

May 3, 2007

Division of Dockets Management (HFA-305)  
Food and Drug Administration  
5630 Fishers Lane,  
Room 1061  
Rockville, MD 20852

Re: Docket No. 2003N-0573, Draft Animal Cloning Risk Assessment; Proposed Risk Management Plan; Draft Guidance for Industry; Availability.

Dear Docket Clerk:

On behalf of ViaGen Inc., I would like to thank the Food & Drug Administration (FDA) for the opportunity to provide comment on “Docket No. 2003N-0573, Draft Animal Cloning Risk Assessment; Proposed Risk Management Plan; Draft Guidance for Industry; Availability.” Based in Austin, Texas, ViaGen is a global provider of advanced livestock genetic technologies, including animal cloning.

ViaGen supports the efforts by the FDA to ensure this Draft Risk Assessment and related documents receive public comment. This transparency is vital to ensuring all stakeholders are familiar with the science surrounding the technology and the science-based process the FDA has used to reach its conclusions.

We are providing comments to the FDA in the following areas: General comments; the draft risk assessment, including additional published data that should be considered; draft guidance for industry; draft risk management document, and the legal foundation for the FDA’s findings and future actions.

### **General**

ViaGen supports the conclusions of the FDA’s Draft Risk Assessment on the safety of foods derived from cloned livestock and their progeny. By the FDA’s own description, that document represents one of the most exhaustive food safety studies the agency has ever conducted. The document demonstrates unequivocally there is no difference between the safety of food from cloned animals or their progeny and the safety of food from other animals (whether bred naturally or through common assisted reproductive technologies [ART] such as *in vitro* fertilization, artificial insemination, embryo splitting or embryo transfer) or their progeny.

The Draft Risk Assessment includes agency analysis of more than 400 U.S. and international scientific studies on livestock cloning, including two reviews by the U.S. National Academy of Sciences. The FDA review encompasses several years of safety data and several generations of livestock, including original safety and equivalency research done in collaboration with the U.S. Department of Agriculture's U.S. Meat Animal Research Center in Clay Center, Nebraska.

Further, the Draft Risk Assessment was produced in collaboration with an independent panel of scientific experts, thoroughly and independently peer reviewed, and vetted with other relevant federal agencies including the U.S. Department of Health & Human Services, the U.S. Department of Agriculture (USDA) through its Food Safety & Inspection Service risk assessment review team, and the office of the U.S. Trade Representative.

Critics of the Draft Risk Assessment contend that some data considered by the FDA was provided by cloning companies, and must therefore be biased or unreliable. Public confidence in the Draft Risk Assessment may be strengthened by clarification of the fact that the data contained in the "ViaGen Dataset" is raw data collected not by ViaGen, but by the USDA's U.S. Meat Animal Research Center in Clay Center, Nebraska and the Food and Animal Health Testing Lab Eurofins Scientific, Inc. The FDA performed its own analysis of this raw data. Allegations of bias regarding this data are therefore without merit.

In analyzing the potential food consumption risk of cloned animals and their progeny, the FDA utilized two methodologies: a Critical Biological Systems Approach, incorporating a systemic review of the health of cloned animals and their progeny, and a Compositional Analysis Method comparing individual components of edible products of progeny of cloned animals and of their conventionally produced comparators. Analysis showed no significant differences in behavior, epigenetic or physiological measurements of adult animals, and showed that healthy adult cloned animals are indistinguishable from their comparators even at the level of clinical chemistry and hematology. The results of this comprehensive risk assessment led to the conclusion that there is no evidence food products derived from adult cloned animals or their progeny present any food safety concern.

The FDA has correctly identified animal cloning as a technology within the continuum of many ART available to animal breeders. As with some other ART (e.g., *in vitro* fertilization), success rates may be lower than in natural breeding and some neonatal anomalies may occur. The FDA found these differences are not unique to cloning, but are similar to those observed for other ART. As when any new technology is introduced, success rates are lower at the beginning; but with experience come knowledge and improvement. The vast majority of animals born through cloning reach healthy adulthood. The success rates of cloning are now comparable to those of other assisted reproductive techniques.

Neonatal anomalies **are not seen in the progeny of cloned animals** with any greater frequency than in the progeny of conventionally produced animals. Health outcomes for the progeny of cloned animals and conventionally produced animals are the same.

As a cloning technology provider, ViaGen has urged the food industry to abide by the request of the FDA to voluntarily withhold the sale of meat and milk products from cloned animals and

their progeny. ViaGen will continue to support this moratorium while the FDA finalizes the risk assessment. However, once the risk assessment is finalized, we expect the FDA to lift the moratorium immediately and completely. The benefits of this technology are needed and wanted by the U.S. livestock industry and by informed consumers. We urge the FDA to remain science-based in its proceedings, to incorporate any new data or peer-reviewed studies published since the release of the Draft Risk Assessment, and to finalize the risk assessment and supporting documents as appropriate.

## **Draft Risk Assessment**

2007 Published Data: Since publication of the FDA Draft Risk Assessment in December 2006, several relevant scientific papers have been published. The International Embryo Transfer Society (IETS) organized a pre-conference symposium “Assisted Reproductive Technologies and Food Safety in Farm Animals” held in Kyoto, Japan on January 6, 2007. Nine out of ten presentations at the symposium were focused on animal cloning technology. All of the presented data are in agreement with the conclusions of the Draft Risk Assessment. Six of those papers contain new data; ViaGen recommends the FDA include them in the final Risk Assessment. They are as follows:

- H. Ortegon, D.H. Betts, L. Lin et al. *Genomic stability and physiological assessments of live offspring sired by a bull clone, Starbuck II*. *Theriogenology* 2007; 67: 116-126.
  - “Offspring of a cloned bull had a normal chromosomal stability, growth, physical, hematological and reproductive parameters.”
- Y. Heyman, P. Chavatte-Palmer, V. Berthlot et al. *Assessing the quality of products from cloned cattle: an integrative approach*. *Theriogenology* 2007; 67: 134-141.
  - “In clone and control groups, most parameters measured for health and development of the animals as well as evaluation of milk and meat products were within the normal range for the breed. Slight significant difference was observed in fatty acid composition.... Nutritional evaluation of milk and meat using the rat model did not reveal any difference between products derived from clones versus controls.”
- M. Panarace, J.I. Aguero, M. Garrote et al. *How healthy are clones and their progeny: 5 years of field experience*. *Theriogenology* 2007; 67: 142-151.
  - “In conclusion, cloning had no risks qualitatively different from those encountered in animals involved in modern agricultural practices, although the frequency of the risks appeared to be increased in cattle during the early portion of the life cycle of cattle clones.”
- M. Yamaguchi, Y. Ito, S. Takahashi. *Fourteen-week feeding test of meat and milk derived from cloned cattle in the rat*. *Theriogenology* 2007; 67: 152-165.
  - A long-term rat feeding study found “no significant differences in general conditions, death loss, growth, battery of functional observation tests and estrous cycles among groups given diets containing meat and milk powder from non-clone, embryonic clone and somatic clone cattle. Furthermore, no significant

changes attributed to consumption of clone meat or milk were detected in urinalysis, hematological and blood chemical, gross pathological or histological examinations. Therefore, we concluded that the physiologic conditions of the rats were not affected by consumption of meat and milk from bovine clones.”

