8.4	2.8	0	5.5	0.1	0	0
	217	38	12.7	8	47	16	34	23.1	13.6	6.9	0	6.4	0.1	0.1	0
	218	42	13.8	10.2	42	14	33	36	9.9	2.6	0	6.8	0.4	0	0.1
	219	31	12.2	9	34	14	40	22.3	12.4	6.9	0	4.8	0.5	0	0.1
Clones	**24**	33	11	6.9	48	16	33	20.2	11.6	6.4	0	4.8	0.5	0	0
	25	32	10.7	6.9	46	16	34	23.8	13.9	6.1	0	7.2	0.6	0	0
	26	32	10.6	6.8	47	16	34	21.4	9.5	2.4	0	6.7	0.2	0.2	0
	27	32	10.5	6.7	47	16	33	20.5	7.8	2.5	0	4.8	0.3	0.2	0
	33	33	10.7	7.7	43	14	32	33	10.2	2.1	0	7	0.5	0.4	0.1
	35	34	11.1	7.7	44	15	33	33.9	10.9	2.7	0	7.7	0.2	0.1	0.1
	36	30	9.9	6.9	44	14	33	32.2	9.2	3	0	5.9	0.1	0.1	0.1
	38	31	9.7	6.6	46	15	32	28.3	10.5	4.7	0	5.4	0	0.4	0
	37	35	12.2	8.7	40	14	35	20.1	8.1	2.3	0	5.2	0.6	0.1	0
	55	30	11.1	8.6	35	13	37	21.7	10.5	2.1	0	7.6	0.5	0.3	0
	67	34	11.1	9.5	36	12	32	32.4	9.5	4.8	0	3.8	0.3	0.6	0
	69	31	10.1	9.5	33	11	33	29.5	8.2	2.5	0	5.4	0.1	0.2	0
	70	33	10.8	9.9	34	11	32	31.7	8.2	2.5	0	5.2	0.1	0.3	0
	98	28	10.8	8.9	32	12	38	22.6	8.1	2.1	0	5.4	0.2	0.1	0.3
	99	28	10.6	9.3	30	12	38	20.4	8.5	2.4	0	5.7	0.4	0	0
	103	28	10.5	7.2	40	15	37	21.6	8.6	3.5	0	4.9	0.2	0	0
	104	28	10.9	7.4	38	15	39	19.9	8.8	5.5	0	3	0.2	0.2	0
	108	37	13.8	11.9	31	12	37	19.4	8.2	3.5	0	3.9	0.3	0.2	0.2

Notes:

NSA	No Significant Abnormalities
NS	None Seen
N	Normal
SCM	Smudged Cells-Moderate

Hemogram		Platelet Smear	Platelets	MPV	TP-Ref	RBC Morphology	Acanthocytes	Anisocytosis	Echinocytes	Poikilocytes	Schistocytes	Parasites	WBC Exam	Plasma Appearance
	Ref Low		232	5.6	5.9									
	Ref High		596	8.2	8.1									hemolysis
	Units		thou/uL	fL	g /dL									
Controls	**135**	Incr.	812	16.8	8.3	NSA						NS	NSA	Moderate
	154	Adeq.	391	5.8	6.7			Mild				NS	NSA	N
	206	Incr. (*1)	601	5.5	6.8	NSA						NS	NSA	N
	160	Adeq.	259	6.6	7.3	NSA						NS	NSA	N
	161	Adeq.	391	7.4	7				Moderate			NS	NSA	N
	162	Adeq.	487	6.8	6.5				Moderate			NS	NSA	N
	163	Adeq.	515	6.3	7.2				Many			NS	NSA	N
	165	Adeq.	279	6.2	6.8	NSA						NS	Few	N
	169	Adeq.(*1)	559	5.9	7.2	NSA						NS	NSA	N
	205	Adeq.	309	10.7	7	NSA						NS	NSA	Slight
	207	Adeq.(*1)			6.6	NSA						NS	NSA	Slight
	208													
	209	Adeq.(*1)			7			Mild				NS	NSA	Slight
	210	Adeq.(*1)	117	6.4	7.3		Few					NS	NSA	Slight
	211	Adeq.	414	7.3	7			Mild				NS	NSA	N
	212	Adeq.	351	6.5	7.4	NSA						NS	NSA	N
	215	Adeq.(*1)	242	5.9	7.5	NSA						NS	NSA	Slight
	216	Incr.	671	6.3	6.7	NSA						NS	NSA	Slight
	217	Adeq.	468	6.3	6.5			Mild				NS	NSA	Slight
	218	Adeq.	422	6	6.9	NSA						NS	NSA	Slight
	219	Adeq.	583	6.3	7			Mild	Few			NS	NSA	Slight
Clones	**24**	Adeq.	398	7.2	7.3	NSA						NS	NSA	Slight
	25	Adeq.	313	6.7	6.8	NSA						NS	NSA	N
	26	Adeq.(*1)			7.2	NSA						NS	NSA	Slight
	27	Adeq.(*1)			7.2	NSA						NS	NSA	N
	33	Adeq.	392	5.8	7.8	NSA						NS	NSA	N
	35	Adeq.(*1)			7.4	NSA						NS	NSA	Slight
	36	Adeq.	335	6.6	7.4	NSA						NS	NSA	N
	38	Adeq.(*1)			7.5	NSA						NS	NSA	Slight
	37	Adeq.	328	12.4	7.5	NSA						NS	NSA	Slight
	55	Adeq.(*1)			6.8	NSA								Slight
	67	Adeq.(*1)			6.9	NSA						NS	NSA	Slight
	69	Incr.	658	5.9	7.7	NSA						NS	NSA	N
	70	Incr.	605	6	7.3	NSA						NS	NSA	N
	98	Adeq. (*1)	395	6.8	6.7			Mild				NS	NSA	N
	99	Incr.(*1)	622	5.5	7.4			Mild				NS	NSA	N
	103	Adeq.	337	11	6.8				Mod			NS	NSA	N
	104	Incr.	745	6.4	7.4	NSA						NS	NSA	N
	108	Adeq.	399	14.4	6.8				Few			NS	NSA	Slight

Cyagra Meat Composition Study Animal Information								
Updated	**27-Jul-04**							
	Calf #	**Breed**	**Sex**	**Age (Months)**	**DOB**	**Assay Date**	**Age (Mo)**	**Sample ID**
Clones	33-1	Cross Breed	F	24	3-Apr-02	19-Mar-04	24	A-F1
	39-2	Angus	F	27	12-Jan-02	19-Mar-04	27	A-F2
	263	Brangus	F	43	29-Aug-00	19-Mar-04	43	A-F3
	264	Brangus	F	43	29-Aug-00	19-Mar-04	43	A-F4
	265	Brangus	F	43	29-Aug-00	19-Mar-04	43	A-F5
	144-2	Holstein	F	15	12-Dec-02	19-Mar-04	15	A-F6
	232-3	R&W Holstein	M	17	10-Feb-03	6-Jul-04	17	A-M1
	232-4	R&W Holstein	M	17	13-Feb-03	6-Jul-04	17	A-M2
	248-4	Holstein	M	17	12-Feb-03	6-Jul-04	17	A-M3
	248-8	Holstein	M	17	21-Feb-03	6-Jul-04	17	A-M4
	200-1	Angus	M	12	8-Jul-03	6-Jul-04	12	A-M5
Controls	247bx	Cross Breed	F	>12	adult	14-Apr-04	>12	B-F1
	248bx	Cross Breed	F	>12	adult	14-Apr-04	>12	B-F2
	261bx	Red Angus	F	>12	adult	14-Apr-04	>12	B-F3
	271bx	Cross Breed	F	>12	adult	14-Apr-04	>12	B-F4
	278bx	Cross Breed	F	>12	adult	14-Apr-04	>12	B-F5
	919g	Holstein	F	>12	5-Oct-02		>12	B-F6
	441g	R&W Holstein	M	17	23-Feb-03	6-Jul-04	17	B-M1
	444g	R&W Holstein	M	16	1-Mar-03	6-Jul-04	16	B-M2
	440g	Holstein	M	17	19-Feb-03	6-Jul-04	17	B-M3
	445g	Holstein	M	17	23-Feb-03	6-Jul-04	17	B-M4
	336or	Holstein	M	20	18-Nov-02	6-Jul-04	20	B-M5

Cyagra Meat Study

SampleNo		36108	36115	36116	36117	36118	36119	36120	36121	36122
Marked ID		AF1 - 1	AF1 - 2	AF1 - 3	AF2- 1	AF2- 2	AF2- 3	AF3- 1	AF3- 2	AF3- 3
Analyte	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
Crude Fat	%	16.7	12.2	46.5	17.5	14.9	30.1	8.1	15.2	27
Moisture	%	62.22	68.38	41.42	61.92	62.86	49.17	69.25	60.93	55.54
Protein - Combustion	%	20.55	20.01	12.14	19.78	18.64	15.34	20.46	18.72	16.15
Protein - Kjeldahl	%	20.38	20.28	12.07	19.31	18.77	15.54	20.69	19.17	16.58
Ash	%	0.95	0.93	0.6	0.89	0.91	0.85	1.16	0.87	1.48
Balance (protein+moist+ash+fat)	%	100.25	101.79	100.59	99.62	97.44	95.66	99.20	96.17	100.60
Amino Acid Profile (results below)										
Tryptophan	%	0.24	0.25	0.14	0.24	0.23	0.2	0.26	0.23	0.19
Aspartic Acid	%	1.82	1.87	1.14	1.79	1.76	1.51	1.97	1.6	1.4
Threonine	%	0.78	0.89	0.55	0.87	0.85	0.74	0.9	0.69	0.6
Serine	%	0.79	0.77	0.47	0.74	0.74	0.62	0.7	0.51	0.45
Glutamic Acid	%	2.82	3.01	1.8	2.86	2.86	2.46	3.17	2.59	2.26
Proline	%	0.8	0.85	0.5	0.83	0.85	0.67	1.05	0.82	0.84
Glycine	%	0.91	0.93	0.57	0.92	0.91	0.69	1.25	0.95	1.03
Alanine	%	1.15	1.19	0.73	1.14	1.12	0.95	1.34	1.05	0.97
Cystine	%	0.23	0.22	0.14	0.2	0.21	0.16	0.23	0.21	0.18
Valine	%	0.58	0.67	0.45	0.7	0.7	0.63	1.08	0.86	0.74
Methionine	%	0.55	0.51	0.31	0.49	0.48	0.37	0.53	0.5	0.41
Isoleucine	%	0.52	0.6	0.39	0.66	0.65	0.57	0.97	0.78	0.66
Leucine	%	1.37	1.46	0.91	1.44	1.43	1.25	1.65	1.34	1.14
Tyrosine	%	0.62	0.65	0.4	0.63	0.62	0.54	0.7	0.56	0.46
Phenylalanine	%	0.71	0.75	0.47	0.74	0.74	0.65	0.88	0.71	0.61
Histidine	%	0.59	0.61	0.41	0.62	0.6	0.52	0.8	0.62	0.54
Lysine, Total	%	1.49	1.61	0.98	1.57	1.57	1.36	1.82	1.49	1.27
Arginine	%	1.11	1.2	0.73	1.13	1.16	0.97	1.4	1.13	1.02
Hydroxyproline	%	0.19	0.17	0.07	0.16	0.25	0.09	0.07	0.3	0.3
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	%	0	0	0	0	0	0	0	0	0
C10:0 Decanoic (Capric)	%	0	0	0	0	0	0	0	0	0.01
C11:0 Undecanoic (Hendecanoic)	%	0	0	0	0	0	0	0	0	0
C12:0 Dodecanoic (Lauric)	%	0	0	0.02	0	0	0.01	0	0	0.02
C14:0 Tetradecanoic (Myristic)	%	0.36	0.23	1.02	0.43	0.35	0.74	0.22	0.36	0.67
C14:1 Tetradecenoic (Myristoleic)	%	0.28	0.14	0.5	0.41	0.26	0.51	0.19	0.22	0.2
C15:0 Pentadecanoic	%	0.05	0.04	0.17	0.06	0.05	0.12	0.02	0.06	0.11
C15:1 Pentadecenoic	%	0	0	0	0	0	0	0	0	0
C16:0 Hexadecanoic (Palmitic)	%	3.54	2.53	10.1	3.82	3.36	6.75	1.95	3.71	6.55

Cyagra Meat Study

SampleNo		36108	36115	36116	36117	36118	36119	36120	36121	36122
Marked ID		AF1 - 1	AF1 - 2	AF1 - 3	AF2- 1	AF2- 2	AF2- 3	AF3- 1	AF3- 2	AF3- 3
Analyte	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	%	1.19	0.68	2.33	1.58	1.1	2.05	0.8	1.05	1.12
C16:2 Hexadecadienoic	%	0.1	0.07	0.34	0.11	0.08	0.22	0.04	0.11	0.2
C16:3 Hexadecatrienoic	%	0	0	0	0	0	0	0	0	0
C16:4 Hexadecatetraenoic	%	0	0	0	0.01	0	0	0	0	0
C17:0 Heptadecanoic (Margaric)	%	0.1	0.09	0.4	0.1	0.1	0.24	0.04	0.13	0.28
C17:1 Heptadecenoic Margaroleic	%	0.18	0.12	0.46	0.21	0.16	0.33	0.09	0.15	0.23
C18:0 Octadecanoic (Stearic)	%	1.06	1.06	4.6	0.98	1.11	2.41	0.42	1.34	3.34
C18:1 Octadecenoic (Oleic)	%	7.93	5.6	20.6	8.02	6.65	13	3.57	6.64	11.6
C18:2 Octadecadienoic (Linoleic)	%	0.38	0.31	1.21	0.39	0.35	0.72	0.18	0.41	0.73
C18:3 Octadecatrienoic (Linolenic)	%	0.07	0.05	0.25	0.07	0.06	0.12	0.04	0.08	0.17
C18:4 Octadecatetraenoic	%	0.15	0.09	0.38	0.1	0.08	0.19	0.05	0.1	0.15
C19:0 Nonadecanoic	%	0	0	0	0	0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	%	0	0	0	0	0	0	0	0	0.02
C20:1 Eicosenoic (Gadoleic)	%	0.06	0.05	0.19	0.05	0.04	0.1	0.02	0.04	0.08
C20:2 Eicosadienoic	%	0	0	0.02	0	0	0	0	0	0
C20:3 Eicosatrienoic	%	0	0	0	0	0	0	0	0	0.01
C20:4 Eicosatetraenoic (Arachidonic)	%	0	0	0	0.01	0	0.02	0	0	0.01
C20:5 Eicosapentaenoic	%	0	0	0	0	0	0	0	0	0
C21:0 Heneicosanoic	%	0	0	0	0	0	0	0	0	0
C21:5 Heneicosapentaenoic	%	0	0	0	0	0	0	0	0	0
C22:0 Docosanoic (Behenic)	%	0	0	0	0	0	0	0	0	0
C22:1 Docosenoic (Erucic)	%	0	0	0	0	0	0	0	0	0
C22:2 Docosadienoic	%	0	0	0	0	0	0	0	0	0
C22:3 Docosatrienoic	%	0	0	0	0	0	0	0	0	0
C22:4 Docosatetraenoic	%	0	0	0	0	0	0	0	0	0
C22:5 Docosapentaenoic	%	0	0	0	0	0	0	0	0	0
C22:6 Docosahexaenoic	%	0	0	0	0	0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	%	0	0	0	0	0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	%	0	0	0	0	0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	%	9.64	6.59	24	10.3	8.21	16	4.66	8.11	13.2
Total Polyunsat. Fatty Acids Calc.	%	0.71	0.54	2.19	0.71	0.58	1.29	0.32	0.72	1.27
Saturated Fatty Acids	%	5.11	3.95	16.3	5.41	4.98	10.3	2.66	5.61	11
Total Fat (as triglycerides)	%	16.2	11.6	44.6	17.2	14.4	28.9	7.99	15.2	26.8
Calcium	mg/100g	3.4	4	20	3.7	5.2	53	4.7	4.8	15
Iron	mg/100 g	1.9	2	1.6	2.1	4.1	2.2	2.3	4.1	3.8

