Bioethics Symposium

Proactive Approaches to Controversial Welfare and Ethical Concerns in Poultry Science

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Edited by

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USDA/CSREES/PAS

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Purpose

The primary goal is to improve the understanding of poultry system members regarding bio-ethical issues and facilitate their capacity to accurately and objectively evaluate comments about our production and processing system. The intent is to also allow better representation of the poultry system on these issues with the public and decision makers in government at all levels. This is a critically important area for the poultry system. Only by having an understanding of issues can personnel take appropriate action or choose inaction.

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Foreword

Richard Reynnells, NPL, Animal Production Systems
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There are significant ethical questions associated with food animal production that society demands be answered. Most of society favors the consumption of meat, and other animal products such as eggs and milk, as evidenced by our shopping habits. For a variety of reasons, others prefer a form of vegetarianism, or even veganism, as their lifestyle. One of these reasons is their concern about the ethics of using animals to benefit humans, and another is a concern about the particular mechanisms of animal use.

Many in society have voted at the ballot box to change some management practices in animal agriculture in their state, but not with their market dollar. The ballot vote is generally against a small industry in their state, with the referendum stimulated by animal activist groups. At other times their vote, or that of elected officials, is related to large intensive confinement facilities. This inconsistency leads to questions such as: “Do these voters have a solid understanding of the issues and consequences of their votes?”; “Do the food animal industries appreciate the significance of the ballot vote, and if so, does their response include more aggressive educational efforts for industry and society?”.

The food animal industry has had many challenges over the years regarding the attempts by activists to modify, or prohibit, the use of animals. One challenge is that those who disagree with animal use in part or in whole also appear to have the moral high ground. The industries are disadvantaged because “profit” is often associated with greed even though each of us and all the so-called non-profit organizations must operate on a profit basis. That is, financial income must exceed out flow over the long term. The industries are further disadvantaged because someone has to kill the animal, and consumers generally do not want to be burdened by the details of killing an animal for food or other reasons.

A significant situation that has contributed to the challenges faced by animal agriculture has been the tendency, or in many cases the overt policy, to ignore the issues. “Do not give free publicity to activists.” “Right makes might.” But “right” may also make you wrong in the eyes of those who only hear one side of the story. Ignoring issues may work in the short term in some instances, but can lead to an information vacuum that is filled by those seeking change. We need to understand and discuss the issues, and bring society and decision makers into a discussion that includes the costs of change to society. Activists who may have ulterior motives and those who want to manage a farmer’s resources at no cost or risk to themselves, are probably influential in large part due to a lack of competition in the marketplace of ideas, and to the lack of many citizen’s knowledge about the implications of their positions and proposed policy changes. Food animal system communications with decision makers in the form of legislators, home makers and students have not kept up with the communications of those who would significantly modify or even eliminate animal use and whose philosophy tends to reflect a different view of nature from many of us.

There are many valid reasons for the way we use animals today, which are far beyond the scope of these introductory comments or that of the symposium. Likewise, there are a number of housing and management practices that are used that can use improvement, but no one has been able to create a perfect management system that accounts for all animal behavioral, physiological and other needs. No management system is ever perfect, even though some want society to believe that this perfection exists and it is only because of bad intentions on the part of farmers that these are not being practiced. Is society willing to pay for incremental costs of greater levels of perfection in animal welfare, or just demand changes through regulations? What are the consequences of these actions? Does everyone in the food animal industries understand these issues, the trade offs, and potential appropriate courses of action? Because these issues directly impact the food animal system's success and our food security, this understanding should exist.

The food animal production system should consider that effective and honest communications can stimulate a change from the absolute ethical requirements or demands by some advocates and various decision makers to a recognition of the validity of situational ethics. In many cases situational ethics is equated with hypocrisy, but here it refers to understanding the range of options available to manage animals and selecting those options which will do so in the most humane manner possible.

The purpose of these discussions is not to convert anyone's basic belief system but to attempt to move toward greater understanding of some of the societal concerns regarding the use of animals to benefit humans, and the ethical basis of controversial issues of production and processing. These discussions will hopefully in turn result in improved management and processing of food animals, and better communications with stakeholders regarding our commitment to humane food animal production and processing.

Welcome and Introduction

Richard Reynnells, NPL, Animal Production Systems
USDA/CSREES/PAS
Washington, DC

On behalf of the organizing committee I want to welcome you to the Bioethics Symposium, "Proactive Approaches to Controversial Welfare and Ethical Concerns in Poultry Science". The symposium is sponsored by the United States Department of Agriculture, Cooperative State Research, Education and Extension Service, Plant and Animal Systems (USDA/CSREES/PAS) and the Southern Poultry Science Society. It is coordinated by members of a Land Grant University Multi-State Research Committee, the WERA1902, Agricultural Bioethics.