- G. Laible, B. Brophy, D. Knighton et al. *Compositional analysis of dairy products derived from clones and cloned transgenic cattle*. *Theriogenology* 2007; 67: 166-177.
  - Compositional differences associated with milk and cheese derived from cloned and transgenic cows were assessed. “Based on gross composition, fatty acid and amino acid profiles and mineral and vitamin contents, milk produced by clones and conventional cattle were essentially similar and consistent with reference values from dairy cows farmed in the same region under similar conditions.”
- S.C. Walker, R.K. Christenson, R.P. Reeves et al. *Comparison of meat composition from offspring of cloned and conventionally produced boars*. *Theriogenology* 2007; 67: 178-184.
  - Meat composition from progeny of cloned and conventionally produced boars was compared. The “data indicated that meat from the offspring of clones was not chemically different than meat from controls.”
  - A statistical analysis of the dataset published in this paper was recently completed by Benyshek and Hough Consulting Services; the analysis found no statistically significant differences in the composition of meat from the progeny of cloned animals and controls. With this comment we are submitting two documents in support of this point; one states the statistical procedures and the conclusion of the analysis (Attachment 1) and the other is a spreadsheet of the data (Attachment 2).

Epigenetics: ViaGen supports the FDA's conclusion that the most compelling end points on food consumption risks are drawn from assessments of the health status of the animals and the composition of food products derived from them, and not from gene expression or epigenetic variation studies (page 66). For several compelling reasons, epigenetic differences and gene expression profiling should not be used as parameters for assessment of food safety. These reasons include the following:

- Epigenetic variation is part of the normal and necessary way organisms adapt to their environment. Fraga et al. (2005)<sup>1</sup> showed human identical twins with very similar epigenetic patterns at the beginning of their lives accumulate epigenetic differences over time. Using mouse coat color as a marker, Cooney et al. (2002)<sup>2</sup> demonstrated the epigenetic profiles of progeny can be influenced by maternal methyl food supplements.
- Epigenetic variations are not unique to cloning. Large offspring syndrome was identified in both sheep and cattle when embryos were produced by IVF and had been exposed to

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<sup>1</sup> Fraga MF, Ballestar E, Paz MF et al. *Epigenetic differences arise during the lifetime of monozygotic twins*. *Proc Natl Acad Sci U S A*. 2005 Jul 26; 102(30): 10604-9.

<sup>2</sup> Cooney CA, Dave AA, Wolff GL. *Maternal methyl supplements in mice affect epigenetic variation and DNA methylation of offspring*. *J Nutr*. 2002 Aug; 132(8 Suppl): 2393S-2400S.

some time in culture, due to epigenetic changes of imprinting genes (Young et al., 1998<sup>3</sup>, Swales and Spears, 2005<sup>4</sup>). The type of embryo culture medium influences the nature and magnitude of methylation levels of imprinting genes (Young et al., 2001<sup>5</sup>; Johnson, 2005<sup>6</sup>). Superovulation has also been implicated in abnormal methylation and imprinting in the resultant embryos (Gardner and Lane, 2005<sup>7</sup>). Therefore, animals produced by non-SCNT ART and by natural mating may have epigenetic dysregulation, but this does not indicate a food safety risk.

- Epigenetic modification is just one of many mechanisms regulating gene expression. Global gene expression studies found minimal difference between IVF and somatic cell nuclear transfer (SCNT) embryos at blastocyst stage (Smith et al., 2005<sup>8</sup>; Beyhan et al., 2007<sup>9</sup>). It is genes and their encoding proteins that ultimately function to determine a cell or embryo's fate. In cloned animals the genome is not altered, with the result that milk, meat, physiological parameters and progeny are all normal. Though epigenetic reprogramming mechanisms warrant further study, we must be cautious in interpreting their implications.
- Genomes are "plastic" and can accommodate some errors in epigenetic reprogramming. Humpherys et al (2001)<sup>10</sup> showed variable epigenetic patterns for imprinted genes are observed in viable cloned animals. Extensive gene knock-out experiments have shown the deletion of many genes does not cause detectable phenotypical abnormalities. These results suggest gene expression profiling cannot be used to measure an animal's health status.
- Severe epigenetic dysregulation is likely the greatest hindrance to efficiency in cloning. Healthy cloned animals are selected for normal functionality. Cloned animals reaching healthy adulthood have comparable epigenetic patterns with animals produced by other ARTs in the genome regions studied so far (Cezar et al., 2003<sup>11</sup>). This indicates epigenetic reprogramming errors are filtered out. More importantly, evidence suggests that during gametogenesis, epigenetic markings--including demethylation--in germ cells can be erased, and germ cells of cloned animals are able to correctly undergo genomic

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<sup>3</sup> Young LE, Sinclair KD, Wilmut I. *Large offspring syndrome in cattle and sheep*. *Rev Reprod*. 1998 Sep; 3(3): 155-63.

<sup>4</sup> Swales AK, Spears N. *Genomic imprinting and reproduction*. *Reproduction*. 2005 Oct; 130(4): 389-99.

<sup>5</sup> Young LE, Fernandes K, McEvoy TG et al. *Epigenetic change in IGF2R is associated with fetal overgrowth after sheep embryo culture*. *Nat Genet*. 2001 Feb; 27(2): 153-4.

<sup>6</sup> Johnson MH. *The problematic in-vitro embryo in the age of epigenetics*. *Reprod Biomed Online*. 2005 Mar; 10 Suppl 1: 88-96.

<sup>7</sup> Gardner DK, Lane M. *Ex vivo early embryo development and effects on gene expression and imprinting*. *Reprod Fertil Dev*. 2005; 17(3): 361-70.

<sup>8</sup> Smith SL, Everts RE, Tian XC et al. *Global gene expression profiles reveal significant nuclear reprogramming by the blastocyst stage after cloning*. *Proc Natl Acad Sci U S A*. 2005 Dec 6; 102(49): 17582-7.

<sup>9</sup> Beyhan Z, Forsberg EJ, Eilertsen KJ et al. *Gene expression in bovine nuclear transfer embryos in relation to donor cell efficiency in producing live offspring*. *Mol Reprod Dev*. 2007 Jan; 74(1): 18-27.

<sup>10</sup> Humpherys D, Eggan K, Akutsu H, et al. *Epigenetic instability in ES cells and cloned mice*. *Science*. 2001 Jul 6; 293(5527): 95-7.

<sup>11</sup> Cezar GG, Bartolomei MS, Forsberg EJ et al. *Genome-wide epigenetic alterations in cloned bovine fetuses*. *Biol Reprod*. 2003 Mar; 68(3): 1009-14.

imprint reprogramming (Tamashiro et al., 2002<sup>12</sup>). Therefore, we do not expect to see epigenetic reprogramming issues in the progeny of cloned animals.