Cyagra Meat Study

SampleNo		36108	36115	36116	36117	36118	36119	36120	36121	36122
Marked ID		AF1 - 1	AF1 - 2	AF1 - 3	AF2- 1	AF2- 2	AF2- 3	AF3- 1	AF3- 2	AF3- 3
Analyte	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phosphorus	mg/100 g	170	160	110	160	150	150	190	150	240
Zinc	mg/100 g	3.5	4.4	2.2	3.8	4.2	3.1	4	4	3.1
Cholesterol	mg/100g	64.9	58	72.4	77.5	69.9	87.1	52.2	59.6	72.5
Niacin	mg/100 g	5.12	3.95	2.52	4.6	4.45	3.13	5.63	3.47	3.13
Vitamin B1 - Thiamine Hydrochloride	mg/100 g	0.0665	0.0728	0.055	0.0505	0.0592	0.0408	0.0432	0.0522	0.0624
Vitamin B2 - Riboflavin	mg/100 g	0.192	0.2	0.166	0.223	0.231	0.256	0.237	0.167	0.196
Vitamin B6	mg/100 g	0.382	0.32	0.151	0.284	0.23	0.217	0.358	0.307	0.198
Vitamin B12	mg/100 g	0.00229	0.00344	0.00216	0.00248	0.00284	0.00372	0.00267	0.00268	0.00278
Vitamin E	IU/100g	0.505	0.382	0.774	0.841	0.5	0.718	0.615	0.627	0.66

Cyagra Meat Study

SampleNo	36123	36124	36125	36126	36127	36128	36129	36131	36132	36133
Marked ID	AF4- 1	AF4- 2	AF4- 3	AF5- 1	AF5- 2	AF5- 3	AF6- 1	AF6- 2	AF6- 3	AM1- 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Crude Fat	13.5	33	13	10.7	7.7	18.1	9.3	7.5	6.8	6.6
Moisture	62.21	50.03	65.91	67.55	68.82	61.96	69.23	72.23	69.68	69.12
Protein - Combustion	18.82	15.95	20.49	18.84	21	19.34	21.89	20.15	23.04	21.45
Protein - Kjeldahl	18.77	15.73	20.61	19.34	20.97	19.76	22.17	20.35	22.54	22.15
Ash	0.84	0.81	0.9	0.9	0.96	0.88	1.08	1.02	1.07	1.11
Balance (protein+moist+ash+fat)	95.32	99.57	100.42	98.49	98.45	100.70	101.78	101.10	100.09	98.98
Amino Acid Profile (results below)										
Tryptophan	0.22	0.2	0.26	0.23	0.26	0.24	0.27	0.27	0.26	0.27
Aspartic Acid	1.74	1.49	1.91	1.81	2	1.84	2.01	1.98	2.12	2.12
Threonine	0.84	0.72	0.93	0.88	0.97	0.91	0.99	0.97	1.06	0.92
Serine	0.74	0.62	0.8	0.76	0.84	0.77	0.85	0.84	0.87	0.68
Glutamic Acid	2.88	2.42	3.12	2.97	3.26	3	3.33	3.41	3.57	3.44
Proline	0.81	0.64	0.86	0.81	0.83	0.84	0.93	0.92	1.09	1.04
Glycine	0.91	0.68	0.94	0.88	0.84	0.88	0.94	0.95	1.3	1.14
Alanine	1.13	0.94	1.23	1.16	1.24	1.18	1.29	1.26	1.46	1.36
Cystine	0.2	0.17	0.22	0.21	0.23	0.22	0.25	0.24	0.24	0.25
Valine	0.72	0.59	0.76	0.72	0.81	0.78	0.85	0.85	1.06	1.15
Methionine	0.47	0.4	0.53	0.49	0.57	0.53	0.57	0.56	0.57	0.57
Isoleucine	0.68	0.53	0.71	0.65	0.76	0.71	0.8	0.78	0.94	1.04
Leucine	1.43	1.22	1.56	1.48	1.66	1.52	1.68	1.64	1.8	1.79
Tyrosine	0.62	0.54	0.67	0.65	0.73	0.65	0.71	0.71	0.76	0.74
Phenylalanine	0.74	0.63	0.79	0.78	0.88	0.77	0.85	0.84	0.93	0.94
Histidine	0.6	0.54	0.69	0.64	0.71	0.69	0.72	0.64	0.76	0.82
Lysine, Total	1.56	1.31	1.69	1.62	1.81	1.65	1.81	1.8	1.95	1.98
Arginine	1.16	0.96	1.24	1.18	1.29	1.23	1.32	1.34	1.51	1.45
Hydroxyproline	0.21	0.12	0.07	0.1	0.04	0.16	0.15	0.12	0.28	0.19
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0	0	0	0	0	0	0
C10:0 Decanoic (Capric)	0	0.01	0	0	0	0	0	0	0	0
C11:0 Undecanoic (Hendecanoic)	0	0	0	0	0	0	0	0	0	0
C12:0 Dodecanoic (Lauric)	0	0.02	0	0.01	0	0.01	0	0	0	0
C14:0 Tetradecanoic (Myristic)	0.3	0.87	0.33	0.26	0.2	0.48	0.24	0.13	0.14	0.16
C14:1 Tetradecenoic (Myristoleic)	0.21	0.54	0.31	0.09	0.06	0.4	0.04	0.03	0.05	0.04
C15:0 Pentadecanoic	0.05	0.14	0.04	0.05	0.03	0.06	0.04	0.03	0.02	0.03
C15:1 Pentadecenoic	0	0	0	0	0	0	0	0	0	0
C16:0 Hexadecanoic (Palmitic)	3.08	7.85	2.98	2.73	1.97	4.33	2.21	1.61	1.52	1.48

Cyagra Meat Study

SampleNo	36123	36124	36125	36126	36127	36128	36129	36131	36132	36133
Marked ID	AF4- 1	AF4- 2	AF4- 3	AF5- 1	AF5- 2	AF5- 3	AF6- 1	AF6- 2	AF6- 3	AM1- 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	1.02	2.27	1.32	0.51	0.33	1.66	0.25	0.25	0.33	0.28
C16:2 Hexadecadienoic	0.09	0.26	0.08	0.07	0.05	0.12	0.08	0.05	0.04	0.05
C16:3 Hexadecatrienoic	0	0	0	0	0	0	0	0	0	0
C16:4 Hexadecatetraenoic	0	0	0	0	0	0	0	0	0	0
C17:0 Heptadecanoic (Margaric)	0.1	0.26	0.07	0.1	0.07	0.1	0.1	0.08	0.06	0.07
C17:1 Heptadecenoic Margaroleic	0.13	0.35	0.14	0.09	0.06	0.19	0.05	0.06	0.06	0.05
C18:0 Octadecanoic (Stearic)	0.99	2.52	0.63	1.17	0.92	0.96	1.94	1.1	0.78	1.01
C18:1 Octadecenoic (Oleic)	5.67	14.1	5.67	4.3	3.01	7.94	3.25	3.25	2.82	2.75
C18:2 Octadecadienoic (Linoleic)	0.33	0.77	0.28	0.29	0.2	0.37	0.36	0.24	0.17	0.25
C18:3 Octadecatrienoic (Linolenic)	0.07	0.16	0.06	0.06	0.04	0.08	0.03	0.03	0.02	0.02
C18:4 Octadecatetraenoic	0.09	0.21	0.1	0.05	0.03	0.13	0.03	0.05	0.04	0.03
C19:0 Nonadecanoic	0	0	0	0	0	0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	0	0	0	0	0	0	0.01	0	0	0
C20:1 Eicosenoic (Gadoleic)	0.04	0.11	0.04	0.02	0.02	0.05	0.02	0.03	0.02	0.02
C20:2 Eicosadienoic	0	0	0	0	0	0	0	0	0	0
C20:3 Eicosatrienoic	0	0	0	0	0	0	0	0	0	0
C20:4 Eicosatetraenoic (Arachidonic)	0	0	0	0	0.01	0	0.02	0.02	0.01	0.01
C20:5 Eicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C21:0 Heneicosanoic	0	0	0	0	0	0	0	0	0	0
C21:5 Heneicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:0 Docosanoic (Behenic)	0	0	0	0	0	0	0	0	0	0
C22:1 Docosenoic (Erucic)	0	0	0	0	0	0	0	0	0	0
C22:2 Docosadienoic	0	0	0	0	0	0	0	0	0	0
C22:3 Docosatrienoic	0	0	0	0	0	0	0	0	0	0
C22:4 Docosatetraenoic	0	0	0	0	0	0	0	0	0	0
C22:5 Docosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:6 Docosahexaenoic	0	0	0	0	0	0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0	0	0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	0	0	0	0	0	0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	7.07	17.3	7.48	5.01	3.48	10.3	3.62	3.62	3.28	3.14
Total Polyunsat. Fatty Acids Calc.	0.59	1.41	0.53	0.49	0.36	0.72	0.53	0.42	0.31	0.38
Saturated Fatty Acids	4.53	11.7	4.06	4.33	3.21	5.95	4.56	2.97	2.54	2.76
Total Fat (as triglycerides)	12.8	31.9	12.7	10.3	7.4	17.8	9.14	7.35	6.43	6.59
Calcium	5.1	4	5.7	3.4	12	6.3	31	3.4	6.4	16
Iron	2.1	2	2	2.5	2.7	2	1.9	2	1.9	2.7

Cyagra Meat Study

SampleNo	36123	36124	36125	36126	36127	36128	36129	36131	36132	36133
Marked ID	AF4- 1	AF4- 2	AF4- 3	AF5- 1	AF5- 2	AF5- 3	AF6- 1	AF6- 2	AF6- 3	AM1- 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phosphorus	140	150	170	160	170	160	200	170	190	190
Zinc	4.2	2.9	3.8	4.4	4.3	3.4	3.5	4.3	3.6	3.8
Cholesterol	72.5	71.6	61.1	58.6	60.4	61.9	72.7	61.1	70.7	78.3
Niacin	3.99	3.78	5.52	4.52	4.3	4.52	4.47	4.29	5.73	4.93
Vitamin B1 - Thiamine Hydrochloride	0.073	0.0811	0.0775	0.144	0.0918	0.0851	0.0732	0.0929	0.0777	0.0938
Vitamin B2 - Riboflavin	0.216	0.2	0.198	0.184	0.244	0.185	0.272	0.266	0.276	0.309
Vitamin B6	0.195	0.225	0.347	0.321	0.369	0.337	0.369	0.291	0.291	0.358
Vitamin B12	0.00311	0.00333	0.00226	0.00318	0.00299	0.00233	0.00347	0.0033	0.00336	0.00407
Vitamin E	0.611	0.649	0.543	0.37	0.469	0.539	0.382	0.517	0.333	0.302

Cyagra Meat Study

SampleNo	36134	36135	36136	36137	36138	36139	36140	36142	36143	36144
Marked ID	AM1- 2	AM1- 3	AM2- 1	AM2- 2	AM2- 3	AM3- 1	AM3- 2	AM3- 3	AM4- 1	AM4- 2
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Crude Fat	1.9	6.4	13.7	3.1	3.8	5.5	2.4	1.4	1.4	3.6
Moisture	69.9	71.8	66.28	70.01	72.83	68.5	74.32	73.93	73.37	73.32
Protein - Combustion	26.19	21.4	20.52	25.16	22.52	21.4	21.97	23.44	23.79	22.06
Protein - Kjeldahl	25.67	21.34	20.66	26.44	22.5	21.06	21.95	23.29	23.52	22.41
Ash	1.17	1.11	1.06	1.11	0.97	1.08	1.14	1.21	1.14	1.1
Balance (protein+moist+ash+fat)	98.64	100.65	101.70	100.66	100.10	96.14	99.81	99.83	99.43	100.43
Amino Acid Profile (results below)										
Tryptophan	0.31	0.25	0.25	0.3	0.27	0.26	0.26	0.29	0.3	0.29
Aspartic Acid	2.71	2.11	1.98	2.36	2.16	2.07	2.15	2.34	2.24	2.18
Threonine	1.19	0.98	0.96	1.16	1.02	1	1	1.11	1.1	1.05
Serine	0.85	0.86	0.84	0.99	0.91	0.82	0.91	0.94	0.91	0.91
Glutamic Acid	4.39	3.47	3.29	3.91	3.55	3.44	3.71	3.91	3.68	3.61
Proline	1.33	1.3	0.93	1.17	1.19	0.88	1.01	1.13	1.06	1.07
Glycine	1.41	1.63	1.03	1.29	1.39	0.94	1.18	1.28	1.15	1.14
Alanine	1.73	1.48	1.28	1.55	1.44	1.3	1.38	1.53	1.44	1.39
Cystine	0.32	0.23	0.23	0.28	0.23	0.25	0.25	0.27	0.27	0.26
Valine	1.47	1.01	0.89	1.06	0.92	1.04	1.08	1.19	0.98	0.94
Methionine	0.77	0.48	0.55	0.65	0.55	0.58	0.59	0.62	0.64	0.59
Isoleucine	1.34	0.89	0.81	0.95	0.82	0.98	1	1.13	0.89	0.86
Leucine	2.26	1.7	1.67	1.96	1.74	1.75	1.82	1.96	1.82	1.78
Tyrosine	0.95	0.72	0.72	0.86	0.75	0.76	0.78	0.8	0.8	0.77
Phenylalanine	1.2	0.91	0.86	1.01	0.91	0.92	0.97	1.01	0.94	0.93
Histidine	1.05	0.73	0.72	0.87	0.71	0.78	0.77	0.83	0.77	0.74
Lysine, Total	2.47	1.86	1.81	2.13	1.9	1.93	2.05	2.21	2	1.97
Arginine	1.82	1.54	1.36	1.61	1.51	1.39	1.51	1.57	1.51	1.47
Hydroxyproline	0.17	0.29	0.15	0.28	0.18	0.09	0.24	0.16	0.12	0.22
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0	0	0	0	0	0	0
C10:0 Decanoic (Capric)	0	0	0	0	0	0	0	0	0	0
C11:0 Undecanoic (Hendecanoic)	0	0	0	0	0	0	0	0	0	0
C12:0 Dodecanoic (Lauric)	0	0	0	0	0	0	0	0	0	0
C14:0 Tetradecanoic (Myristic)	0.05	0.14	0.37	0.08	0.09	0.11	0.04	0.03	0.03	0.07
C14:1 Tetradecenoic (Myristoleic)	0.02	0.03	0.14	0.03	0.03	0	0	0	0	0.02
C15:0 Pentadecanoic	0	0.03	0.05	0.01	0.01	0.03	0	0	0	0
C15:1 Pentadecenoic	0	0	0	0	0	0	0	0	0	0.01
C16:0 Hexadecanoic (Palmitic)	0.46	1.41	2.96	0.66	0.79	1.22	0.42	0.3	0.31	0.75