Whether or not we recognize it, at some level, ethics drive decisions about food animal management and processing. Decisions may be internally or externally generated. Profit and efficiency may temporarily define our actions, but ultimately it is ethical considerations (what "ought" to be) as reflected by the purchases or demands of customers that will create the reality to which we must respond. It is in the best interest of food animal agriculture if we are proactive and help define the conditions under which we will produce and market our products. To ignore the demands of a vocal minority allows reasonable as well as unreasonable recommendations to become the law of the land, to which all must comply. Industry leaders and members must understand the basis of arguments for change, and respond accordingly. Costs of change demanded by society, whether through "voluntary" change as market demand, or regulations, must be passed along to society if farmers are to survive. Farmers can not long subsidize the cheap food demands of society if costs of additional demanded specific management systems, that may or may not be more humane, are not included in the cost of food. Is it ethical to make farmers serfs on their own land? This question will not be directly answered today, but just like the topics of today's symposium, must be addressed if our food animal system is to survive and we are to enjoy the advantages of food security.

The primary goal of this symposium is to improve the understanding of poultry system members regarding bio-ethical (ethics applied to living systems) issues and facilitate their capacity to accurately and objectively evaluate comments about our food production and processing system. The intent is to also allow better representation of the poultry system with the public and decision makers in government at all levels. This is a critically important area for the poultry system. Only by having an understanding of issues can personnel take appropriate action or inaction. In order to help persons that were not able to participate in this important symposium understand these concepts, an on-site proceedings will be provided.

Is it ethical to put an animal into a management environment that may normally be considered less than acceptable or even abusive but to which the animal is genetically modified to be less or not responsive? Our keynote speaker will discuss these concepts in "Welfare as an Ethical Issue: Are Blind Chickens the Answer?".

Ethical concepts and considerations are complex and interrelated, with one component of our food production system impacting the decisions of another. Components of the panel "Ethical Issues Affecting Poultry, and Alternative Solutions" are: "Ethical Issues in Processing and Marketing", "Ethical Issues in Production", and "Societal Responsibilities". How do the cheap food demands of society impact choices of which alternatives in production and processing that will be used? Are some management procedures necessary but perhaps incorrectly considered inhumane? Which should have greater significance in defining management options, profit margins or manager preferences and capabilities? Which better defines humane production and processing practices, changes based on the very real retailers fears of consumer boycotts and activist demands, or science?

How an animal is killed is a contentious issue, and will be addressed by speakers on the panel, "Electric, Gas or Religious Slaughter Alternatives". Kosher (and Halal) religious slaughter requirements are seen by some as being inhumane, yet properly conducted these methods of slaughter may well be as humane as any other. The presentation "Is Kosher Ethical?" will provide important insight on this topic. Some organizations demand that poultry be killed using gas mixtures based on what some perceive as insufficient evidence of the degree of humaneness of the procedure. Highlights of the advantages and disadvantages of this procedure will be discussed in "Is Gas Stunning/Killing Ethical?". Industry leaders with whom I have discussed this issue have indicated that conversion to gas stunning/killing would be acceptable if there was proof this system was more humane than the electrical stunning method. However, there is no reason to convert to a system that may not be as humane as the current system even though demands are being made by activist groups. Electrical stunning has been used by the industry for many years, and has many proponents. The advantages and disadvantages of this procedure will be covered in "Is Electrical Stunning Ethical?".

We hope you will enjoy the presentations and that they will stimulate your desire for more information on this subject. Contact the coordinating committee for additional copies of the proceedings.

Welfare as an Ethical Issue: Are Blind Chickens the Answer?

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INTRODUCTION

This paper uses a multi-variate conceptualization of animal welfare as comprising physiological, behavioral and psychological indicators (Appleby 1999). One technical response to welfare problems in concentrated animal feeding operations is to adjust the animal, rather than adjusting the production system. Adjustments in the genetics of breeds utilized in animal production can minimize susceptibility to various production diseases as well as tendencies toward behaviors such as cannibalism that cause either welfare problems or management responses (such as beak trimming) that can themselves be associated with welfare problems. A 1999 paper by Sandøe and coauthors reviews the strategy of using blind hens in light of their reduced susceptibility to stress. This strategy is reminiscent of a thought experiment described by Bernard Rollin (1995) intended to probe the ethics of using genetic engineering in vertebrate species. Although Rollin found genetic engineering acceptable under certain specified conditions, responses to Rollin's paper suggest that many people find deliberate manipulation of animal genetics as a response to welfare issues to be ethically unacceptable. This paper reviews the ethical issues that bear upon this question within the context of possible responses that poultry producers might make to address welfare issues in egg and broiler production.