### **Draft Guidance for Industry**

The FDA analyzed the complete universe of available domestic and global research and experience related to the safety of foods from cloned animals and their progeny. The agency collected an extensive amount of extant information and original research related to the health of cloned animals and their progeny, and the safety of products derived therefrom which may enter the food supply through rendering or animal feed/pet food use.

ViaGen's review of the draft guidance for industry document yields the following comments on the FDA's conclusions:

- ViaGen supports the FDA's conclusion that cloned animals and their progeny require no unique animal feeding or nutrition regimes.
- ViaGen supports the FDA's conclusion that since no unique food safety risks are connected to the meat and milk from cloned animals or their progeny, the rendering of any cloned animals or their progeny – including the use of such rendered products or milk in the production of animal feeds – presents no unique or material risk to the animals being fed or the population that may consume the meat and dairy products from such animals.
- There is no science-based rationale or practical consumer benefit to require any extraordinary labeling of meat and dairy products derived from cloned animals or their progeny. ViaGen strongly concurs with and supports the FDA's conclusion that no unique risks for human food consumption were identified in cloned cattle, swine or goats and their progeny, and that no anomalies exist in animals produced by cloning that are not also observed in animals produced by other ART and natural mating.
- Federal food safety systems now in place for all food animals – the Federal Meat Inspection Act, Humane Slaughter Act, Pasteurized Milk Ordinance, etc. administered by the USDA and FDA separately and in coordination – as well as other local, state and federal requirements are sufficient to provide the public the confidence it needs in the foods it purchases.

ViaGen strongly recommends the agency insert into this guidance document – as well as within the risk assessment and the proposed risk management plan – the strongest, most unequivocal statements it can regarding the safety and equivalence of foods from cloned animals and their progeny. While the agency has talked openly about the scope of the Draft Risk Assessment, surveys consistently demonstrate the public wants to hear strong messages of food safety and equivalency from the FDA. The consumer is less likely to question and more likely to embrace the conclusions of the FDA's risk assessment if he or she hears from the FDA and its sister

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<sup>12</sup> Tamashiro KL, Wakayama T, Akutsu H et al. *Cloned mice have an obese phenotype not transmitted to their offspring*. Nat Med. 2002 Mar; 8(3): 262-7.

agencies the strongest possible statements of food safety and equivalency, e.g. “The foods are the same as ... ,” “These foods are as safe as ... .”

Strong public support for the agency’s conclusions will mitigate questions and concerns held by some in Congress and a few state legislatures. Some federal and state legislators have gone so far as to introduce legislation that would require foods from cloned animals and their progeny be labeled as such. As of this writing, seven states have bills pending that target cloning specifically.<sup>13</sup> The seven labeling bills tread on FDA authority over food labeling for products moving in interstate commerce. In such cases, it is our understanding the FDA communicates to the respective state attorneys general, as well as the state food control offices/departments of food and agriculture, stating that the legislation is subject to challenge by the federal government.

### **Proposed Risk Management Document**

This section would have greater value to stakeholders if timelines and/or mechanisms were detailed demonstrating how the FDA will carry out the various monitoring, liaison, and review functions it proposes. For instance, in which organizations does the FDA intend to participate to gain insights into technology changes and new data? For how long will the FDA carry out these tasks? Who from the agency will be assigned these monitoring activities? Will there be a team or an individual monitoring animal cloning technology? The more details the agency can provide, the greater trust the public and industry will have in the commitment and actual effort.

ViaGen supports the FDA’s stance that ethical considerations fall outside the statutory mandate given the agency under the Federal Food, Drug & Cosmetic Act, and therefore, outside the scope of the Draft Risk Assessment. Nonetheless, we affirm industry has taken -- and will continue to take -- steps to ensure ethical issues related to livestock cloning are adequately considered and addressed. Paramount among those issues is animal welfare. Because improvements in cloning efficiency will reduce anomalous outcomes, industry is already invested in research that will positively affect the welfare of the animals involved.

Somatic Cell Nuclear Transfer as ART: As previously stated, ViaGen concurs with and strongly supports the FDA’s determination that SCNT is but another ART, e.g. *in vitro* fertilization, artificial insemination, embryo splitting, and embryo transfer, and as such does not require special or different regulatory treatment. This decision by the agency is appropriate and substantiated by the FDA studies on animal health, food safety and equivalency that underpin the Draft Risk Assessment.

The FDA has determined that as a baseline, cloned animals and food products derived therefrom will be subject to all applicable federal, state and local regulations as conventional livestock. Through analysis of physiological, anatomical, health and available behavioral data, the agency has determined there are no anomalies present in cloned cattle, swine or goats different from those associated with any other assisted reproductive technique.

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<sup>13</sup> California, Massachusetts, Missouri, New York, North Carolina, New Jersey and Washington State have bills that would require labeling of food from cloned animals.

An important statement in the Draft Risk Management document, under “Food Consumption Conclusions,” is the following: “In fact, these animals meet all of the developmental milestones appropriate for their species, and become otherwise indistinguishable from sexually reproduced comparators.” Confidence must be drawn from similar findings as to the composition of meat and milk from cloned animals, i.e. such foods, following inspections under existing local, state and federal regulatory regimes, are safe and equivalent to foods derived from conventionally bred animals subject to the same regulatory requirements.

Further, the collective decision by OIE (World Organization for Animal Health) and the Codex Alimentarius Commission to remove SCNT (cloning) from the definition of “biotechnology” for the purposes of these organizations’ respective reviews and recommendations on animal biotechnology regulation per se, also speaks to the benign nature of the technology when applied to animal reproduction and recognizes there is no genetic addition, deletion or manipulation involved in SCNT.

Data/technical monitoring: ViaGen supports the FDA’s intention to maintain its ongoing monitoring of data and the evolution of cloning technology. ViaGen will cooperate fully in the FDA’s monitoring activities.

However, given the antipathy displayed by some organizations toward animal cloning technology, ViaGen urges the FDA to remain vigilant in its distinction between serious, verifiable scientific data and data that may be generated to support an antithetical position.

As previously stated, there were at least six new scientific studies presented at the January, 2007 meeting of IETS that should be incorporated in the Draft Risk Assessment. Further, the French Food Safety Agency released its risk assessment on the safety of foods from cloned animals and their progeny in 2005, and in 2007 the government of New Zealand completed its risk assessment. Upon review, it is fair to say these nations agree with the FDA’s assessment of the risks – or lack thereof – from foods from cloned animals and their progeny. The European Food Safety Agency (EFSA) is studying the issue as well, and has begun taking public comment on cloning technology and its application to livestock.

As stated earlier regarding epigenetic dysregulation, ViaGen supports the FDA finding that “the most compelling conclusions about food consumption risks are drawn from assessments of the health status of the animals and the composition of food products derived from them, and not from gene expression studies.”