Cyagra Meat Study

SampleNo	36134	36135	36136	36137	36138	36139	36140	36142	36143	36144
Marked ID	AM1- 2	AM1- 3	AM2- 1	AM2- 2	AM2- 3	AM3- 1	AM3- 2	AM3- 3	AM4- 1	AM4- 2
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	0.11	0.24	0.75	0.19	0.19	0.12	0.06	0.05	0.04	0.12
C16:2 Hexadecadienoic	0.01	0.05	0.09	0.02	0.02	0.04	0.01	0	0	0.03
C16:3 Hexadecatrienoic	0	0	0	0	0	0	0	0	0	0
C16:4 Hexadecatetraenoic	0	0	0	0	0	0	0	0	0	0
C17:0 Heptadecanoic (Margaric)	0.02	0.06	0.12	0.02	0.03	0.06	0.02	0.01	0.01	0.04
C17:1 Heptadecenoic Margaroleic	0.02	0.05	0.13	0.03	0.04	0.03	0.01	0	0	0.03
C18:0 Octadecanoic (Stearic)	0.21	0.91	1.38	0.26	0.39	1.34	0.36	0.23	0.24	0.59
C18:1 Octadecenoic (Oleic)	0.82	2.74	5.52	1.26	1.61	1.9	0.78	0.53	0.5	1.35
C18:2 Octadecadienoic (Linoleic)	0.07	0.26	0.41	0.1	0.14	0.23	0.08	0.05	0.05	0.15
C18:3 Octadecatrienoic (Linolenic)	0	0.02	0.04	0.01	0.02	0.03	0	0	0	0.02
C18:4 Octadecatetraenoic	0.01	0.03	0.08	0.02	0.02	0.02	0	0	0	0.02
C19:0 Nonadecanoic	0	0	0	0	0	0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	0	0	0	0	0	0	0	0	0	0
C20:1 Eicosenoic (Gadoleic)	0	0.02	0.04	0	0.01	0.01	0	0	0	0
C20:2 Eicosadienoic	0	0	0	0	0	0	0	0	0	0
C20:3 Eicosatrienoic	0	0	0	0	0	0	0	0	0	0
C20:4 Eicosatetraenoic (Arachidonic)	0	0	0.01	0.01	0.01	0.02	0	0	0	0.01
C20:5 Eicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C21:0 Heneicosanoic	0	0	0	0	0	0	0	0	0	0
C21:5 Heneicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:0 Docosanoic (Behenic)	0	0	0	0	0	0	0	0	0	0
C22:1 Docosenoic (Erucic)	0	0	0	0	0	0	0	0	0	0
C22:2 Docosadienoic	0	0	0	0	0	0	0	0	0	0
C22:3 Docosatrienoic	0	0	0	0	0	0	0	0	0	0
C22:4 Docosatetraenoic	0	0	0	0	0	0	0	0	0	0
C22:5 Docosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:6 Docosahexaenoic	0	0	0	0	0	0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0	0	0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	0	0	0	0	0	0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	0.97	3.08	6.57	1.53	1.87	2.07	0.87	0.59	0.55	1.51
Total Polyunsat. Fatty Acids Calc.	0.1	0.38	0.64	0.17	0.23	0.36	0.13	0.07	0.07	0.24
Saturated Fatty Acids	0.74	2.56	4.91	1.03	1.31	2.77	0.84	0.58	0.6	1.45
Total Fat (as triglycerides)	1.9	6.31	12.7	2.86	3.58	5.46	1.93	1.3	1.29	3.35
Calcium	5.2	5.1	43	4	5.1	16	4.1	4.5	6.2	8.2
Iron	4	2.3	2.4	1.9	2.6	2.3	2.2	2	1.7	2.3

Cyagra Meat Study

SampleNo	36134	36135	36136	36137	36138	36139	36140	36142	36143	36144
Marked ID	AM1- 2	AM1- 3	AM2- 1	AM2- 2	AM2- 3	AM3- 1	AM3- 2	AM3- 3	AM4- 1	AM4- 2
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phosphorus	230	170	190	190	200	180	180	210	190	180
Zinc	4.6	4.7	3.5	3.5	5.5	3.8	4.7	4.6	3.8	4.5
Cholesterol	60.2	61.3	65.6	62	65.1	58	57.5	52.3	56.6	62
Niacin	7.08	4.51	5.72	7.91	5.69	4.92	5.37	5.89	6.05	5
Vitamin B1 - Thiamine Hydrochloride	0.094	0.086	0.181	0.147	0.145	0.161	0.109	0.112	0.118	0.154
Vitamin B2 - Riboflavin	0.279	0.283	0.31	0.257	0.311	0.272	0.309	0.226	0.266	0.292
Vitamin B6	0.49	0.315	0.373	0.418	0.306	0.276	0.362	0.358	0.368	0.327
Vitamin B12	0.0029	0.00366	0.00359	0.00305	0.00365	0.00293	0.00319	0.00279	0.00283	0.00338
Vitamin E	0.51	0.377	0.319	0.376	0.35	0.498	0.525	0.392	0.507	0.61

Cyagra Meat Study

SampleNo	36145	36146	36148	36149		36150	36151	36152	36153	36154
Marked ID	AM4- 3	AM5- 1	AM5- 2	AM5- 3		BF1- 1	BF1- 2	BF1- 3	BF2- 1	BF2- 2
Analyte	Result	Result	Result	Result		Result	Result	Result	Result	Result
Crude Fat	5.3	8.2	7.2	5.1		4.1	5.3	23.2	21	19.9
Moisture	72.66	69.5	70.22	68.71		71.18	72.44	58.66	58.01	60.84
Protein - Combustion	22.53	21.99	21.18	25.98		22.82	20.05	17.13	19.54	19.11
Protein - Kjeldahl	22.26	21.81	21.23	25.14		22.71	19.92	17.01	19.49	18.93
Ash	1.24	1.06	1.06	1.27		1.08	0.94	0.85	0.95	0.86
Balance (protein+moist+ash+fat)	101.46	100.57	99.71	100.22		99.07	98.60	99.72	99.45	100.53
Amino Acid Profile (results below)										
Tryptophan	0.29	0.24	0.25	0.27		0.26	0.23	0.19	0.21	0.22
Aspartic Acid	2.09	1.97	2	2.38		2.15	1.88	1.55	1.8	1.78
Threonine	1	0.93	0.97	1.18		1.05	0.93	0.75	0.88	0.89
Serine	0.89	0.87	0.86	1.01		0.91	0.81	0.71	0.73	0.75
Glutamic Acid	3.48	3.27	3.34	3.92		3.54	3.15	2.55	2.92	2.96
Proline	1.34	1.39	0.98	1.18		1.03	0.73	0.73	0.66	0.74
Glycine	1.67	1.68	1.09	1.13		1.14	0.95	1.03	0.83	0.87
Alanine	1.52	1.48	1.31	1.5		1.42	1.22	1.08	1.13	1.14
Cystine	0.22	0.22	0.23	0.27		0.23	0.21	0.18	0.19	0.2
Valine	1.03	0.98	0.98	1.16		1.06	0.89	0.74	0.94	0.91
Methionine	0.53	0.52	0.53	0.66		0.56	0.48	0.42	0.47	0.47
Isoleucine	0.92	0.85	0.88	1.06		0.95	0.82	0.68	0.86	0.84
Leucine	1.73	1.61	1.67	2		1.82	1.6	1.31	1.56	1.54
Tyrosine	0.71	0.66	0.71	0.86		0.77	0.69	0.55	0.66	0.66
Phenylalanine	0.93	0.86	0.87	1.05		0.96	0.83	0.68	0.82	0.82
Histidine	0.73	0.71	0.72	0.88		0.83	0.69	0.57	0.71	0.69
Lysine, Total	1.91	1.79	1.89	2.27		2.05	1.79	1.46	1.74	1.73
Arginine	1.56	1.49	1.37	1.6		1.45	1.26	1.08	1.2	1.2
Hydroxyproline	0.13	0.19	0.16	0.15		0.2	0.11	0.12	0.12	0.27
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0		0	0	0	0	0
C10:0 Decanoic (Capric)	0	0	0	0		0	0	0.01	0	0
C11:0 Undecanoic (Hendecanoic)	0	0	0	0		0	0	0	0	0
C12:0 Dodecanoic (Lauric)	0	0	0	0		0	0	0.02	0.01	0.02
C14:0 Tetradecanoic (Myristic)	0.12	0.2	0.16	0.13		0.12	0.13	0.65	0.66	0.63
C14:1 Tetradecenoic (Myristoleic)	0.02	0.03	0.03	0.04		0.06	0.04	0.24	0.23	0.33
C15:0 Pentadecanoic	0.02	0.04	0.03	0.02		0.01	0.02	0.09	0.09	0.09
C15:1 Pentadecenoic	0	0	0	0		0	0	0	0	0
C16:0 Hexadecanoic (Palmitic)	1.15	1.93	1.69	1.22		0.94	1.17	5.39	5.39	5.16

Cyagra Meat Study

SampleNo	36145	36146	36148	36149		36150	36151	36152	36153	36154
Marked ID	AM4- 3	AM5- 1	AM5- 2	AM5- 3		BF1- 1	BF1- 2	BF1- 3	BF2- 1	BF2- 2
Analyte	Result	Result	Result	Result		Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	0.16	0.23	0.2	0.21		0.29	0.25	1.09	0.93	1.26
C16:2 Hexadecadienoic	0.04	0.06	0.05	0.03		0.02	0.03	0.15	0.16	0.15
C16:3 Hexadecatrienoic	0	0	0	0		0	0	0	0	0
C16:4 Hexadecatetraenoic	0	0	0	0		0	0	0	0.01	0
C17:0 Heptadecanoic (Margaric)	0.05	0.11	0.09	0.05		0.03	0.05	0.23	0.23	0.2
C17:1 Heptadecenoic Margaroleic	0.03	0.06	0.05	0.05		0.04	0.05	0.22	0.19	0.19
C18:0 Octadecanoic (Stearic)	0.98	1.55	1.37	0.69		0.33	0.59	2.65	2.29	1.99
C18:1 Octadecenoic (Oleic)	1.83	3.05	2.79	1.99		1.79	2.33	10	8.09	7.81
C18:2 Octadecadienoic (Linoleic)	0.19	0.26	0.29	0.13		0.09	0.14	0.59	0.37	0.34
C18:3 Octadecatrienoic (Linolenic)	0.02	0.02	0.03	0.01		0.02	0.02	0.14	0.12	0.11
C18:4 Octadecatetraenoic	0.03	0.03	0.03	0.02		0.02	0.02	0.14	0.07	0.08
C19:0 Nonadecanoic	0	0	0	0		0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	0	0	0	0		0	0	0.01	0.05	0
C20:1 Eicosenoic (Gadoleic)	0.01	0.02	0.02	0.01		0.01	0.01	0.06	0.01	0.04
C20:2 Eicosadienoic	0	0	0	0		0	0	0	0	0
C20:3 Eicosatrienoic	0	0	0	0		0	0	0.02	0	0
C20:4 Eicosatetraenoic (Arachidonic)	0.01	0.01	0.01	0		0.01	0.01	0.02	0.02	0.01
C20:5 Eicosapentaenoic	0	0	0	0		0	0	0	0	0
C21:0 Heneicosanoic	0	0	0	0		0	0	0	0	0
C21:5 Heneicosapentaenoic	0	0	0	0		0	0	0	0	0
C22:0 Docosanoic (Behenic)	0	0	0	0		0	0	0	0	0
C22:1 Docosenoic (Erucic)	0	0	0	0		0	0	0	0	0
C22:2 Docosadienoic	0	0	0	0		0	0	0	0	0
C22:3 Docosatrienoic	0	0	0	0		0	0	0	0	0
C22:4 Docosatetraenoic	0	0	0	0		0	0	0	0	0
C22:5 Docosapentaenoic	0	0	0	0		0	0	0.01	0	0
C22:6 Docosahexaenoic	0	0	0	0		0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0		0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	0	0	0	0		0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	2.05	3.4	3.09	2.29		2.2	2.69	11.6	9.46	9.63
Total Polyunsat. Fatty Acids Calc.	0.31	0.41	0.44	0.2		0.18	0.25	1.08	0.76	0.7
Saturated Fatty Acids	2.33	3.84	3.36	2.12		1.44	1.97	9.06	8.72	8.1
Total Fat (as triglycerides)	4.93	8.02	7.22	4.83		4	5.15	22.8	19.9	19.4
Calcium	53	23	6.7	5		6.7	6.1	35	54	5.6
Iron	2.3	1.4	1.3	1.1		2.4	2.7	2.4	2.7	2.5

Cyagra Meat Study

SampleNo	36145	36146	36148	36149		36150	36151	36152	36153	36154
Marked ID	AM4- 3	AM5- 1	AM5- 2	AM5- 3		BF1- 1	BF1- 2	BF1- 3	BF2- 1	BF2- 2
Analyte	Result	Result	Result	Result		Result	Result	Result	Result	Result
Phosphorus	220	190	180	220		190	170	150	180	160
Zinc	3.8	3.1	3.9	2.8		3.8	4.9	3.4	3.6	4.6
Cholesterol	60.1	65.3	63	70.4		57.7	56.2	73.3	71.1	84.2
Niacin	4.97	5.93	5.18	7.34		5.47	3.95	3.05	4.34	3.59
Vitamin B1 - Thiamine Hydrochloride	0.147	0.114	0.111	0.119		0.108	0.101	0.09	0.12	0.079
Vitamin B2 - Riboflavin	0.308	0.212	0.205	0.172		0.231	0.257	0.224	0.284	0.222
Vitamin B6	0.417	0.361	0.334	0.492		0.344	0.274	0.233	0.301	0.209
Vitamin B12	0.00392	0.00203	0.00198	0.00174		0.00229	0.00403	0.00273	0.00378	0.00342
Vitamin E	0.708	0.353	0.532	0.249		0.389	0.474	0.434	0.331	0.479

Cyagra Meat Study

SampleNo	36155	36156	36157	36158	36170	36171	36172	36173	36174	36175
Marked ID	BF2- 3	BF3- 1	BF3- 2	BF3- 3	BF4-1	BF4- 2	BF4- 3	BF5- 1	BF5- 2	BF5- 3
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Crude Fat	5.8	10.7	33.7	15.9	10.5	8.8	6.5	4.4	6.2	11.4
Moisture	68.09	64.54	52.56	63.01	66.77	69.1	69.44	69.29	71.24	66.64
Protein - Combustion	24.64	21.94	15.03	20.27	21.39	21.99	23.33	23.97	22.12	20.59
Protein - Kjeldahl	24.49	22.11	15.25	20.08	21.25	21.55	22.56	23.58	21.63	20.76
Ash	1.16	1.04	0.74	0.92	1.01	0.97	0.95	1.12	0.91	1.06
Balance (protein+moist+ash+fat)	99.54	98.39	102.25	99.91	99.53	100.42	99.45	98.39	99.98	99.86
Amino Acid Profile (results below)										
Tryptophan	0.28	0.27	0.2	0.24	0.26	0.27	0.28	0.29	0.25	0.25
Aspartic Acid	2.34	2.12	1.53	1.87	2.04	2.09	2.18	2.42	2.11	2.01
Threonine	1.16	1.03	0.73	0.89	1.03	1.03	1.08	1.2	1.02	0.98
Serine	1	0.83	0.57	0.69	0.86	0.91	0.94	1.05	0.87	0.86
Glutamic Acid	3.8	3.47	2.49	3.09	3.31	3.47	3.55	3.93	3.5	3.28
Proline	0.94	0.98	0.66	0.75	0.77	0.83	0.91	0.95	0.96	0.84
Glycine	1.31	1.11	0.72	0.8	0.91	1.03	1.05	1.12	1.1	1
Alanine	1.61	1.39	0.99	1.17	1.28	1.33	1.4	1.55	1.38	1.32
Cystine	0.24	0.24	0.18	0.23	0.23	0.23	0.23	0.24	0.22	0.21
Valine	1.25	1.1	0.79	0.98	1	0.99	1.05	1.18	1.09	1.05
Methionine	0.6	0.56	0.42	0.55	0.56	0.57	0.56	0.61	0.53	0.5
Isoleucine	1.1	1.02	0.73	0.93	0.93	0.93	0.97	1.08	0.99	0.94
Leucine	2.03	1.79	1.31	1.59	1.76	1.77	1.85	2.07	1.81	1.75
Tyrosine	0.85	0.76	0.54	0.67	0.76	0.76	0.78	0.86	0.75	0.73
Phenylalanine	1.07	0.93	0.7	0.83	0.91	0.91	0.94	1.04	0.93	0.89
Histidine	0.95	0.82	0.57	0.74	0.78	0.73	0.82	0.95	0.81	0.77
Lysine, Total	2.26	1.99	1.43	1.79	1.98	2	2.09	2.35	2.06	1.96
Arginine	1.57	1.44	1.01	1.24	1.34	1.37	1.4	1.56	1.43	1.34
Hydroxyproline	0.14	0.16	0.13	0.11	0.23	0.16	0.1	0.42	0.13	0.21
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0	0	0	0	0	0	0
C10:0 Decanoic (Capric)	0	0	0.01	0	0	0	0	0	0	0
C11:0 Undecanoic (Hendecanoic)	0	0	0	0	0	0	0	0	0	0
C12:0 Dodecanoic (Lauric)	0	0	0.02	0.01	0	0.01	0	0	0	0
C14:0 Tetradecanoic (Myristic)	0.17	0.33	1.04	0.46	0.29	0.23	0.17	0.12	0.15	0.32
C14:1 Tetradecenoic (Myristoleic)	0.13	0.24	0.31	0.28	0.13	0.11	0.14	0.09	0.04	0.11
C15:0 Pentadecanoic	0.02	0.03	0.13	0.05	0.05	0.05	0.03	0.02	0.03	0.06
C15:1 Pentadecenoic	0	0	0	0	0	0	0	0	0	0
C16:0 Hexadecanoic (Palmitic)	1.42	2.5	8.32	3.81	2.69	2.21	1.65	1.05	1.51	2.88

Cyagra Meat Study

SampleNo	36155	36156	36157	36158	36170	36171	36172	36173	36174	36175
Marked ID	BF2- 3	BF3- 1	BF3- 2	BF3- 3	BF4-1	BF4- 2	BF4- 3	BF5- 1	BF5- 2	BF5- 3
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	0.52	1.09	1.64	1.34	0.58	0.49	0.56	0.49	0.31	0.64
C16:2 Hexadecadienoic	0.03	0.06	0.24	0.09	0.09	0.07	0.05	0.03	0.05	0.1
C16:3 Hexadecatrienoic	0	0	0	0	0	0	0	0	0	0
C16:4 Hexadecatetraenoic	0	0	0	0	0.01	0	0	0	0	0
C17:0 Heptadecanoic (Margaric)	0.03	0.06	0.35	0.11	0.11	0.09	0.04	0.03	0.07	0.13
C17:1 Heptadecenoic Margaroleic	0.05	0.12	0.31	0.16	0.11	0.09	0.07	0.05	0.06	0.12
C18:0 Octadecanoic (Stearic)	0.34	0.58	4.26	1.21	1	0.84	0.38	0.24	0.72	1.23
C18:1 Octadecenoic (Oleic)	2.41	4.71	14.2	6.99	4.13	3.34	2.69	1.79	2.44	4.48
C18:2 Octadecadienoic (Linoleic)	0.09	0.19	0.7	0.28	0.23	0.19	0.13	0.09	0.16	0.3
C18:3 Octadecatrienoic (Linolenic)	0.02	0.04	0.2	0.06	0.06	0.06	0.03	0.02	0.05	0.08
C18:4 Octadecatetraenoic	0.02	0.06	0.14	0.06	0.05	0.04	0.03	0.02	0.02	0.06
C19:0 Nonadecanoic	0	0	0	0	0	0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	0.01	0	0.03	0	0	0	0	0	0	0
C20:1 Eicosenoic (Gadoleic)	0	0.04	0.13	0.05	0.03	0.03	0.02	0.01	0.02	0.03
C20:2 Eicosadienoic	0	0	0	0	0	0	0	0	0	0
C20:3 Eicosatrienoic	0	0	0	0	0	0	0	0	0	0
C20:4 Eicosatetraenoic (Arachidonic)	0	0	0	0	0.02	0.01	0.01	0	0.01	0.02
C20:5 Eicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C21:0 Heneicosanoic	0	0	0	0	0	0	0	0	0	0
C21:5 Heneicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:0 Docosanoic (Behenic)	0	0	0	0	0	0	0	0	0	0
C22:1 Docosenoic (Erucic)	0	0	0	0	0	0	0	0	0	0
C22:2 Docosadienoic	0	0	0	0	0	0	0	0	0	0
C22:3 Docosatrienoic	0	0	0	0	0	0	0	0	0	0
C22:4 Docosatetraenoic	0	0	0	0	0	0	0	0	0	0
C22:5 Docosapentaenoic	0	0	0	0	0	0.01	0	0	0	0
C22:6 Docosahexaenoic	0	0	0	0	0	0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0	0	0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	0	0	0	0	0	0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	3.11	6.2	16.6	8.82	4.99	4.04	3.49	2.44	2.87	5.38
Total Polyunsat. Fatty Acids Calc.	0.18	0.36	1.28	0.51	0.48	0.4	0.28	0.18	0.31	0.58
Saturated Fatty Acids	1.99	3.51	14.2	5.66	4.16	3.44	2.28	1.46	2.51	4.64
Total Fat (as triglycerides)	5.53	10.6	33.6	15.7	10.1	8.28	6.35	4.28	5.97	11.1
Calcium	7	5.4	10	4.9	41	7.4	4.1	4.8	5.7	29
Iron	3.3	2.4	2.4	3	3.3	3	2.9	3.7	4.1	3.6

Cyagra Meat Study

SampleNo	36155	36156	36157	36158	36170	36171	36172	36173	36174	36175
Marked ID	BF2- 3	BF3- 1	BF3- 2	BF3- 3	BF4-1	BF4- 2	BF4- 3	BF5- 1	BF5- 2	BF5- 3
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phosphorus	210	180	130	150	190	180	190	220	180	250
Zinc	4.9	4	3.4	4.5	4.6	5.7	4.4	4.3	4.7	4.3
Cholesterol	66.7	62	74.5	62	63.5	70	61.7	61.6	57.6	66.8
Niacin	7.12	5.92	3.55	3.8	5.16	4.98	6.58	5.96	4.32	4.53
Vitamin B1 - Thiamine Hydrochloride	0.121	0.093	0.104	0.1	0.127	0.083	0.121	0.097	0.102	0.11
Vitamin B2 - Riboflavin	0.277	0.239	0.238	0.26	0.352	0.294	0.304	0.323	0.304	0.331
Vitamin B6	0.497	0.419	0.167	0.242	0.412	0.289	0.433	0.582	0.51	0.371
Vitamin B12	0.00365	0.00321	0.00407	0.00347	0.0046	0.00416	0.00369	0.00335	0.00422	0.00399
Vitamin E	0.369	0.482	0.86	0.758	0.608	0.44	0.509	0.28	0.308	0.405

Cyagra Meat Study

SampleNo	36176	36178	36179	36183	36198	36199	36200	36201	36202	36203
Marked ID	BF6- 1	BF6- 2	BF6- 3	BM1- 1	BM1- 2	BM1- 3	BM2 - 1	BM2 - 2	BM2 - 3	BM3 - 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Crude Fat	7.8	22.5	4	6.8	1.4	2.4	0.6	1.1	4.4	3.5
Moisture	70.82	60.58	72.53	70.02	70.42	74.07	73.69	74.35	71.77	74.17
Protein - Combustion	21.14	18.04	22.64	21.48	27.66	22.08	23.83	21.72	22.32	21.25
Protein - Kjeldahl	21.11	17.87	22.35	21.52	26.07	21.71	23.48	22.68	22.39	21.21
Ash	1.05	0.93	1.11	1.16	1.24	1.1	1.16	1.11	1.09	1.11
Balance (protein+moist+ash+fat)	100.78	101.88	99.99	99.50	99.13	99.28	98.93	99.24	99.65	99.99
Amino Acid Profile (results below)										
Tryptophan	0.26	0.21	0.28	0.25	0.31	0.26	0.27	0.25	0.26	0.26
Aspartic Acid	2.11	1.73	2.26	2.05	2.47	2.13	2.17	2.16	2.12	2.07
Threonine	0.99	0.81	1.04	1.03	1.24	1.08	1.1	1.07	1.07	1.02
Serine	0.76	0.7	0.74	0.89	1.09	0.95	0.92	0.91	0.87	0.85
Glutamic Acid	3.51	2.86	3.73	<0.0	4.09	0.01	3.54	3.62	3.47	3.53
Proline	0.89	0.75	0.91	0.94	1.33	0.97	1	0.88	0.89	0.9
Glycine	0.97	0.83	1.03	1.06	1.81	1.12	1.11	1.04	0.96	1.04
Alanine	1.34	1.1	1.46	1.4	1.86	1.4	1.4	1.39	1.34	1.36
Cystine	0.25	0.2	0.25	0.23	0.29	0.28	0.29	0.29	0.27	0.29
Valine	1.11	0.87	1.24	1.05	1.36	1.07	1.09	1.13	1.11	1.07
Methionine	0.57	0.44	0.59	0.53	0.68	0.57	0.61	0.61	0.61	0.58
Isoleucine	1.05	0.82	1.16	0.97	1.17	0.99	1.01	1.04	1.04	1
Leucine	1.78	1.47	1.92	1.79	2.15	1.84	1.87	1.87	1.85	1.79
Tyrosine	0.75	0.6	0.78	0.75	0.9	0.77	0.78	0.78	0.77	0.76
Phenylalanine	0.92	0.75	1.01	0.91	1.11	0.9	0.92	0.93	0.91	0.89
Histidine	0.8	0.64	0.91	0.74	0.93	0.8	0.83	0.84	0.8	0.57
Lysine, Total	2	1.61	2.15	1.96	2.32	2.04	2.08	2.12	2.04	1.99
Arginine	1.42	1.15	1.49	1.42	1.8	1.5	1.5	1.48	1.39	1.4
Hydroxyproline	0.17	0.17	0.04	0.15	0.12	0.18	0.15	0.11	0.09	0.17
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0	0	0	0	0	0	0
C10:0 Decanoic (Capric)	0	0	0	0	0	0	0	0	0	0
C11:0 Undecanoic (Hendecanoic)	0	0	0	0	0	0	0	0	0	0
C12:0 Dodecanoic (Lauric)	0	0.01	0	0	0	0	0	0	0	0
C14:0 Tetradecanoic (Myristic)	0.19	0.59	0.11	0.13	0.03	0.04	0.01	0.02	0.08	0.07
C14:1 Tetradecenoic (Myristoleic)	0.09	0.2	0.06	0.02	0.01	0	0	0	0	0.01
C15:0 Pentadecanoic	0.03	0.13	0.02	0.03	0	0	0	0	0.02	0.02
C15:1 Pentadecenoic	0	0	0	0	0	0	0	0	0	0
C16:0 Hexadecanoic (Palmitic)	1.77	5.22	0.91	1.28	0.28	0.41	0.11	0.24	0.84	0.73

Cyagra Meat Study

SampleNo	36176	36178	36179	36183	36198	36199	36200	36201	36202	36203
Marked ID	BF6- 1	BF6- 2	BF6- 3	BM1- 1	BM1- 2	BM1- 3	BM2 - 1	BM2 - 2	BM2 - 3	BM3 - 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
C16:1 Hexadecenoic (Palmitoleic)	0.42	0.9	0.27	0.15	0.06	0.06	0.02	0.03	0.1	0.1
C16:2 Hexadecadienoic	0.06	0.22	0.03	0.05	0	0.01	0	0	0.03	0.02
C16:3 Hexadecatrienoic	0	0	0	0	0	0	0	0	0	0
C16:4 Hexadecatetraenoic	0	0	0	0	0	0	0	0	0	0.01
C17:0 Heptadecanoic (Margaric)	0.08	0.3	0.03	0.07	0	0.02	0	0.01	0.05	0.04
C17:1 Heptadecenoic Margaroleic	0.08	0.22	0.04	0.03	0	0.01	0	0	0.02	0.02
C18:0 Octadecanoic (Stearic)	0.85	3.2	0.34	1.51	0.17	0.39	0.08	0.23	0.9	0.69
C18:1 Octadecenoic (Oleic)	3.28	8.9	1.65	2.34	0.54	0.84	0.18	0.41	1.47	1.23
C18:2 Octadecadienoic (Linoleic)	0.24	0.65	0.11	0.3	0.05	0.12	0.03	0.07	0.21	0.19
C18:3 Octadecatrienoic (Linolenic)	0.06	0.18	0.03	0.04	0	0	0	0	0.02	0.02
C18:4 Octadecatetraenoic	0.03	0.09	0.02	0.02	0	0	0	0	0.02	0.01
C19:0 Nonadecanoic	0	0	0	0	0	0	0	0	0	0
C20:0 Eicosanoic (Arachidic)	0	0.03	0	0.01	0	0	0	0	0	0
C20:1 Eicosenoic (Gadoleic)	0.03	0.07	0.01	0.02	0	0	0	0	0	0
C20:2 Eicosadienoic	0	0	0	0	0	0	0	0	0	0
C20:3 Eicosatrienoic	0	0.02	0	0	0	0	0	0	0	0
C20:4 Eicosatetraenoic (Arachidonic)	0.01	0.02	0	0.02	0	0.01	0	0.01	0.02	0.02
C20:5 Eicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C21:0 Heneicosanoic	0	0	0	0	0	0	0	0	0	0
C21:5 Heneicosapentaenoic	0	0	0	0	0	0	0	0	0	0
C22:0 Docosanoic (Behenic)	0	0	0	0	0	0	0	0	0	0
C22:1 Docosenoic (Erucic)	0	0	0	0	0	0	0	0	0	0
C22:2 Docosadienoic	0	0	0	0	0	0	0	0	0	0
C22:3 Docosatrienoic	0	0	0	0	0	0	0	0	0	0
C22:4 Docosatetraenoic	0	0	0	0	0	0	0	0	0	0
C22:5 Docosapentaenoic	0	0.01	0	0	0	0	0	0	0	0
C22:6 Docosahexaenoic	0	0	0	0	0	0	0	0	0	0
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0	0	0	0	0	0	0
C24:1 Tetracosenoic (Nervonic)	0	0	0	0	0	0	0	0	0	0
Total Monounsat. Fatty Acids Calc.	3.89	10.3	2.04	2.56	0.62	0.93	0.21	0.45	1.61	1.37
Total Polyunsat. Fatty Acids Calc.	0.42	1.22	0.2	0.44	0.08	0.18	0.04	0.1	0.31	0.29
Saturated Fatty Acids	2.94	9.48	1.4	3.03	0.5	0.87	0.21	0.52	1.89	1.55
Total Fat (as triglycerides)	7.6	22	3.82	6.33	1.26	2.07	0.48	1.12	4	3.37
Calcium	5.4	22	4.2	39	6.5	6.4	5.4	6.7	20	6.8
Iron	2.6	2.4	2.2	1.7	1.5	1.6	1.6	1.6	1.8	1.7

Cyagra Meat Study

SampleNo	36176	36178	36179	36183	36198	36199	36200	36201	36202	36203
Marked ID	BF6- 1	BF6- 2	BF6- 3	BM1- 1	BM1- 2	BM1- 3	BM2 - 1	BM2 - 2	BM2 - 3	BM3 - 1
Analyte	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Phosphorus	170	160	190	200	240	200	200	210	200	190
Zinc	5	3.8	4.2	3.7	4.3	4.7	3.4	4	3	5.3
Cholesterol	57.6	67.9	54.4	71.2	101	73.3	72.8	68.2	69.9	73.4
Niacin	4.56	3.3	4.94	4.4	5.74	4.57	6.38	6.22	6.53	4.1
Vitamin B1 - Thiamine Hydrochloride	0.096	0.078	0.087	0.099	0.093	0.102	0.079	0.072	0.059	0.106
Vitamin B2 - Riboflavin	0.264	0.284	0.231	0.322	0.279	0.323	0.298	0.271	0.335	0.284
Vitamin B6	0.365	0.318	0.556	0.358	0.492	0.5	0.485	0.398	0.509	0.289
Vitamin B12	0.00394	0.0043	0.00385	0.00405	0.00384	0.00411	0.00374	0.00401	0.00443	0.00419
Vitamin E	0.487	0.377	0.724	0.427	0.542	0.431	0.375	0.403	0.387	0.331