International database: The FDA writes of its intention to cooperate in the creation of a publicly accessible “international database” on clone technology information and other related data, but does not describe who would create such a database, where it would be housed, who would pay for it, who would maintain and control it, etc. ViaGen fully believes in and practices transparency with its technology. However, the credibility of such a database must be unimpeachable; the control over what information is added to the database is a critical component requiring close study.

Animal health risks: The FDA's commitment to the health and wellbeing of surrogate dams and young cloned animals is commendable and is shared by ViaGen. However, this section requires more detail to clarify the FDA's exact intent and the role the FDA would expect to play in the ongoing formal or informal oversight of the animals in question.

In one section, the FDA refers to "working with professional societies dedicated to animal health and the care of food producing animals, such as veterinary medicine or the practice of embryo transfer." The agency then writes "we propose to work with professional and scientific organizations whose missions include ensuring the health of animals to establish animal health assessment and care standards ... ." And in a third mention, the FDA writes, "We would look to partner with organizations having expertise in cloning technology, and to establish direct liaisons with academic and industry scientists recognized for their international expertise in animal health and safety management. In addition, we will partner with the veterinary community regarding animal evaluation and care issues."

It seems the FDA is saying it will partner with scientists and established scientific organizations both domestic and international, including those representing veterinary medicine, that have demonstrated expertise in animal health, care and handling. The proposition that the FDA will partner with scientists with recognized expertise is important because such a partnership is consistent with the FDA's mandate to make science-based risk and safety decisions. It is also important because it minimizes the possibility that some organizations, seeking to demonize this new technology, can intervene in the partnership process. The FDA should be explicit as to the type of scientific organizations with which it will partner, the vetting process for scientist participation, and the criteria it will use in "partnering" on these important issues.

If the goal of the agency is to seek scientific partnerships so as to approach the issues of care and handling in the most objective manner possible, then the FDA should look at a more specific, focused collaboration, i.e. the development of "best laboratory standards" through a third-party independent scientific organization. It can be argued that once a cloned animal is on-farm, there is no longer a reason for the federal government to be involved beyond existing regulatory authority and programs. Again, the following is an important FDA statement: "In fact, these animals meet all of the developmental milestones appropriate for their species, and become otherwise indistinguishable from sexually reproduced comparators." Since the animals develop normally, according to the FDA's study and review, then special care and handling of these "normal" animals is moot once they are husbanded on farms and ranches.

The FDA should make it clear in this section that just as it does not intend to regulate food products of cloned livestock or their progeny, neither does the agency intend to seek regulation through standard-setting of on-farm production practices, animal health and/or handling regarding surrogate dams and young cloned animals beyond existing FDA regulatory programs or jurisdiction.

All major U.S. livestock groups have established, through their animal care committees and councils and their quality assurance programs, animal wellbeing guidelines, standards, and in some cases specific detailed animal welfare programs, routinely audited by independent third

parties. The FDA should incorporate these science-based programs in its compilation of data relevant to the health and care of surrogate dams and young cloned animals.

As a general comment, the FDA must be explicit in placing some of the perceived “risks” and “anomalies” in a temporal context. It may be helpful for the agency to consider creating a timeline of progress in the evolution of the technology, an evolution that inevitably has led to a significant reduction in “anomalies” and “adverse outcomes” so often cited, for use in its FAQ documents for consumers and producers, or as part of its “cloning myths” page.

### **Legal Foundation for the FDA’s Findings, Future Actions**

The FDA’s Draft Risk Assessment is unequivocal: No risks have been identified associated with consumption of food from cloned animals. Accordingly, the FDA should not impose additional labeling requirements on products made from cloned animals or their progeny. To do so would depart from the relevant FDA and broader federal government approach to date. Such an approach also would be inconsistent with the FDA’s fundamental statutory mandate to protect public health. As the FDA has previously asserted, a science-based assessment of the end product should continue to form the basis of food labeling requirements, not the method of production, i.e. “it’s the product, not the process.”

*Labeling Authority & Actions* – The FDA’s core authority to regulate food labeling is derived from the FDCA (21 U.S.C. §§301, et seq.). That authority provides firm legal grounds for not imposing special labeling requirements on products derived from cloned animals or their progeny; indeed, it establishes that for the FDA to take any other action would raise very substantial legal issues.

In 1986, the U.S. Office of Science & Technology Policy (OSTP) published the *Coordinated Framework for Regulation of Biotechnology*. That document was a significant, early step in articulating regulatory principles applicable to products manufactured using biotechnology.

The FDA subsequently issued a *Statement of Policy: Foods Derived from New Plant Varieties* (“Food Policy”) in 1992. Based in part on the lack of scientific evidence suggesting bioengineered foods differ in any scientifically meaningful way from traditional foods, that policy did not suggest any special labeling requirements for bioengineered foods. Significantly, the FDA emphasized the regulatory status of a food, “irrespective of the method by which it is developed, is dependent upon the objective characteristics of the food . . . . [T]he key factors in reviewing safety concerns should be the characteristics of the food product, rather than the fact that new methods are used.” (57 FR 22984). The FDA stated the method of development (including embryo rescue, somaclonal variation, or “any other method”) is not normally material information, and therefore need not be included in product labeling. (57 FR 22991).

The agency’s regulation of milk produced from cows treated with recombinant bovine somatotropin (rbST) provides an analogous example of the appropriate approach to labeling of these kinds of products. In 1994, the FDA issued a guidance explaining that because there was no “significant difference” between milk from treated and untreated cows, it lacked authority to require special labeling for milk from treated cows. The guidance explained that there were no

compositional differences between the two types of milk – the same conclusion the FDA has made about food produced from cloned animals and their progeny.

The FDA's decision not to impose special label requirements for rbST milk was challenged in federal court. The suit was dismissed in 1995 on the ground the label information at issue was not material because the treated versus untreated milk types were indistinguishable. Implicit in the decision was the court's support for the FDA's risk assessment methodology of analyzing the end food product. (Stauber v. Shalala, 894 F. Supp 1178).

In 2001, the FDA issued draft guidance on voluntary labeling for bioengineered foods. Again, the FDA declined to mandate special requirements. The agency noted that despite more than 50,000 comments received on the safety and labeling of bioengineered foods, it remained unaware of any basis on which to conclude that production involving bioengineering would be a material fact warranting mention in labeling.

In 2002, the director of the FDA's Center for Food Safety and Applied Nutrition communicated to Congress the agency's view that it had neither a legal nor scientific basis for requiring special labeling. There were no known data suggesting adverse consequences to public health as a result of consuming bioengineered foods (again, just as the FDA has found with respect to food produced from cloned animals and their progeny). In 2002, the FDA and the USDA jointly issued draft industry guidance on products derived from bioengineered plants. There again, both agencies adopted a scientific approach, analyzing the factors that could affect the safety of the ultimately produced products.