Cyagra Meat Study

SampleNo	36204	36206	36207	36208	36209	36210	36211	36213		
Marked ID	BM3 - 2	BM3 - 3	BM4- 1	BM4- 2	BM4- 3	BM5- 1	BM5- 2	BM5- 3		Clone
Analyte	Result	Result	Result	Result	Result	Result	Result	Result		Mean
Crude Fat	4	1.2	5.9	2.9	2.1	22.1	2.3	2.1		11.62
Moisture	72.37	71.42	70.79	72.59	74.99	61.82	73.9	70.71		66.18
Protein - Combustion	21.89	24.91	22.5	23.21	23.31	16.36	22.56	25.89		20.69
Protein - Kjeldahl	21.41	25.39	22.5	23.76	22.99	16.19	21.92	26.39		20.74
Ash	1.18	1.32	1.16	1.16	1.09	0.84	1.02	1.23		1.03
Balance (protein+moist+ash+fat)	98.96	99.33	100.35	100.41	101.17	100.95	99.14	100.43		99.56
Amino Acid Profile (results below)										
Tryptophan	0.27	0.31	0.27	0.28	0.26	0.2	0.27	0.31		0.25
Aspartic Acid	2.11	2.37	2.17	2.27	2.34	1.72	2.12	2.39		1.96
Threonine	1.03	1.19	1.08	1	1.08	0.8	0.98	1.12		0.93
Serine	0.9	1.02	0.9	0.7	0.93	0.71	0.9	1		0.79
Glutamic Acid	3.61	4.05	3.56	3.77	3.64	2.96	3.53	4.02		3.22
Proline	0.98	1.23	0.97	1.04	1.07	0.69	1	1.23		0.97
Glycine	1.17	1.41	1.08	1.22	1.14	0.91	1.13	1.59		1.08
Alanine	1.43	1.61	1.39	1.51	1.4	1.11	1.39	1.63		1.28
Cystine	0.27	0.32	0.23	0.36	0.2	0.2	0.27	0.31		0.23
Valine	1.08	1.25	1.12	1.26	1.13	0.89	1.08	1.26		0.89
Methionine	0.59	0.72	0.57	0.73	0.46	0.42	0.56	0.67		0.54
Isoleucine	1	1.13	1.02	1.15	1.04	0.83	1	1.14		0.81
Leucine	1.84	2.06	1.88	1.91	1.88	1.48	1.79	2.01		1.61
Tyrosine	0.76	0.84	0.78	0.78	0.79	0.61	0.76	0.83		0.69
Phenylalanine	0.91	1.01	0.94	1	0.94	0.77	0.93	1.04		0.84
Histidine	0.58	0.63	0.84	0.85	0.79	0.61	0.78	0.93		0.70
Lysine, Total	2.03	2.31	2.1	2.09	2.09	1.64	1.98	2.24		1.77
Arginine	1.46	1.61	1.44	1.54	1.55	1.17	1.43	1.73		1.33
Hydroxyproline	0.09	0.3	0.11	0.16	0.18	0.08	0.27	0.2		0.17
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0	0	0	0	0	0	0	0		0.00
C10:0 Decanoic (Capric)	0	0	0	0	0	0	0	0		0.00
C11:0 Undecanoic (Hendecanoic)	0	0	0	0	0	0	0	0		0.00
C12:0 Dodecanoic (Lauric)	0	0	0	0	0	0.01	0	0		0.00
C14:0 Tetradecanoic (Myristic)	0.07	0.03	0.13	0.07	0.04	0.49	0.04	0.06		0.28
C14:1 Tetradecenoic (Myristoleic)	0.01	0	0.03	0.03	0	0.08	0.01	0.02		0.15
C15:0 Pentadecanoic	0.02	0	0.02	0	0	0.11	0	0		0.04
C15:1 Pentadecenoic	0	0	0	0	0	0	0	0		0.00
C16:0 Hexadecanoic (Palmitic)	0.79	0.26	1.29	0.62	0.43	5.14	0.47	0.5		2.65

Cyagra Meat Study

SampleNo	36204	36206	36207	36208	36209	36210	36211	36213		
Marked ID	BM3 - 2	BM3 - 3	BM4- 1	BM4- 2	BM4- 3	BM5- 1	BM5- 2	BM5- 3		Clone
Analyte	Result	Result	Result	Result	Result	Result	Result	Result		Mean
C16:1 Hexadecenoic (Palmitoleic)	0.1	0.05	0.18	0.13	0.06	0.57	0.08	0.1		0.69
C16:2 Hexadecadienoic	0.03	0	0.04	0.02	0.01	0.17	0.02	0.01		0.08
C16:3 Hexadecatrienoic	0	0	0	0	0	0	0	0		0.00
C16:4 Hexadecatetraenoic	0	0	0	0	0	0	0	0		0.00
C17:0 Heptadecanoic (Margaric)	0.04	0.01	0.06	0.02	0.02	0.28	0.02	0.02		0.10
C17:1 Heptadecenoic Margaroleic	0.02	0	0.04	0.02	0.01	0.14	0.02	0.02		0.11
C18:0 Octadecanoic (Stearic)	0.77	0.17	1.07	0.35	0.35	4.32	0.35	0.28		1.18
C18:1 Octadecenoic (Oleic)	1.28	0.43	2.12	1.09	0.75	8	0.81	0.79		4.94
C18:2 Octadecadienoic (Linoleic)	0.18	0.05	0.26	0.11	0.12	0.62	0.11	0.08		0.31
C18:3 Octadecatrienoic (Linolenic)	0.02	0	0.02	0	0	0.1	0	0		0.05
C18:4 Octadecatetraenoic	0.01	0	0.02	0.01	0	0.12	0	0		0.07
C19:0 Nonadecanoic	0	0	0	0	0	0	0	0		0.00
C20:0 Eicosanoic (Arachidic)	0	0	0	0	0	0.03	0	0		0.00
C20:1 Eicosenoic (Gadoleic)	0	0	0.01	0	0	0.06	0	0		0.03
C20:2 Eicosadienoic	0	0	0	0	0	0.01	0	0		0.00
C20:3 Eicosatrienoic	0	0	0	0	0	0.01	0	0		0.00
C20:4 Eicosatetraenoic (Arachidonic)	0.02	0	0.02	0.01	0.02	0.03	0.02	0.01		0.01
C20:5 Eicosapentaenoic	0	0	0	0	0	0	0	0		0.00
C21:0 Heneicosanoic	0	0	0	0	0	0	0	0		0.00
C21:5 Heneicosapentaenoic	0	0	0	0	0	0	0	0		0.00
C22:0 Docosanoic (Behenic)	0	0	0	0	0	0	0	0		0.00
C22:1 Docosenoic (Erucic)	0	0	0	0	0	0	0	0		0.00
C22:2 Docosadienoic	0	0	0	0	0	0	0	0		0.00
C22:3 Docosatrienoic	0	0	0	0	0	0	0	0		0.00
C22:4 Docosatetraenoic	0	0	0	0	0	0	0	0		0.00
C22:5 Docosapentaenoic	0	0	0	0	0	0	0	0		0.00
C22:6 Docosahexaenoic	0	0	0	0	0	0	0	0		0.00
C24:0 Tetracosanoic (Lignoceric)	0	0	0	0	0	0	0	0		0.00
C24:1 Tetracosenoic (Nervonic)	0	0	0	0	0	0	0	0		0.00
Total Monounsat. Fatty Acids Calc.	1.42	0.5	2.38	1.27	0.84	8.86	0.91	0.92		5.92
Total Polyunsat. Fatty Acids Calc.	0.28	0.08	0.38	0.18	0.19	1.06	0.17	0.13		0.54
Saturated Fatty Acids	1.7	0.47	2.59	1.07	0.84	10.4	0.9	0.86		4.25
Total Fat (as triglycerides)	3.57	1.1	5.61	2.64	1.97	21.3	2.07	2		11.24
Calcium	22	9.3	43	5.5	5.9	24	5.1	8.1		12.01
Iron	1.6	1.5	1.8	1.6	1.7	1.9	1.8	1.7		2.29

Cyagra Meat Study

SampleNo	36204	36206	36207	36208	36209	36210	36211	36213		
Marked ID	BM3 - 2	BM3 - 3	BM4- 1	BM4- 2	BM4- 3	BM5- 1	BM5- 2	BM5- 3		Clone
Analyte	Result	Result	Result	Result	Result	Result	Result	Result		Mean
Phosphorus	210	250	220	210	180	150	180	220		179.09
Zinc	3.6	3.5	3.2	3.8	4.6	3.3	4.3	3.9		3.86
Cholesterol	70.3	71.5	73.9	66.9	66	69.4	67	74.6		64.92
Niacin	5.26	6.33	5.45	5.68	4.66	3.9	4.29	6.47		4.96
Vitamin B1 - Thiamine Hydrochloride	0.132	0.118	0.08	0.064	0.066	0.084	0.077	0.064		0.10
Vitamin B2 - Riboflavin	0.302	0.275	0.327	0.328	0.351	0.291	0.274	0.255		0.24
Vitamin B6	0.266	0.351	0.372	0.431	0.367	0.184	0.367	0.447		0.33
Vitamin B12	0.00434	0.0029	0.00326	0.00392	0.00241	0.00188	0.0041	0.00292		0.00
Vitamin E	0.259	0.303	0.485	0.247	0.328	0.726	0.415	0.302		0.50

Cyagra Meat Study

SampleNo					Clone		Comparator			Clone
Marked ID		Comparator			Females		Females			Males
Analyte	Std dev	Mean	Std dev		Mean	Std Dev	Mean	Std Dev		Mean
Crude Fat	10.08	8.62	8.10		17.10	10.62	12.32	8.50		5.04
Moisture	7.68	68.57	5.51		62.18	8.32	65.87	5.76		70.96
Protein - Combustion	2.96	21.72	2.58		18.96	2.62	20.87	2.46		22.77
Protein - Kjeldahl	2.90	21.58	2.51		19.06	2.60	20.70	2.35		22.76
Ash	0.17	1.05	0.13		0.95	0.18	0.98	0.11		1.12
Balance (protein+moist+ash+fat)	1.72	99.82	0.89		99.29	1.99	99.87	1.04		99.89
Amino Acid Profile (results below)										
Tryptophan	0.03	0.26	0.03		0.23	0.03	0.25	0.03		0.27
Aspartic Acid	0.31	2.08	0.23		1.76	0.25	2.00	0.25		2.19
Threonine	0.15	1.01	0.12		0.84	0.14	0.97	0.13		1.04
Serine	0.14	0.86	0.12		0.72	0.13	0.82	0.12		0.88
Glutamic Acid	0.54	3.33	0.71		2.88	0.44	3.28	0.41		3.63
Proline	0.21	0.91	0.16		0.83	0.13	0.84	0.11		1.13
Glycine	0.27	1.08	0.21		0.92	0.17	0.99	0.15		1.28
Alanine	0.21	1.36	0.18		1.14	0.17	1.30	0.17		1.45
Cystine	0.04	0.24	0.04		0.21	0.03	0.22	0.02		0.25
Valine	0.21	1.07	0.14		0.75	0.16	1.01	0.14		1.06
Methionine	0.09	0.56	0.08		0.49	0.07	0.53	0.06		0.59
Isoleucine	0.20	0.98	0.12		0.69	0.14	0.93	0.13		0.96
Leucine	0.27	1.78	0.20		1.44	0.22	1.71	0.22		1.82
Tyrosine	0.11	0.74	0.08		0.62	0.09	0.72	0.09		0.77
Phenylalanine	0.14	0.91	0.10		0.75	0.11	0.89	0.11		0.95
Histidine	0.12	0.77	0.11		0.63	0.09	0.77	0.11		0.79
Lysine, Total	0.31	1.98	0.23		1.58	0.24	1.91	0.25		2.01
Arginine	0.23	1.41	0.17		1.17	0.18	1.33	0.16		1.52
Hydroxyproline	0.07	0.16	0.07		0.16	0.08	0.17	0.08		0.18
Fatty Acid (results below)										
C08:0 Octanoic (Caprylic)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C10:0 Decanoic (Capric)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C11:0 Undecanoic (Hendecanoic)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C12:0 Dodecanoic (Lauric)	0.01	0.00	0.01		0.01	0.01	0.01	0.01		0.00
C14:0 Tetradecanoic (Myristic)	0.24	0.23	0.24		0.41	0.26	0.35	0.26		0.12
C14:1 Tetradecenoic (Myristoleic)	0.17	0.09	0.10		0.25	0.17	0.16	0.09		0.03
C15:0 Pentadecanoic	0.04	0.04	0.04		0.06	0.04	0.05	0.04		0.02
C15:1 Pentadecenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C16:0 Hexadecanoic (Palmitic)	2.29	2.04	2.00		3.92	2.37	3.00	2.10		1.12

Cyagra Meat Study

SampleNo					Clone		Comparator			Clone
Marked ID		Comparator			Females		Females			Males
Analyte	Std dev	Mean	Std dev		Mean	Std Dev	Mean	Std Dev		Mean
C16:1 Hexadecenoic (Palmitoleic)	0.68	0.45	0.44		1.10	0.67	0.73	0.42		0.20
C16:2 Hexadecadienoic	0.08	0.06	0.06		0.12	0.08	0.09	0.07		0.03
C16:3 Hexadecatrienoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C16:4 Hexadecatetraenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C17:0 Heptadecanoic (Margaric)	0.08	0.09	0.09		0.13	0.10	0.12	0.10		0.05
C17:1 Heptadecenoic Margaroleic	0.11	0.08	0.08		0.17	0.11	0.12	0.08		0.04
C18:0 Octadecanoic (Stearic)	0.93	1.05	1.10		1.52	1.07	1.28	1.14		0.77
C18:1 Octadecenoic (Oleic)	4.49	3.43	3.34		7.42	4.72	5.06	3.52		1.96
C18:2 Octadecadienoic (Linoleic)	0.24	0.22	0.18		0.43	0.27	0.27	0.19		0.18
C18:3 Octadecatrienoic (Linolenic)	0.05	0.05	0.05		0.08	0.06	0.07	0.06		0.02
C18:4 Octadecatetraenoic	0.08	0.04	0.04		0.11	0.09	0.05	0.04		0.02
C19:0 Nonadecanoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C20:0 Eicosanoic (Arachidic)	0.00	0.01	0.01		0.00	0.01	0.01	0.01		0.00
C20:1 Eicosenoic (Gadoleic)	0.04	0.02	0.03		0.05	0.04	0.03	0.03		0.01
C20:2 Eicosadienoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C20:3 Eicosatrienoic	0.00	0.00	0.01		0.00	0.00	0.00	0.01		0.00
C20:4 Eicosatetraenoic (Arachidonic)	0.01	0.01	0.01		0.01	0.01	0.01	0.01		0.01
C20:5 Eicosapentaenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C21:0 Heneicosanoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C21:5 Heneicosapentaenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:0 Docosanoic (Behenic)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:1 Docosenoic (Erucic)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:2 Docosadienoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:3 Docosatrienoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:4 Docosatetraenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:5 Docosapentaenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C22:6 Docosahexaenoic	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C24:0 Tetracosanoic (Lignoceric)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
C24:1 Tetracosenoic (Nervonic)	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
Total Monounsat. Fatty Acids Calc.	5.42	4.08	3.93		8.99	5.60	6.10	4.08		2.24
Total Polyunsat. Fatty Acids Calc.	0.44	0.40	0.33		0.76	0.48	0.52	0.36		0.28
Saturated Fatty Acids	3.51	3.47	3.42		6.07	3.75	4.83	3.63		2.08
Total Fat (as triglycerides)	9.76	8.34	7.99		16.60	10.23	12.01	8.41		4.82
Calcium	13.78	14.30	13.67		10.62	12.84	14.35	15.20		13.67
Iron	0.74	2.32	0.71		2.40	0.78	2.87	0.54		2.17

Cyagra Meat Study

SampleNo					Clone		Comparator			Clone
Marked ID		Comparator			Females		Females			Males
Analyte	Std dev	Mean	Std dev		Mean	Std Dev	Mean	Std Dev		Mean
Phosphorus	27.31	191.21	28.12		166.11	27.47	180.56	27.75		194.67
Zinc	0.67	4.14	0.64		3.71	0.60	4.34	0.61		4.04
Cholesterol	7.79	68.43	8.64		66.93	8.57	64.93	7.67		62.51
Niacin	1.18	5.00	1.07		4.28	0.88	4.73	1.15		5.77
Vitamin B1 - Thiamine Hydrochloride	0.04	0.09	0.02		0.07	0.02	0.10	0.01		0.13
Vitamin B2 - Riboflavin	0.05	0.29	0.04		0.22	0.04	0.27	0.04		0.27
Vitamin B6	0.08	0.37	0.11		0.29	0.07	0.36	0.12		0.37
Vitamin B12	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00
Vitamin E	0.15	0.44	0.15		0.56	0.14	0.48	0.16		0.44

Cyagra Meat Study

SampleNo		Comparator	
Marked ID		Males	
Analyte	Std Dev	Mean	Std Dev
Crude Fat	3.22	4.35	5.26
Moisture	2.39	71.88	3.20
Protein - Combustion	1.78	22.48	2.50
Protein - Kjeldahl	1.74	22.53	2.44
Ash	0.08	1.12	0.11
Balance (protein+moist+ash+fat)	1.32	99.88	0.73
Amino Acid Profile (results below)			
Tryptophan	0.02	0.27	0.03
Aspartic Acid	0.19	2.17	0.18
Threonine	0.09	1.05	0.10
Serine	0.08	0.88	0.10
Glutamic Acid	0.30	3.61	1.01
Proline	0.16	0.99	0.16
Glycine	0.23	1.15	0.24
Alanine	0.12	1.41	0.17
Cystine	0.03	0.28	0.04
Valine	0.14	1.12	0.11
Methionine	0.07	0.59	0.09
Isoleucine	0.14	1.03	0.09
Leucine	0.17	1.85	0.15
Tyrosine	0.07	0.77	0.06
Phenylalanine	0.09	0.93	0.08
Histidine	0.09	0.75	0.12
Lysine, Total	0.19	2.06	0.16
Arginine	0.11	1.48	0.15
Hydroxyproline	0.06	0.16	0.06
Fatty Acid (results below)			
C08:0 Octanoic (Caprylic)	0.00	0.00	0.00
C10:0 Decanoic (Capric)	0.00	0.00	0.00
C11:0 Undecanoic (Hendecanoic)	0.00	0.00	0.00
C12:0 Dodecanoic (Lauric)	0.00	0.00	0.00
C14:0 Tetradecanoic (Myristic)	0.09	0.09	0.12
C14:1 Tetradecenoic (Myristoleic)	0.03	0.02	0.02
C15:0 Pentadecanoic	0.02	0.02	0.03
C15:1 Pentadecenoic	0.00	0.00	0.00
C16:0 Hexadecanoic (Palmitic)	0.72	0.95	1.23

Cyagra Meat Study

SampleNo		Comparator	
Marked ID		Males	
Analyte	Std Dev	Mean	Std Dev
C16:1 Hexadecenoic (Palmitoleic)	0.17	0.13	0.13
C16:2 Hexadecadienoic	0.02	0.03	0.04
C16:3 Hexadecatrienoic	0.00	0.00	0.00
C16:4 Hexadecatetraenoic	0.00	0.00	0.00
C17:0 Heptadecanoic (Margaric)	0.03	0.05	0.07
C17:1 Heptadecenoic Margaroleic	0.03	0.03	0.03
C18:0 Octadecanoic (Stearic)	0.48	0.80	1.06
C18:1 Octadecenoic (Oleic)	1.30	1.55	1.90
C18:2 Octadecadienoic (Linoleic)	0.10	0.17	0.15
C18:3 Octadecatrienoic (Linolenic)	0.01	0.02	0.03
C18:4 Octadecatetraenoic	0.02	0.02	0.03
C19:0 Nonadecanoic	0.00	0.00	0.00
C20:0 Eicosanoic (Arachidic)	0.00	0.00	0.01
C20:1 Eicosenoic (Gadoleic)	0.01	0.01	0.02
C20:2 Eicosadienoic	0.00	0.00	0.00
C20:3 Eicosatrienoic	0.00	0.00	0.00
C20:4 Eicosatetraenoic (Arachidonic)	0.01	0.02	0.01
C20:5 Eicosapentaenoic	0.00	0.00	0.00
C21:0 Heneicosanoic	0.00	0.00	0.00
C21:5 Heneicosapentaenoic	0.00	0.00	0.00
C22:0 Docosanoic (Behenic)	0.00	0.00	0.00
C22:1 Docosenoic (Erucic)	0.00	0.00	0.00
C22:2 Docosadienoic	0.00	0.00	0.00
C22:3 Docosatrienoic	0.00	0.00	0.00
C22:4 Docosatetraenoic	0.00	0.00	0.00
C22:5 Docosapentaenoic	0.00	0.00	0.00
C22:6 Docosahexaenoic	0.00	0.00	0.00
C24:0 Tetracosanoic (Lignoceric)	0.00	0.00	0.00
C24:1 Tetracosenoic (Nervonic)	0.00	0.00	0.00
Total Monounsat. Fatty Acids Calc.	1.53	1.73	2.10
Total Polyunsat. Fatty Acids Calc.	0.16	0.27	0.25
Saturated Fatty Acids	1.31	1.92	2.50
Total Fat (as triglycerides)	3.08	4.10	5.08
Calcium	15.12	13.48	12.63
Iron	0.69	1.69	0.12

Cyagra Meat Study

SampleNo		Comparator	
Marked ID		Males	
Analyte	Std Dev	Mean	Std Dev
Phosphorus	17.67	201.67	24.44
Zinc	0.71	3.83	0.63
Cholesterol	6.17	70.33	8.31
Niacin	0.99	5.44	0.94
Vitamin B1 - Thiamine Hydrochloride	0.03	0.08	0.02
Vitamin B2 - Riboflavin	0.04	0.30	0.03
Vitamin B6	0.06	0.37	0.09
Vitamin B12	0.00	0.00	0.00
Vitamin E	0.13	0.38	0.12

Appendix F:

The Viagen Dataset

Appendix F: The ViaGen Dataset

A. Background

ViaGen, Inc., a privately held company engaged in cloning swine and cattle for agricultural purposes, also responded to CVM's request for additional data on clones and their progeny (for a similar discussion on cattle, see Appendix E: The Cyagra Dataset). ViaGen designed two studies to evaluate the health, growth, and meat composition of swine clones, fertility of boar[126] clones, and health, growth and meat composition of clone progeny vs. age-matched, genetically related, artificial insemination (AI)-derived comparator animals. Various scientists from CVM with expertise relevant to these studies provided peer-review comments to ViaGen on the overall experimental design, but did not formally approve or disapprove the studies. All of the raw data that CVM received from ViaGen is found at the end of this Appendix.

As described in their report, the company's objectives in running these studies were to

1. Compare the health of swine clones vs. AI-derived pigs of a related genetic line;
2. Compare the biological characteristics, including laboratory measurements and meat composition, of swine clones vs. AI-derived swine;
3. Assess the reproductive characteristics of clone boars vs. AI-derived boars; and,
4. Compare the biological characteristics, including laboratory measurements and meat composition, of the progeny of clone boars vs. progeny of AI-derived closely-related boars (nuclear donors for clones or progeny of nuclear donor).

B. Experimental Design

Study 1 Overview: Evaluation of Clones

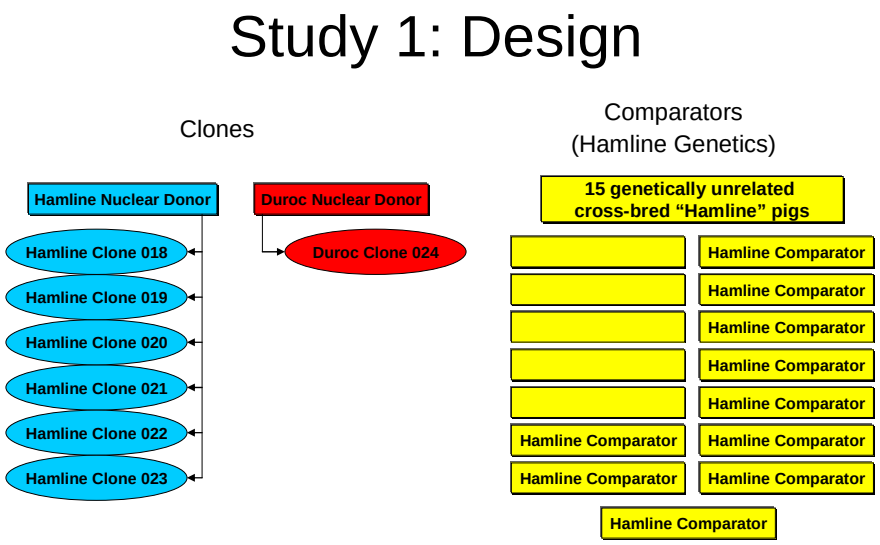
Survival, health, growth and meat characteristics of seven clones (6 "Hamline"[127] and 1 Duroc (a common breed of swine used in U.S. commercial pork production), all barrows[128]) and 15 conventional barrows (all Hamline) were followed from 50 days after birth through slaughter at approximately 6 months of age. Clones were assigned to this study shortly after they were

[126] A boar is a reproductively intact male pig.
[127] "Hamline" refers to a specific crossbred line of swine used by ViaGen, Inc. This line was developed by crossing various breeds, including Duroc, European Landrace, Pietran, and European Large White swine.
[128] A barrow is a castrated male pig.

weaned. Age-matched comparator[129] pigs were selected from litters sired by the Hamline nuclear donor boar in a conventional breeding (AI) program.

An additional group of four clones (three Hamline and one Duroc) and three AI-derived boars (the Hamline nuclear donor and two AI sons of the Duroc nuclear donor) were used for evaluation of semen quality and fertility. The progeny generated from these boars were used in another experiment to study whether progeny of clones were materially different in growth, health or meat characteristics from conventional swine. Because of the small number of clones, these animals were evaluated on a case-by-case basis and simple means generated when appropriate, rather than applying statistical methods to the data.

Figure F-1: Design of ViaGen Study 1



Study 2 Overview: Evaluation of Clone Progeny

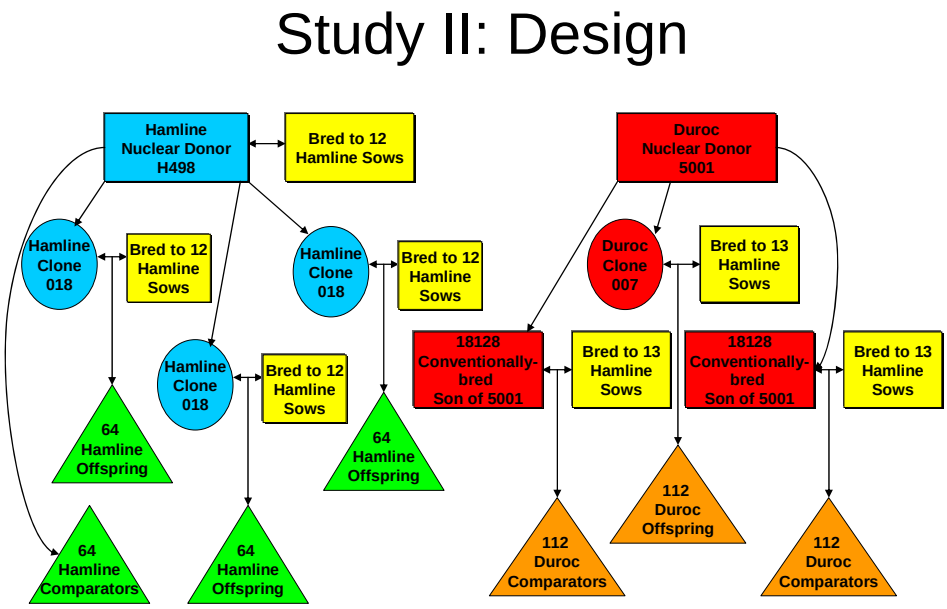
In the second experiment, survival, health, growth, and meat composition of progeny derived from clone boars (three Hamline and one Duroc) and either their nuclear donor (Hamline) or two sons of the nuclear donor Duroc boar were compared. Gilts[130] sired by six different boars were randomly assigned according to their sire (such that each maternal grandsire was represented in

[129] Although this study is a more controlled experiment than the retrospective review of the Cyagra clones, the word "comparator" is used for consistency with the discussion of Cyagra data, rather than the more common term "control."

[130] A gilt is a young female pig that has not given birth (termed "farrowing").

each breeding group to control for effect of maternal grandsire) to each clone or comparator boar, and bred by AI. Sixty-eight gilts farrowed (gave birth) under standard commercial procedures, yielding 402 total progeny from clone boars and 300 total progeny from comparator boars. This included 284 progeny from Hamline clones, 118 progeny from the Duroc clone, 61 progeny from the Hamline donor sire (Hamline comparator), and 239 progeny from Duroc donor sire sons (Duroc comparators).