*No Special Labeling for Cloned Animals or their Progeny* -- To not require special labeling for foods derived from cloned animals or their progeny would be entirely consistent with the FDA's relevant decision-making to this point. As the Draft Risk Assessment spells out, no unique risks for human food consumption were identified in cattle, swine, or goat clones or their progeny. As the FDA said in its 2003 press release, "adult clones are virtually indistinguishable from their conventional counterparts"; nothing in the 2006 Draft Risk Assessment suggests otherwise.

Special designation for the labeling of cloned animals or their progeny is neither necessary to protect public health nor consistent with precedent. To the contrary, it would be misleading if such labeling were to imply to consumers a material difference between conventional food and that produced from cloned animals, when no such difference exists. In the Stauber rbST case, the court explained, "if the product does not differ in any significant way from what it purports to be, then it would be misbranding to label the product as different, even if consumers misperceived the product as different."

Consumer interest alone is not an appropriate basis for requiring, or even allowing, label information -- especially when the added statement(s) could be misleading. This proposition is supported by another decision, Alliance for Integrity v. Shalala, which addressed the FDA's 1992 Food Policy. The court articulated the FDA's limited authority: "Without a determination that as a class, rDNA-derived foods pose inherent risks or safety consequences to consumers, or differ in some material way from their traditional counterparts, the FDA is without authority to mandate labeling."

FDA guidance on rbST milk labeling points out that unqualified statements such as “rbST-free” would be misleading in implying a difference in the milk itself rather than the way the milk was produced. The FDA has also recognized instances in which extra information could be misleading by distracting the consumer from the important, material information. **For these reasons, the FDA should, in any document it issues on this subject, make clear that statements such as “non-cloned meat” or “non-cloned milk” are prohibited.**

A scientific assessment of the food products at issue provides no basis on which to require special label explanation. Courts may find agency action to be arbitrary and capricious when, among other possible reasons, the agency relies on factors that Congress did not intend for the agency to consider. (Motor Vehicle Manufacturers Assn. v. State Farm Mutual Automobile Insurance Co., 463 U.S. 29).

As previously noted, the FDA’s primary statutory mandate is to protect public health and safety. That end is not served by imposing production method disclosures on products with no known health risks. The FDA has previously acknowledged its lack of authority to require additional label information when no difference exists between the conventional product and that produced with new technology. Administrative Procedures Act (APA) principles dictate that FDA action in similar circumstances here must be consistent.

The U.S. Constitution provides further limitation on the FDA’s ability to require special labeling. The First Amendment protects against being compelled to speak unless prompted by a “substantial government interest,” as outlined in the Central Hudson four-prong test. (447 U.S. 557). For example, when the State of Vermont required milk products derived from rbST-treated cows to bear that fact in labeling, interested parties challenged the requirement, arguing that milk producers’ right to refrain from speaking was being infringed. (International Dairy Foods Assn v. Amestoy, 92 F.3d 67). The State of Vermont did not claim that health or safety prompted the law, but instead relied on “consumer curiosity.” In 1996, the Second Circuit court of Appeals found the Vermont law to be unconstitutional because consumer interest in rbST information was not sufficient to constitute a “substantial government interest.” The court even acknowledged it was unaware of *any* case in which consumer interest was, by itself, “sufficient to justify requiring a product’s manufacturer to publish the functional equivalent of a warning about a production method that has no discernable impact on a final product.” Significantly, the court found this to be true even when the speech compelled would consist of accurate, factual statements. The International Dairy Foods logic should apply with equal force to cloned animal product labeling.<sup>14</sup>

The FDA’s approach thus far is consistent with the product-based approach exhibited in other contexts by the U.S. government in both domestic and international arenas. The U.S. has also advocated an end product-based position in international dealings. For more than 50 years, in the context of the General Agreement on Tariffs and Trade (GATT), the U.S. government has maintained that regulations affecting imported products must regulate the product itself, not its

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<sup>14</sup> State laws should be preempted that attempt to require labeling for products derived from animal clones, where FDA has failed to do so. Imposing cloning-related disclosure would conflict with the objectives of the FDCA and should therefore be prohibited. Greier v. Honda, 529 US 861 (2000).

production methodology. Indeed, the U.S. lost a dispute in the early days of the World Trade Organization (WTO) because, as Brazil pointed out, U.S. environmental regulations discriminated between identical imported and domestic gasoline based on how the gasoline was made.

More recently, in proceedings under international treaty obligations affecting the regulation of food safety, the U.S. has steadfastly argued that regulatory measures must be supported by a scientific justification, consistent with the Agreement on the Application of Sanitary and Phytosanitary Measures (“SPM Agreement”, part of the Marrakesh Agreement Establishing the World Trade Agreement of 1994). In a 2004 written submission in *EC – Measures Affecting the Approval and Marketing of Biotech Products*, the U.S. wrote: “one of the most important concepts in the SPM Agreement is that any sanitary or phytosanitary measure must have a basis in science.”

Finally, the U.S. recently opposed the European Community’s ban on meat products made from certain hormone-treated animals on the basis that the EC has not conducted a risk assessment or otherwise provided sufficient scientific justification. (*United States – Continued Suspension of Obligations in the EC -- Hormones Dispute* WT/DS320, 2005). Thus, for the FDA to take any contrary position would be inconsistent not only with its own past pronouncements on this issue, but also with the long-held and consistently articulated view of the U.S. government. There is no reason here for the FDA to take such an action.

## **Conclusion**

ViaGen strongly supports the FDA’s conclusion in the Draft Risk Assessment that there is no evidence that food products derived from adult cloned animals or their progeny present any food safety concern. We also agree no new measures or additional safeguards specific to cloned animals and their progeny are necessary.

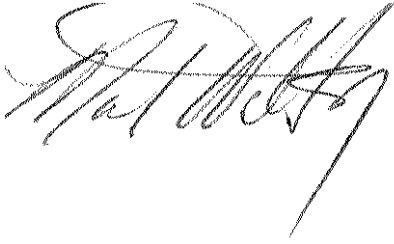
ViaGen believes the FDA has the authority to take a very firm stance regarding the labeling of the eventual food products from cloned livestock and their progeny. We encourage the FDA to state in all documents related to the final risk assessment that special labeling of these products is not required. Further, we strongly encourage the FDA to remind industry that statements such as “non-cloned meat” and “non-cloned milk” are prohibited.

We urge the FDA to act in a judicious but expedited manner to finalize this risk assessment. The benefits of this technology are needed and wanted by the U.S. livestock industry and by informed consumers. We urge the FDA to remain science-based in its proceedings, to incorporate any new data or peer-reviewed studies since the release of the Draft Risk Assessment into the analysis, and to finalize the risk assessment and supporting documents as appropriate.

Finally, while ViaGen supports the voluntary moratorium on the sale of food products from cloned animals and their progeny, we expect that once the risk assessment is finalized, this moratorium will be lifted immediately and completely.

Thank you for considering our comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark Walton". The signature is fluid and cursive, with a long, sweeping tail that extends downwards and to the right.

Mark Walton, Ph.D., M.S.  
President

## Attachment 1

### Statistical Analysis and General Conclusions for Meat Composition Study Involving Progeny from Cloned and Control Boars\*

The statistical analysis was conducted with the GLM procedure in the Statistical Analysis System (SAS Institute, Inc. Cary, NC). The model included the following effects: treatment (clones versus controls), boars within treatment (accounting for repeat measurement), sex, maternal grandsire (accounting for some differences among the female mates) and covariates for age (linear, or linear and quadratic where appropriate). Treatment effects were tested using the mean square for boars within treatment as the denominator of the *F*-ratio. Other effects in the model were tested with the error mean square as the denominator of the *F*-ratio.  $P < 0.05$  was used as the basis for considering differences to be statistically significant.

Least-squares means were computed for the model effects including boars within treatments. Pre-planned comparisons were made between least-squares means (SAS *t*-test) for individual cloned boars versus control boars within the two genetic groups, 1 and 2.

There were no statistically significant differences between Clone and Control progeny means for the meat composition characteristics studied.

Examination of the preplanned comparisons of actual sire progeny group least-squares means revealed some statistically significant differences. These differences while significant for a number of the characteristics were generally inconclusive with respect to any biological effect of clone versus control. These data generally demonstrate the natural variability found for most measurements taken on animals. The general conclusion supported by these data is that if differences exist for the biological effects of cloning on meat composition characteristics these effects appear to be smaller than those effects created by sire selection in a routine swine management program or the simple natural variability in a species.

\* Conducted by Benyshek and Hough Consulting Services, December 2006

Alanine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.3960	0.0058	NS	
<b>Controls</b>	162	1.3885	0.0072		

Alanine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.3819	0.0120	a
		3	60	1.4142	0.0114	ab
		5	62	1.4036	0.0117	a
	Originator	498	44	1.3684	0.0142	ac
Genetic Group 2	Clone	7	61	1.3842	0.0115	a
	Half-sibs of Originator	18128	57	1.4245	0.0119	b
		25515	61	1.3726	0.0114	a

Arginine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.5840	0.0077	NS	
<b>Controls</b>	162	1.5899	0.0096		

Arginine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.5752	0.0159	a
		3	60	1.6192	0.0151	b
		5	62	1.5758	0.0155	a
	Originator	498	44	1.5627	0.0188	a
Genetic Group 2	Clone	7	61	1.5659	0.0152	a
	Half-sibs of Originator	18128	57	1.6478	0.0158	b
		25515	61	1.5594	0.0151	a

Aspartic Acid%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	2.3113	0.0110	NS	
<b>Controls</b>	162	2.3028	0.0136		

Aspartic Acid%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	2.3242	0.0227	a
		3	60	2.3475	0.0215	ab
		5	62	2.3019	0.0221	a
	Originator	498	44	2.2678	0.0268	ac
Genetic Group 2	Clone	7	61	2.2715	0.0217	a
	Half-sibs of Originator	18128	57	2.3698	0.0225	b
		25515	61	2.2709	0.0214	a

Cystine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.2467	0.0009	NS	
<b>Controls</b>	162	0.2491	0.0012		

Cystine%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.2451	0.0019	a
		3	60	0.2469	0.0018	a
		5	62	0.2497	0.0019	a
	Originator	498	44	0.2486	0.0023	a
Genetic Group 2	Clone	7	61	0.2452	0.0019	a
	Half-sibs of Originator	18128	57	0.2524	0.0019	b
		25515	61	0.2464	0.0018	a

Glutamic Acid					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	3.7494	0.0188	NS	
<b>Controls</b>	162	3.7414	0.0233		

Glutamic Acid**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	3.7303	0.0388	a
		3	60	3.8127	0.0368	ab
		5	62	3.7438	0.0378	a
	Originator	498	44	3.6892	0.0459	ac
Genetic Group 2	Clone	7	61	3.7108	0.0371	a
	Half-sibs of Originator	18128	57	3.8472	0.0385	b
		25515	61	3.6879	0.0367	a

<b>Glycine%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	1.1351	0.0094	NS	
<b>Controls</b>	162	1.1185	0.0116		

<b>Glycine%*</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	1.0848	0.0194	a
		3	60	1.1498	0.0184	b
		5	62	1.1587	0.0189	bc
	Originator	498	44	1.0848	0.0229	ad
Genetic Group 2	Clone	7	61	1.1471	0.0185	a
	Half-sibs of Originator	18128	57	1.1463	0.0192	a
		25515	61	1.1245	0.0183	a

<b>Histidine%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.9791	0.0052	NS	
<b>Controls</b>	162	0.9820	0.0065		

<b>Histidine%NS</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.9807	0.0108	a
		3	60	0.9826	0.0103	a
		5	62	0.9720	0.0105	a
	Originator	498	44	0.9634	0.0128	a
Genetic Group 2	Clone	7	61	0.9811	0.0103	a
	Half-sibs of Originator	18128	57	1.0027	0.0107	a
		25515	61	0.9800	0.0102	a

<b>Isoleucine%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	1.0295	0.0073	NS	
<b>Controls</b>	162	1.0322	0.0090		

Isoleucine%*						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.0190	0.0151	a
		3	60	1.0505	0.0143	a
		5	62	1.0299	0.0147	a
	Originator	498	44	1.0125	0.0178	a
Genetic Group 2	Clone	7	61	1.0185	0.0144	a
	Half-sibs of Originator	18128	57	1.0679	0.0149	b
		25515	61	1.0162	0.0142	a

Leucine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.9002	0.0082	NS	
<b>Controls</b>	162	1.8956	0.0101		

Leucine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.9023	0.0169	a
		3	60	1.9277	0.0160	ab
		5	62	1.8901	0.0164	a
	Originator	498	44	1.8682	0.0199	ac
Genetic Group 2	Clone	7	61	1.8808	0.0161	a
	Half-sibs of Originator	18128	57	1.9456	0.0167	b
		25515	61	1.8730	0.0159	a

Lysine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	2.0643	0.0103	NS	
<b>Controls</b>	162	2.0750	0.0128		

Lysine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	2.0745	0.0214	a
		3	60	2.1024	0.0203	ab
		5	62	2.0534	0.0208	a
	Originator	498	44	2.0363	0.0252	ac
Genetic Group 2	Clone	7	61	2.0267	0.0204	a
	Half-sibs of Originator	18128	57	2.1501	0.0212	b
		25515	61	2.0388	0.0202	a

Methionine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.6116	0.0027	NS	
<b>Controls</b>	162	0.6230	0.0034		

Methionine%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.6094	0.0057	a
		3	60	0.6164	0.0054	a
		5	62	0.6163	0.0055	a
	Originator	498	44	0.6212	0.0067	a
Genetic Group 2	Clone	7	61	0.6042	0.0054	a
	Half-sibs of Originator	18128	57	0.6338	0.0056	b
		25515	61	0.6141	0.0054	a

Phenylalanine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.9569	0.0053	NS	
<b>Controls</b>	162	0.9425	0.0066		