Figure F-2: Design of ViaGen Study 2



1. Study 1: Clones vs. Comparators

Clone pigs were obtained by Caesarean section (C-section) on the day of or the day before the sows' predicted farrowing date. Clone piglets were kept under highly biosecure[131] conditions prior to initiating the experiment. Clones were bottle fed commercial milk replacer and did not receive colostrum at the time of birth. Comparator pigs, however, were born naturally (i.e., vaginally) in a standard commercial farrowing house, and suckled their dams until weaning. By

[131] "Biosecure" connotes conditions that, although not completely sterile, are designed to prevent introduction of most disease-causing organisms. Because animals' immune systems produce antibodies in response to specific stimuli (antigens), animals raised under biosecure conditions lack the full battery of antibodies needed to respond to common pathogens found in conventional environments (although they may have some antibodies if they have been vaccinated, these antibodies will be specific for the antigen used in the vaccine). It can take up to two weeks for an animal to develop a sufficient concentration of antibodies to a specific antigen following exposure.

the start of the test period (~50 days of age), the clones were similar in weight to the comparator pigs (16.4 vs. 15.3 kg for clones and comparators, respectively). In addition, comparator barrows were castrated during the first week of life, as per normal industry practice, but clone barrows were castrated at a later age (~30 days old). Pigs were assigned to this study shortly after they were weaned. Comparator barrows were selected from litters sired by one of the nuclear donor boars in a conventional (AI) breeding program. At the start of Study 1 clones and comparator animals were housed in the same facility. Target slaughter weight was approximately 122 kg.[132]

a. Animal Health, Hematology, Clinical Chemistry, and Urinalysis

Health records from date of birth were submitted for clones, and included birth weight, heart rate, respiration, body temperature, body weight, and daily health observations. All health problems and treatments were recorded. Necropsy reports were provided for clones that died or were euthanized. Blood samples of clones and comparators were collected at birth and again either approximately one week prior to slaughter, or immediately after animals were slaughtered. Urine samples were collected after slaughter (by bladder puncture). Blood hematology, clinical chemistry, and urine values were assayed as for the Cyagra dataset at the same independent testing laboratory (Cornell University's Animal Health Diagnostic Laboratory, see Appendix E).

b. Boar Semen Evaluation

Semen samples were evaluated in two commercial boar lines (Hamline and Duroc). The Hamline included three clone boars and the sexually derived nuclear donor boar for the clones as a comparator. The Duroc line included one clone boar and two comparators that were AI-derived progeny of the donor (semen from the Duroc nuclear donor was unavailable). Clones and comparator animals were housed at separate facilities. Semen was collected at least once a week from each boar, was diluted with a commercial semen extender to yield 3×10^9 sperm per dose, and cooled to 19˚C per standard industry practice. Semen from clones was evaluated pre-freezing and post-freezing (post-shipping) to determine quality. Comparator boar semen was only evaluated post-shipping. Standard tests such as sperm concentration, percent total motility, percent progressive motility, and number of head/tail abnormalities were evaluated.

c. Farrowing Rate

Following semen evaluation, semen from the four clone boars and three comparator boars were used to evaluate pregnancy (number of females diagnosed pregnant divided by number of

[132] Swine are typically slaughtered in groups. Usually, all swine raised together in a pen will go to slaughter on the same day once the average weight of the animals within that pen has reached a pre-set target weight. The date of slaughter can be affected by the availability of transportation and the capacity of the slaughter facility.

females bred) and farrowing (number of females giving birth to a litter divided by the number of females bred) rates. Three of the clone boars were bred to 12 gilts each and one clone boar was bred to 13 gilts (total of 49 gilts bred). For the comparator boars, two were bred to 14 gilts each and one was bred to 12 gilts (a total of 40 gilts bred). All gilts were bred via AI twice, once on the day of observed estrus and approximately 24 hours later.

2. Study 2: Progeny of Clone Boars vs. Progeny of Conventional Boars

Breeding resulted in 36 litters (402 total progeny) from the clone boars and 25 litters (300 total progeny) from the comparator boars. Reproductive outcomes evaluated included litter size, birth weight, number of stillborns, number of dead/destroyed animals, abnormalities, and nipple counts (another measure of breeding fitness often taken at birth). Animals were slaughtered when they had reached the target weight of approximately 122 kg. Average age at slaughter was 169.3 days for progeny of comparators and 174.9 days for progeny of clones.

a. Statistical Analysis

i. Methodology

To aid CVM's analysis of the very large sample sizes in Study 2, the Center's biostatisticians produced data summaries to facilitate veterinary and scientific evaluation of the outcomes collected from the progeny. Two types of summaries were used: contingency tables and boxplots. Definitions and examples of both are given below.

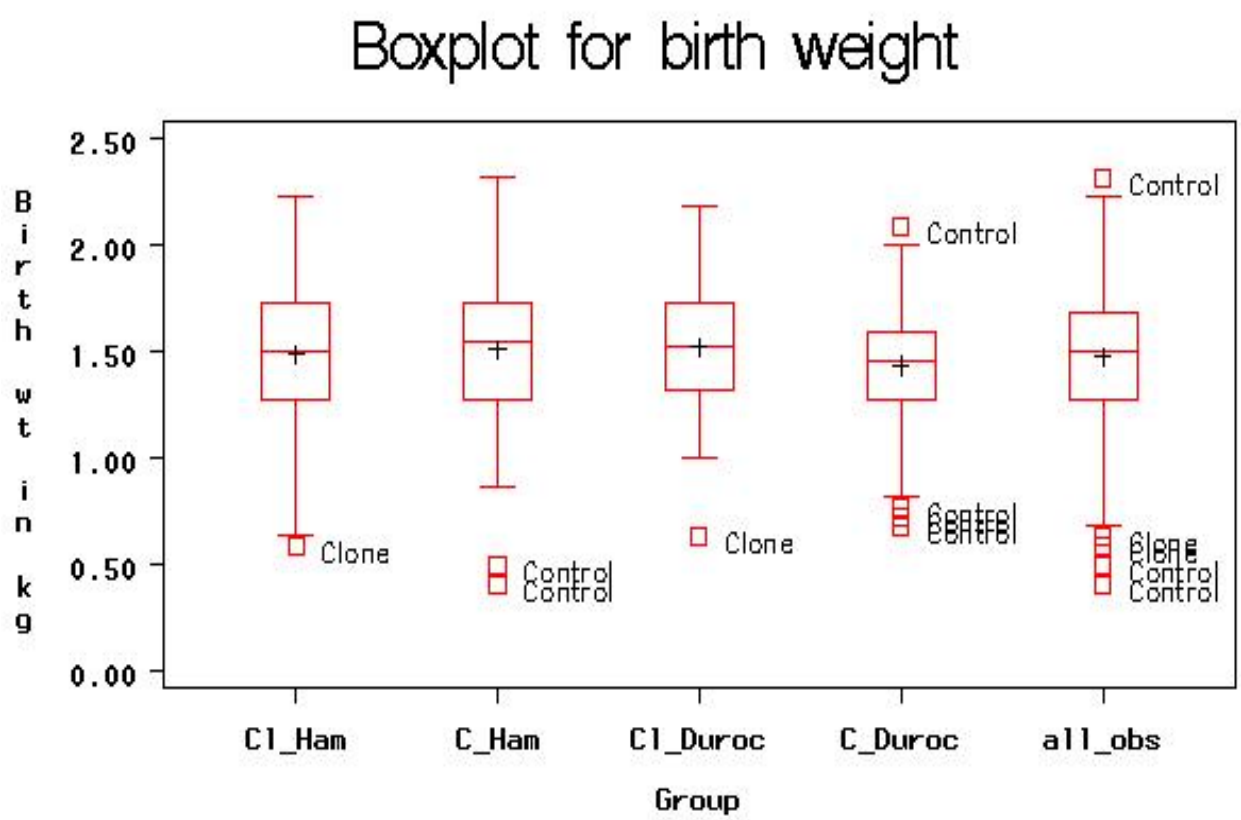
Contingency tables present data in a row and column format and are often used to summarize the results of discrete variables. A variable can be defined as discrete if its responses are limited to a few predetermined values. For example, a discrete variable from Study 2 is "Abnormality at birth" which is described according to four possible discrete outcomes: Normal, Atresia, Spraddle legs, or Other. For those progeny for which this variable was recorded, the distributions of "Abnormality" for the live-born progeny of animal clones and progeny of comparators are displayed in the following contingency table (Table F-1).

Table F-1: Contingency Table Data Description for Distribution of Abnormalities for Progeny of Clones and Progeny of Comparators

	Progeny of Clones		Progeny of Comparators	
Abnormality	**Number**	**Percentage**	**Number**	**Percentage**
Normal	384	97.5%	291	99%
Atresia	1	0.3%	0	0%
Spraddle Legs	4	1.0%	3	1.0%
Other	5	1.2%	0	0%
Total	394	100%	294	100%

By contrast, continuous variables are those whose responses can take on a continuum of values. Graphical displays are useful in summarizing the responses from continuous variables. The boxplot is one type of graphical display. An example of a continuous variable from Study 2 is "animal weight." The boxplots of birth weights from the progeny experiment are provided as an example below.

Figure F-3: Boxplot of birth weights of progeny of clones and comparators (in kgs)



In Figure F-3, the boxplot on the far right includes all of the birth weights recorded for clone progeny and comparators. To create a boxplot, the birth weight data was ordered from smallest

to largest. The bottom edge of the box was drawn at a value of birth weight for which 25 percent of the observations have a lower value, which is called the "25th percentile"[1] (or first quartile) of the sample. Similarly, the top of the box was drawn at a value of birth weight for which 75 percent of the observations have a lower value, which is called the "75th percentile"[133] of the sample. The value of the observation associated with the 75th percentile minus the value of the observation associated with the 25th percentile is called the interquartile range (IQR). Within the box, a plus sign is used to indicate the sample mean and the line from side to side of the box indicates the sample median which is the value of the observation associated with the 50th percentile below which half the observations lie. Any observation values which lie above the "upper fence," a point equal to 1.5 times IQR plus the value associated with the 75th percentile or below the "lower fence," a value equal to the value of the observation associated with the 25th percentile minus 1.5 times IQR, are individually plotted on the graph and are called extreme values. (Note the actual fence values are not plotted.) The whiskers stemming out from the boxes represent the observation just below the upper fence and the observation just above the lower fence. In the example above, the boxplots, from left to right, are for progeny of Hamline clones, progeny of Hamline comparator animals, progeny of Duroc clones, and progeny of Duroc comparator animals.

Boxplots do not require assumptions about the form of the underlying continuous data distributions and are uniformly applicable across a range of different distributions. When boxplots are used to describe a variable sampled from a single population and having a normal distribution, they tend to identify about 1 percent of values above and 1 percent of values below the box as "extreme."

When the underlying distribution has more data in the tails than a normal distribution, then more than 1 percent of the distribution is identified as extreme. To evaluate the ViaGen data, values from the progeny of clones were compared to the ends of the whiskers in the boxplots for the values from the progeny of comparators.

ii. Utility of Statistical Analysis as a Tool for Assessment of Outcomes

Results (numerical values) for any outcome from the clone progeny were compared to the ends of the whiskers for the distribution of values from progeny. If a result fell within the range defined by the box and whiskers, it was considered "within the same range as the comparators" and therefore posed no significant concern for the health of the animal or the composition of the food product. If a result for a clone fell outside the range identified by the whiskers for the comparators, or was identified because of its value in a contingency table, the appropriate CVM

[133] A percentile is defined as (1/(total sample size))*100

scientist (e.g., veterinarian, animal scientist, chemist, toxicologist) traced back all of the data for that the individual animal, and conducted a thorough examination of all of the relevant clinical information to draw a conclusion regarding the biological or health significance of the value.

In addition, to provide consistency with the presentation of the analysis developed for the Cyagra dataset (Appendix E), box charts were constructed. As described in that Appendix, black boxes or up or down arrows were assigned to values for each clone progeny by the reviewing veterinarian or scientist on the basis of this multi-step review procedure.

b. Specific Methods for the Analysis of Animal Health, Hematology, Clinical Chemistry, and Urinalysis Data

Progeny of clones and comparators were farrowed during a three week period from July 7-27, 2004, at the Meat Animal Research Center, USDA, Clay Center, Nebraska. All available animals were sampled (serum and whole blood) in July, October, and January. Blood samples were obtained between 7:30 and 10:30 AM. After collection, samples were placed on ice until centrifugation at 900 x g for 10 min at 4°C. Serum was collected and stored at -20°C until analysis for estradiol-17β (E2), and Insulin like growth factor-I (IGF-I). These time points represented early, middle and late stages in the life of the test subjects, which mirrors the lifespan of animals used for commercial pork production in the U.S. When considered in the context of the CBSA approach used in this Draft Risk Assessment, these time points roughly correspond to the Perinatal (July) and Juvenile (October and January) developmental nodes, as most pigs used for food are slaughtered before they reach sexual maturity. July and October blood samples were collected from the cranial vena cava. In January, blood and urine samples were harvested post-mortem. Pigs were individually identified by numbered ear tags, which did not reveal to caretakers or personnel taking samples whether the animals were the progeny of clones or comparators.

c. Meat Composition, Carcass Characteristics, and Meat Quality Assessments for Clones, Comparators, and Progeny.

As in standard US pork production, swine were slaughtered when they reached approximately 122 kg in weight. Samples were collected from the *latissimus dorsi* muscle (the muscle that comprises the large, round-shaped muscle next to the vertebrae end of the ribs that makes up the boneless portion of the "rib eye" roast or steak), frozen, and held at -20°C for approximately two weeks prior to shipping to a commercial laboratory for compositional analysis. Samples were identified by a nine digit code so that personnel at the analytical laboratory did not know which samples belonged to comparators, clones, or progeny of clones. Muscle samples (approximately 0.45 kg, deboned) were held frozen at -20°C for three to 20 days after receipt at the laboratory

before being partially thawed (10 – 18˚C overnight) and homogenized using a commercial grade meat grinder with a #12 blade and passed through a 1/8 inch screen. Homogenized meat samples were analyzed for fatty acid and amino acid profiles, cholesterol, vitamins B_6, B_{12}, niacin, calcium, iron, phosphorus, and zinc. Analyses were carried out according to the Association of Analytical Communities International (AOAC) methods for amino acids (982.30), calcium, iron, phosphorus and zinc (965.17 and 985.01), cholesterol (994.10), fatty acid profile (996.06), niacin (944.13), vitamin B_{12} (952.20) and vitamin B_6 (961.15). With the exception of vitamins B_6, B_{12}, niacin, and cholesterol, values were reported as percentages. Vitamin B_6, niacin and cholesterol were reported as mg/100 g of sample, and vitamin B_{12} was reported as mcg/100 g of sample. Percentages were based on grams of nutrient per 100 grams of homogenized meat sample.

Economically important traits for the swine carcass evaluation include animal live weight, dressing percentage, carcass length, loin muscle area, backfat depth, extent of muscling, and firmness. These are described in the following paragraphs.

The normal range for dressing percentage[134] is 68-77 percent (average of 72 percent) with a minimum carcass length of 76.2 cm. The minimum acceptable area for loin muscle is 11.4 cm^2 and the maximum back fat thickness over the last rib (10th or 11th rib) is 3.8 cm.[135]

Three degrees of pork carcass muscling are recognized in the pork grading standards or USDA[136] carcass muscling score: muscle score #1 = thin (inferior), muscle score #2 = average, and muscle score #3 = thick (superior). Scores of either 2 or 3 are considered acceptable under USDA inspection standards. Muscle firmness is a subjective score determined by visual observation and physical handling of the meat. Muscle firmness is measured on a three-point scale: score #1 = soft, score #2 = firm, and #3 = very firm. As with muscling score, a firmness score of 2 or 3 is considered desirable.

C. Results

1. Study 1

a. Survival

Seven clones and 16 comparators were raised by ViaGen Inc. The seven clones began the study at 50 days of age, and all seven survived until the end of the observation period (approximately

[134] Dressing percentage refers to the proportion of the live animal that ends up as the carcass used for food production, or Carcass Weight / Live Weight X 100.
[135] http://www.animalrangeextension.montana.edu/Articles/Swine/2-Det-quant.htm
[136] http://ars.sdstate.edu/AnimalEval/Swine/SwineGrade.htm

195 days of age); however, two clones were euthanized due to chronic health problems at the end of the study. Thus, five clones were slaughtered as per normal industry practice. One of these clones was diagnosed with a lung adhesion post mortem, which, by USDA standards would have led to condemnation of the carcass. Similarly, 15/16 comparators reached the end of the observation period (approximately 171 days of age), with one comparator euthanized approximately four months prior to the end of the study because of a chronic respiratory condition.

Because litters of clones were born approximately six weeks apart, they were separated into two groups of animals and matched with comparators born at approximately the same time. In the first group, five clones and 11 comparators were raised and studied. In this first group, one clone (#21, farrowed 10/13/03) and one comparator (#025435) did not thrive. Clone #21, a Duroc, was euthanized at the end of the study (May 27, 2004) and was not included in the final carcass evaluations because of low weight. However, hematology and clinical chemistry values for this clone were used for analysis of health data. Non-clone comparator #025435 was euthanized on December 4, 2003 because of a respiratory condition that was not improving.

ViaGen raised two clones and five comparators in the second group. Clone #23, a Hamline, farrowed on 11/23/03, was described as a "poor doer" and was euthanized at the end of the study. All comparators from this group survived to slaughter.

b. Animal Health, Growth, Blood Clinical Chemistry, Hematology, and Urinalysis

Clones were smaller on average at birth than their conventionally bred counterparts (1.1 vs. 1.7 kg) (Table F-2). By the start of the test period (~50 days), however, clones were similar in weight to their comparators (16.4 vs. 15.3 kg).