Phenylalanine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.9514	0.0110	a
		3	60	0.9693	0.0104	a
		5	62	0.9543	0.0107	a
	Originator	498	44	0.9176	0.0130	b
Genetic Group 2	Clone	7	61	0.9526	0.0105	a
	Half-sibs of Originator	18128	57	0.9783	0.0109	b
		25515	61	0.9317	0.0104	a

Proline%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.0938	0.0086	NS	
<b>Controls</b>	162	1.1121	0.0107		

Proline%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.0723	0.0180	a
		3	60	1.1159	0.0170	a
		5	62	1.1153	0.0175	a
	Originator	498	44	1.1106	0.0213	a
Genetic Group 2	Clone	7	61	1.0717	0.0170	ab
	Half-sibs of Originator	18128	57	1.1233	0.0175	ac
		25515	61	1.1025	0.0170	a

Serine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.9622	0.0047	NS	
<b>Controls</b>	162	0.9585	0.0058		

Serine%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.9597	0.0096	a
		3	60	0.9726	0.0091	a
		5	62	0.9622	0.0094	a
	Originator	498	44	0.9524	0.0114	a
Genetic Group 2	Clone	7	61	0.9540	0.0092	a
	Half-sibs of Originator	18128	57	0.9770	0.0095	ab
		25515	61	0.9463	0.0091	ac

Threonine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.0896	0.0053	NS	
<b>Controls</b>	162	1.0872	0.0066		

Threonine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.0925	0.0110	a
		3	60	1.1102	0.0104	ab
		5	62	1.0880	0.0107	a
	Originator	498	44	1.0736	0.0130	ac
Genetic Group 2	Clone	7	61	1.0678	0.0105	a
	Half-sibs of Originator	18128	57	1.1153	0.0109	b
		25515	61	1.0725	0.0104	a

Tyrosine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.8117	0.0036	NS	
<b>Controls</b>	162	0.8090	0.0045		

Tyrosine%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.8143	0.0075	a
		3	60	0.8257	0.0071	ab
		5	62	0.8076	0.0073	a
	Originator	498	44	0.7969	0.0088	ac
Genetic Group 2	Clone	7	61	0.7994	0.0072	a
	Half-sibs of Originator	18128	57	0.8337	0.0074	b
		25515	61	0.7964	0.0071	a

Valine%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>		1.0934	0.0073	NS	
<b>Controls</b>		1.0970	0.0091		

Valine%*						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.0797	0.0152	a
		3	60	1.1141	0.0144	a
		5	62	1.0992	0.0148	a
	Originator	498	44	1.0747	0.0179	a
Genetic Group 2	Clone	7	61	1.0807	0.0145	a
	Half-sibs of Originator	18128	57	1.1344	0.0150	b
		25515	61	1.0819	0.0143	a

Calcium%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>		0.0056	0.0001	NS	
<b>Controls</b>		0.0054	0.0002		

Calcium%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.0057	0.0003	a
		3	60	0.0054	0.0003	a
		5	62	0.0060	0.0003	a
	Originator	498	44	0.0054	0.0004	a
Genetic Group 2	Clone	7	61	0.0052	0.0003	a
	Half-sibs of Originator	18128	57	0.0054	0.0003	a
		25515	61	0.0053	0.0003	a

C16:0 Hexadecanoic Palmitic%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	1.3877	0.0291	NS	
<b>Controls</b>	162	1.4155	0.0360		

C16:0 Hexadecanoic Palmitic%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	1.2632	0.0601	a
		3	60	1.3395	0.0570	a
		5	62	1.3306	0.0585	a
	Originator	498	44	1.3522	0.0709	a
Genetic Group 2	Clone	7	61	1.6176	0.0574	a
	Half-sibs of Originator	18128	57	1.3357	0.0595	b
		25515	61	1.5586	0.0568	a

C16:1 Hexadecenoic Palmitoleic%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.1651	0.0034	NS	
<b>Controls</b>	162	0.1615	0.0042		

C16:1 Hexadecenoic Palmitoleic%**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.1452	0.0071	ab
		3	60	0.1647	0.0067	ac
		5	62	0.1609	0.0069	a
	Originator	498	44	0.1593	0.0083	a
Genetic Group 2	Clone	7	61	0.1895	0.0067	a
	Half-sibs of Originator	18128	57	0.1526	0.0070	b
		25515	61	0.1726	0.0067	a

<b>C17:0 Heptadecanoic Margaric%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.002	0.000	NS	
<b>Controls</b>	162	0.003	0.000		

<b>C17:0 Heptadecanoic Margaric%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0021	0.0006	a
		3	60	0.0009	0.0006	ab
		5	62	0.0015	0.0006	a
	Originator	498	44	0.0029	0.0007	ac
Genetic Group 2	Clone	7	61	0.0044	0.0006	a
	Half-sibs of Originator	18128	57	0.0016	0.0006	b
		25515	61	0.0041	0.0006	a

<b>C17:1 Heptadecenoic Margaroleic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.0020	0.0003	NS	
<b>Controls</b>	162	0.0024	0.0004		

<b>C17:1 Heptadecenoic Margaroleic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0015	0.0006	a
		3	60	0.0012	0.0006	ab
		5	62	0.0015	0.0006	a
	Originator	498	44	0.0030	0.0007	ac
Genetic Group 2	Clone	7	61	0.0037	0.0006	a
	Half-sibs of Originator	18128	57	0.0013	0.0006	b
		25515	61	0.0030	0.0006	a

<b>C18:0 Octadecanoic Stearic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.666	0.014	NS	
<b>Controls</b>	162	0.688	0.018		

<b>C18:0 Octadecanoic Stearic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.6095	0.0294	a
		3	60	0.6258	0.0279	a
		5	62	0.6279	0.0286	a
	Originator	498	44	0.6419	0.0347	a
Genetic Group 2	Clone	7	61	0.8004	0.0281	a
	Half-sibs of Originator	18128	57	0.6349	0.0291	b
		25515	61	0.7862	0.0278	a

<b>C18:1 Octadecenoic Oleic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	2.2571	0.0451	NS	
<b>Controls</b>	162	2.2273	0.0559		

<b>C18:1 Octadecenoic Oleic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	2.0585	0.0933	a
		3	60	2.1811	0.0883	a
		5	62	2.1898	0.0907	a
	Originator	498	44	2.2316	0.1101	a
Genetic Group 2	Clone	7	61	2.5989	0.0888	a
	Half-sibs of Originator	18128	57	2.0446	0.0923	b
		25515	61	2.4058	0.0881	a

<b>C18:2 Octadecadienoic Linoleic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.2967	0.0071	NS	
<b>Controls</b>	162	0.2847	0.0087		

<b>C18:2 Octadecadienoic Linoleic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.2818	0.0146	a
		3	60	0.2882	0.0138	a
		5	62	0.2869	0.0142	a
	Originator	498	44	0.2933	0.0172	a
Genetic Group 2	Clone	7	61	0.3299	0.0139	a
	Half-sibs of Originator	18128	57	0.2460	0.0144	b
		25515	61	0.3149	0.0138	a