Animal health records indicated that six of the seven clones developed scours (severe diarrhea) approximately two months after birth, which would have been shortly after they were moved from the biosecure environment. The affected clones were #18, 19, 20, 21, 22 and 23. One of these animals (Clone #22) was diagnosed at approximately four months of age with influenza and secondary bacterial septicemia, was periodically treated with antibiotics throughout the experimental period, and was eventually euthanized at the end of the study. One of the comparator animals (#025435) was diagnosed at approximately one month of age with influenza and secondary bacterial septicemia. This animal was periodically treated with antibiotics throughout the experimental period and was eventually euthanized. The clones weighed less at slaughter and took an average of 27 days longer to reach the target slaughter weight. As a result, the calculated average daily (weight) gain (ADG) for clones was lower than for comparators

(0.63 vs. 0.93 kg/day). The clones were slaughtered later than comparators because of the greater length of time needed for them to achieve the target weight, and also because the slaughter facility could only accommodate them on a few specified days. This latter point was because clones are currently withheld from the food supply, and the facility preferred to slaughter the clones on days when no other swine were being processed, in order to prevent accidental mixing of the clones with conventional animals.

Table F-2: Comparison of the Body Weight (kg) of Barrows Derived by Somatic Cell Nuclear Transfer (Clones) or Conventional Breeding (mean ± standard deviation)

	Comparators		**Clones**	
	Age	**Body Weight**	**Age**	**Body Weight**
Birth weight	—	1.72 ± 0.28a (n=15)	—	1.13 ± 0.09b (n=4)
Post-weaning	22.4 ± 4.81 (n=15)	15.3 ± 5.99 (n=15)	21.2 ± 1.81 (n=4)	17.0 ± 3.40 (n=4)
End of Experiment	77.9 ± 5.62a (n=15)	128.9 ± 7.26 (n=15)	88.5 ± 8.16b (n=4)	122.2 ± 8.93 (n=4)

Note: one comparator is not included because it was euthanized at about 1 month of age. Three clones are not included due to low weight.

As previously mentioned, clones and comparators were reared under different conditions prior to starting the experiment. Clones were delivered by C-section, did not receive colostrum, were fed a commercial milk replacer, were castrated at an older age, and were raised in a biosecure environment prior to initiation of the study. The clones were then housed along with the comparator animals in an environment similar to commercial swine facilities, where they were exposed to a typical range of pathogens. The comparators were farrowed vaginally following natural initiation of labor in a farrowing house similar to commercial swine operations, and the progeny were allowed to nurse off their dams. This disparity likely accounts for some of the differences in growth and health observed. The sudden change from a biosecure environment, with a low immune challenge, to a more conventional barn with a high immune challenge placed considerable stress on the immune systems of the young clones. This stress likely led to the higher incidence of scouring in this group, and may have resulted in decreased food consumption or absorption, and increased energy expenditure to combat illness.

Body temperature, heart and respiration rates were measured in clones, but not in comparators. Because of the absence of comparator data, observations for these measurements are put in the context of common veterinary practice or reference texts or manuals.

Table F-3: Average Body Temperature, Heart Rate, and Respiration Rate for Neonatal Clones During First Eight Days After Birth

Day	Temperature (˚F)[1]	Heart Rate (beats/min)	Respiration Rate (breaths/min)
1	100.38 ± 0.18	194.33 ± 1.42	87.56 ± 0.71
2	100.80 ± 0.17	184.22 ± 0.96	79.61 ± 0.53
3	101.40 ± 0.19	179.96 ± 0.92	75.72 ± 0.53
4	101.43 ± 0.19	177.30 ± 1.03	72.52 ± 0.59
5	101.53 ± 0.21	177.28 ± 1.23	71.81 ± 0.71
6	101.41 ± 0.23	177.94 ± 1.23	71.06 ± 0.71
7	101.59 ± 0.22	179.00 ± 1.19	70.29 ± 0.79
8	101.89 ± 0.21	178.11 ± 1.18	72.34 ± 0.68

[1] Temperatures were recorded and analyzed in Fahrenheit. Standard deviations are not convertible to Celsius.

Body Temperature (BT). Clones #18, 19, 20, 22, and 24 were measured for BT 2-9 times per day for the first eight days of life (no records on BT for other clones were available). Body temperature increased over this eight day period from an average of 100.38 ± 0.18ºF (37.99˚C) on Day 1 to 101.89 ± 0.21ºF (38.83˚C) on Day 8. The low BT was 97.7º F (36.5˚C), and occurred in clones #22 and 24 early in the study (Days 1 and 2 post farrowing). The high temperatures were 104.6ºF (40.33˚C), 103.8ºF (39.89˚C), and 103ºF (39.44˚C) and occurred in one clone (#24), twice on Day 1, 1, and 8 respectively. The Merck Manual's Reference range for swine BT is 101-103°F (38.33 – 39.44˚C). The BT indicates an apparent appropriate response to autonomous BT regulation (adjustment to post-natal environment) after delivery from the uterus where BT is not self-regulated, but controlled by the intra-uterine environment. As mentioned in Chapter V, newborn pigs typically cannot regulate their own BT. Generally, it is recommended to maintain the environment of newborn pigs at a temperature of 86-93˚F (30-34˚C) for the first week to allow for this adaptation period (Merck Veterinary Manual Online).

Heart rates (HR). The heart rates (HRs) of clones also were measured 4-12 times per day for the first eight days of life. Heart rate decreased over time from 194.33 ± 1.42 to 178.11 ± 1.18 beats per minute (bpm). The highest value was 220 bpm for clone #18 on Day 1; the lowest value is 100 bpm for clone #22 on Day 1. This decrease is an appropriate response for neonates. Heart rates decrease with age as fetal circulation (ductus venosus,[137] foramen ovale,[138] and

[137] The ductus venosus carries oxygenated blood from the umbilical vein to the caudal vena cava, bypassing the fetal liver.
[138] The foramen ovale is a hole between the right and left atria in the fetal heart, for the purpose of by-passing the fetal lungs *in utero*.

ductus arteriosus[139] closure) normalizes and the neonate develops autonomic control (Medline, Medical Encyclopedia[140]). There were no values from the non-clone group for direct comparison. These values should be evaluated with caution because the very act of ausculting (listening to) the thorax of an animal that is seldom handled can raise HR artifactually. In fact, it is possible that the reduction in HR over time represents the pigs becoming more accustomed to handling. Data on HR for non-clone neonatal swine are not routinely reported; however, one study (Foster et al. 2001) recorded HR of day-old piglets before and after insertion of a breathing tube. Prior to insertion of the tube, average HR was 190.75 ± 36.45 bpm. In another study (Aaltonen et al. 2003) examining the effects of mecomium aspiration and asphyxia in piglets aged 10 to 12 days. Average HR for the control (untreated) group was 203 ± 23 bpm. Given these data for comparison, the HR of clone pigs during the first eight days of life fell within or slightly below the range of non-clone pigs of similar ages.

Respiration. The same clones as above were evaluated 5-12 times per day for the first eight days of life. Respiration rates decreased over time, ranging from 87.56 ± 0.71 breaths/minute on Day 1 to 70.29 ± 0.79 breaths/minute on Day 7. As with HR, data on swine neonatal respiration rates are not commonly reported. However, one study (McDeigan et al. 2003) measured respiratory responses in pigs from 3 to 7 days of age before and after exposure to either saline (control) or *Escherichia coli* endotoxin. Average pre-treatment respiration rate for control piglets was 44 ± 5 breaths/minute in this study, and thus considerably lower than the average respiration rates of the clones in the ViaGen study. The lowest daily average respiration rate among the neonatal clones in the ViaGen study was 69.6 breaths/min on day 7 (Clone #18). The cautions mentioned for interpreting HR data should also be applied to interpreting respiration rates. Also, animals delivered by C-section have a transient tachypnea (rapid breathing) because the pulmonary surfactant and fluid is not distributed and squeezed out of the lungs as it would in a vaginal birth (Medline, Medical Encyclopedia).

Daily Health Records. Clones #18, 19, 20, 21, 22, and 23 all had scours (severe diarrhea) while on study. Clone #18 herniated a loop of bowel post-castration, which was repaired, and the pig responded well. This pig had an inguinal hernia, sometimes referred to as a "busted pig," which is not uncommon in swine (Gatphayak et al. 2005). As previously mentioned, clone #21 was described as a "poor doer" (unthrifty, poor weight gain) and was euthanized because of low body weight. He had chronic scours and a skin abscess on his neck. Clone #22 had scours twice while on study. He developed sepsis (a blood infection), and had a low body weight at slaughter. Clone #23 had many health problems, including scours, respiratory disease, cyanotic (bluish) skin

[139] The ductus arteriosis carries oxygenated blood from the main pulmonary artery to the descending aorta, bypassing the fetal lungs.
[140] http://www.nlm.nih.gov/medlineplus/ency/article/003399.htm

color, and grew slowly. He was euthanized because of his low body weight. Clone #24 had some respiratory difficulty toward the end of the study but responded to therapy. One comparator pig (#025435) was euthanized for non-responsive diarrhea and pneumonia early in the study. Another comparator (#027446) had one reported health problem of a swollen dewclaw that responded to therapy.

Although these clones had more health problems than comparators, it is important to note that differences in early rearing are likely to have contributed to these outcomes. First, the clones were not suckled on their dams, but were fed commercial milk replacer. This deprived them of the passive immunity provided by transfer of maternal antibodies in the colostrum. Secondly, pigs raised in a biosecure environment would not have developed antibodies to common environmental pathogens, and would be at increased risk of developing infections until their immune systems adjusted to the environmental challenges when they were moved to less-biosecure conditions at day 50 of age. The comparators, on the other hand, were born in conditions equivalent to commercial swine breeding, and were allowed to suckle on their dams, thereby allowing their immune systems to develop along more conventional lines. We also note that even though some of the clones developed illness, most (5/7) were able to respond to treatment. Further, the hernia observed in clone #18 is not unique to clones, but is considered common among male pigs in the general swine population (Merck Veterinary Manual Online).

Clinical Chemistry and Pathology. Clinical pathology is the term generally used for laboratory findings that includes clinical chemistry, hematology, and urinalysis among others. As described in Appendices E and G, clinical chemistry and hematology responses are best evaluated in the context of the whole animal, including its age, species, breed, husbandry, geographic location, reproductive status, and the laboratory performing the analysis. Laboratory findings complement the subjective physical diagnosis of the patient by providing objective information for the process of differential diagnosis, monitoring treatment, and formulation of a prognosis. "Abnormal" laboratory measurements and examinations are often defined as those values lying outside the limits of the reference range. Determining what constitutes "normal" is more complex than simply comparing an individual value to a reference range derived from a sample of a representative population. In this study, the firm provided serum chemistry data, white cell counts, red cell counts, and urinalysis using a rapid "dipstick" test. Because the number of pigs in the study was low, a statistical analysis of the comparator ranges was not appropriate. Values from clones were compared to those from the comparators.

Across all three sampling periods, 89 percent (281/315) of clones' hematology measurements were within the range of the comparator population. At the beginning of the study, 80 percent of the clones' hematology values (84/105) were within the range of the comparators. This

percentage improved at the next sampling period, approximately two months later, such that 88 percent of the clones' values (92/105) were within range. For clinical chemistry, 76 percent of the clones' values (236/315) were within the comparator range across all time periods. As with hematology, the percentage of clone values within the range of comparators was lower at the beginning of the trial, but this ratio improved as the animals grew. At the beginning of the study, 63 percent (66/105) of the clones' values were within the comparator range. By the second sampling period, 83 percent (88/105) of the clones' values were within the comparator range. By the end of the trial it appeared that clones for the most part had stabilized, with 84 percent of the hematology values and 98 percent of clinical chemistry values within the comparator range (Table F-4).

Table F-4: Clone Hematology and Clinical Chemistry Values Identified As Outside The Comparator Range

Sampling Period	Number of Variables	Number of Observations	Number of Clones	Number of Out of Range Values	Percentage Out of Range	Number of In Range Values	Percentage In Range
1st hematology	21	105	5	21	20%	84	80%
1st clinical chemistry	21	105	5	39	37%	66	63%
2nd hematology	21	105	5	13	12%	92	88%
2nd clinical chemistry	21	105	5	17	16%	88	84%
3rd hematology	21	105	5	17	16%	88	84%
3rd clinical chemistry	21	84	4	23	2%	82	98%

Seven comparators had elevated WBC counts with no apparent health problem. Clone #20 had a high WBC (32,000 cells/µl) during an episode of diarrhea. This is an appropriate clinical response. One clone (#18) and one comparator (#025457) had low platelets at the end of the study. Red blood cell size for both clones and comparators indicated a microcytosis (low MCV). Because the clones and comparators were similar, this value is likely related to the laboratory and not a difference in health.

Clone #21 had elevated BUN levels at the start and middle of the study and elevated liver and muscle enzymes at the start and end of study. He did not show an increase in WBC, and had a slight increase in urine glucose at the end of the study. These findings are consistent with a "poor-doing" animal. Animals in a negative energy balance (due to inadequate nutrition, food

intake or utilization) will start to mobilize muscle protein for energy once their body energy stores are depleted. Blood urea can elevate with increased protein digestion or mobilization. CK (an intracellular enzyme for muscle) will also increase with muscle break down. The elevated liver enzymes indicate some insult to the liver. The cause of these health problems is not evident from the data presented.

Clone #23 exhibited an increase in blood glucose at the start of the study (January) and bile acids at the mid-point of the study (March). By the end of the study (May), clone #23 had glucose and bile acid values within the range of the comparators. Clone #23 was also a "poor doer" (poor weight gain), but had no other clinical pathology abnormalities evident. Although increased blood glucose levels may indicate metabolic disturbances such as diabetes, the increased glucose levels in this study (in blood and once in urine) appear to have been transient and resolved spontaneously. They therefore do not appear to be indicative of an insulin deficiency or resistance. Bile acids are an indicator of liver function (see Appendix G). If the bile acid value is consistently elevated, liver insufficiency may be indicated. However, bile acid levels are also dependent on when the animal was fed, and increase after a meal. Because information on the relationship between blood draws and feeding times was not provided, no conclusion can be made about the single measurement which on its own does not suggest a health problem.

Urinalysis. Urine values were determined by dipstick. There was apparently no Specific Gravity (SG) determination using a refractometer or sedimentation evaluation, so SG was measured only by the dipstick method, which is less accurate than these other methods. With these caveats in mind, two clones and one comparator had glucose in their urine. The percent of clones and comparators with blood and protein in their urine were similar. Seven out of 15 urine samples from clones were positive for blood (47 percent) vs. 16/ 44 (36 percent) samples from comparators. For protein, 6/15 samples from clones (40 percent) vs. 20/44 (45 percent) samples from comparators were positive. Color, turbidity, SG, bilirubin, pH, ketone, nitrite, and leukocytes were all similar between clones and comparators. The presence of blood in the urine may have been due to the fact that these samples were taken after the pigs had been slaughtered.

Organ weights. The clones' body weights were lighter on average than comparators at slaughter (117 vs. 128.8 kg). Clones #21 and 23 were so light (86.2 and 89.8 kg, respectively), they were not included in the organ weight analyses. Kidneys were smaller for clones vs. comparators on a percent of body weight basis. However, heart, liver, lungs, and spleen were similar as a percent of body weight for clones vs. comparators. With no clinical chemistry indicators of renal insufficiency in clones, the smaller kidney weights are interesting but not conclusive. These findings indicate no appreciable differences between clones and comparators in organ size as a percent of body weight.