<b>C18:3 OctadecatrienoicLinolenic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.0086	0.0005	NS	
<b>Controls</b>	162	0.0066	0.0006		

<b>C18:3 OctadecatrienoicLinolenic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0079	0.0011	a
		3	60	0.0081	0.0010	a
		5	62	0.0075	0.0011	a
	Originator	498	44	0.0078	0.0013	a
Genetic Group 2	Clone	7	61	0.0111	0.0010	a
	Half-sibs of Originator	18128	57	0.0041	0.0011	b
		25515	61	0.0080	0.0010	c

<b>C20:0 Eicosanoic Arachidic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>		0.0096	0.0005	NS	
<b>Controls</b>		0.0069	0.0006		

<b>C20:0 Eicosanoic Arachidic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0099	0.0010	a
		3	60	0.0095	0.0010	a
		5	62	0.0090	0.0010	a
	Originator	498	44	0.0088	0.0012	a
Genetic Group 2	Clone	7	61	0.0100	0.0010	a
	Half-sibs of Originator	18128	57	0.0028	0.0010	b
		25515	61	0.0090	0.0010	a

<b>C20:1 Eicosanoic Gadoleic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>		0.0761	0.0024	NS	
<b>Controls</b>		0.0761	0.0030		

<b>C20:1 Eicosenoic Gadoleic%NS</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0766	0.0049	a
		3	60	0.0722	0.0047	a
		5	62	0.0706	0.0048	a
	Originator	498	44	0.0753	0.0058	a
Genetic Group 2	Clone	7	61	0.0851	0.0047	a
	Half-sibs of Originator	18128	57	0.0708	0.0049	bc
		25515	61	0.0822	0.0047	ac

<b>C20:2 Eicosadienoic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>		0.0121	0.0005	NS	
<b>Controls</b>		0.0112	0.0006		

<b>C20:2 Eicosadienoic%**</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0120	0.0011	a
		3	60	0.0103	0.0010	a
		5	62	0.0112	0.0010	a
	Originator	498	44	0.0117	0.0012	a
Genetic Group 2	Clone	7	61	0.0149	0.0010	a
	Half-sibs of Originator	18128	57	0.0092	0.0010	b
		25515	61	0.0128	0.0010	a

<b>C22:1 Docosenoic Erucic%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>		0.0068	0.0005	NS	
<b>Controls</b>		0.0080	0.0007		

<b>C22:6 Docosaehaenoic%*</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0138	0.0017	a
		3	60	0.0105	0.0016	a
		5	62	0.0106	0.0017	a
	Originator	498	44	0.0128	0.0020	a
Genetic Group 2	Clone	7	61	0.0169	0.0016	a
	Half-sibs of Originator	18128	57	0.0130	0.0017	a
		25515	61	0.0154	0.0016	a

<b>Iron%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.0007	0.0001	NS	
<b>Controls</b>	162	0.0009	0.0002		

<b>Iron%NS</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	0.0009	0.0003	a
		3	60	0.0007	0.0003	a
		5	62	0.0007	0.0003	a
	Originator	498	44	0.0007	0.0004	a
Genetic Group 2	Clone	7	61	0.0006	0.0003	a
	Half-sibs of Originator	18128	57	0.0014	0.0003	a
		25515	61	0.0006	0.0003	a

<b>Niacinmg/100 g</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	10.6756	0.0711	NS	
<b>Controls</b>	162	10.7448	0.0881		

<b>Niacinmg/100 gNS</b>						
		<b>Sires</b>	<b>No. Progeny</b>	<b>L-S Mean</b>	<b>SE</b>	<b>Significance</b>
Genetic Group 1	Clones	2	59	10.8472	0.1470	a
		3	60	10.7090	0.1392	a
		5	62	10.6095	0.1430	a
	Originator	498	44	10.6617	0.1736	a
Genetic Group 2	Clone	7	61	10.5368	0.1401	a
	Half-sibs of Originator	18128	57	10.7851	0.1455	a
		25515	61	10.7877	0.1389	a

<b>Phosphorus%</b>					
	<i>No.</i>	<i>L-S Mean</i>	<i>S.E.</i>	<i>F-ratio</i>	<i>Prob</i>
<b>Clones</b>	242	0.1748	0.0047	NS	
<b>Controls</b>	162	0.1762	0.0058		

Phosphorus%NS						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.1692	0.0097	a
		3	60	0.1648	0.0092	a
		5	62	0.1829	0.0094	a
	Originator	498	44	0.1775	0.0114	a
Genetic Group 2	Clone	7	61	0.1824	0.0092	a
	Half-sibs of Originator	18128	57	0.1744	0.0096	a
		25515	61	0.1768	0.0091	a

Vitamin B6mg/100 g					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.3985	0.0044	NS	
<b>Controls</b>	162	0.3853	0.0054		

Vitamin B6mg/100 g**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.4283	0.0090	a
		3	60	0.3862	0.0085	b
		5	62	0.3940	0.0088	b
	Originator	498	44	0.4025	0.0106	b
Genetic Group 2	Clone	7	61	0.3855	0.0086	a
	Half-sibs of Originator	18128	57	0.3485	0.0089	b
		25515	61	0.4047	0.0085	a

Zinc%					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	0.0015	0.0000	NS	
<b>Controls</b>	162	0.0015	0.0000		

Zinc%*						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	0.0016	0.0000	a
		3	60	0.0015	0.0000	a
		5	62	0.0015	0.0000	a
	Originator	498	44	0.0015	0.0000	a
Genetic Group 2	Clone	7	61	0.0015	0.0000	a
	Half-sibs of Originator	18128	57	0.0016	0.0000	ab
		25515	61	0.0014	0.0000	ac

Cholesterolmg/100 g					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	242	57.6709	0.3307	NS	
<b>Controls</b>	161	59.4583	0.4114		

Cholesterolmg/100 g**						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	59	55.6150	0.6839	a
		3	60	57.9910	0.6467	bd
		5	62	57.9563	0.6649	cd
	Originator	498	44	57.3997	0.8070	ad
Genetic Group 2	Clone	7	61	59.1213	0.6508	a
	Half-sibs of Originator	18128	57	62.0019	0.6766	b
		25515	60	58.9734	0.6508	a

Vitamin B12mcg/100 g					
	No.	L-S Mean	S.E.	F-ratio	Prob
<b>Clones</b>	225	0.9913	0.0170	NS	
<b>Controls</b>	157	0.9717	0.0210		

Vitamin B12mcg/100 g*						
		Sires	No. Progeny	L-S Mean	SE	Significance
Genetic Group 1	Clones	2	53	0.9483	0.0357	a
		3	57	0.9805	0.0332	a
		5	55	1.0282	0.0352	ab
	Originator	498	41	0.9171	0.0416	ac
Genetic Group 2	Clone	7	60	1.0083	0.0327	a
	Half-sibs of Originator	18128	57	1.0675	0.0340	ab
		25515	59	0.9304	0.0328	ac

Yellow Color: Quadratic age correction

Green Color: Linear age correction

Orange: Covariate for age not significant