THE ETHICS OF GENETIC MANIPULATION

Both Rollin (1995) and Sandøe and coauthors (1999) argue that manipulation of animal genetics should be subjected to an ethical test that Rollin called "The Principle of Conservation of Welfare." Animals resulting from either genetic engineering or breeding programs should not have worse welfare than would individuals from founder populations used to establish the breed kept under comparable conditions. Sandøe and coauthors argue that many breeds currently used in poultry production fail to meet this test, and conclude that the development of these breeds is unethical. However, neither Rollin nor Sandøe and coauthors find genetic alterations that result in improved welfare relative to that of founder populations to be ethically problematic.

However, Bovenkirk, Brom and van den Bergh (2001) argue that some genetic modifications can violate what they call the "integrity" of animals. This notion has been used especially to criticize genetic engineering of animals (Balzer, Rippe and Schaber, 2000; Warkintin, 2006). Bovenkirk, Brom and van den Bergh recognize that conventional animal breeding programs can also result in violations of integrity, which they define as the holistic fit between a farm animal and its environment. Though in some respects vague, it is clear that they believe there are at least some modifications to animal genetics that should not be made. The key criterion is that such adjustments will considered unethical whenever it would have been possible to address welfare problems by making changes in husbandry or in the design of a production system. The relative cost-efficiency of a genetic vs. environmental response to an animal welfare problem does not factor into their analysis. Although they do not rule out all forms of biotechnology and

breeding, they do suggest that economic efficiencies should not play a decisive role in the ethical justification of a genetic approach. Their analysis suggests that it is wrong to manipulate animal genetics *as a means* to solving production problems, even when doing so results in relatively improved welfare for the animals being used in production settings.

CONSUMER RESPONSE

Research on public responses to biotechnology has long documented that people tend to associate ethical issues with manipulation of animal genomes. Although survey research has not addressed the extent to which ethical concern about genetic manipulation is uniquely tied to the use of recombinant techniques, as opposed to breeding, anecdotal evidence provides some support for the conclusion that there are at least some modifications capable of being made through breeding that elicit reactions of moral disapproval comparable to those associated with biotechnology. Blind chickens are a case in point (Thompson, forthcoming). It is therefore reasonable to entertain the hypothesis that many consumers would find the use of *any* genetic technology, including breeding, to be ethically objectionable in at least some circumstances.

If correct, then there are questions that should be raised about a number of strategies that are currently being deployed to address animal welfare issues. If Bovenkirk, Brom and van den Bergh have diagnosed the source of qualms about using genetic strategies to address animal welfare, animal scientists and industry leaders should be cautious in using genetic strategies as a response to poor welfare or production disease. It is possible that such strategies will be seen as unethical, at least in cases where the public is convinced that environmental or husbandry based alternatives to improving welfare were available.

It is worth stressing that more traditional approaches in animal welfare and animal rights might not support this conclusion. Both Rollin (1995) and Sandøe and coauthors (1999) have concluded that the emblematic blind chicken case is something of an anomaly: Persuasive considerations about the welfare of animals in production systems seem to be at odds with reactions that see such strategies as ethically problematic. Even the more radical types of animal advocacy associated with philosophers such as Peter Singer would appear to provide a rationale for using genetic techniques (including breeding based techniques) when doing so passes the “conservation of welfare” test and might actually lead to an improvement of welfare. However, the blind chicken case is emblematic of strategies where improvements in welfare come as a result of a reduced capacity to experience suffering. This appears to trigger the response that Bovenkirk, Brom and van den Bergh has called a violation of animal integrity.

CONCLUSION

The blind chicken problem represents an ethical conundrum. On the one hand, there are what appear to be valid ethical arguments for using cost-effective strategies to adjust production systems that improve animal welfare. Animals produced through breeding who lack a given capacity to suffer pain, stress or a specific pathology have not been actively deprived of a capacity they once had. It is only relative to animals in founder populations that they can be described as lacking a capacity, and in that sense “worse off”. Clearly, founder animals in the same circumstances would have worse welfare. Hence it seems that genetic strategies should be used.

On the other hand, such strategies seem very likely to engender very critical responses from the public, and especially from people who are self-identified as animal activists. This will especially be the case when a) the resulting animals are seen to have reduced capacities or b) alternative means for addressing animal welfare were available through changes in husbandry or production environments. While the ethical analysis of this conundrum continues to present a puzzle for philosophers, it seems prudent for those in animal industry to be cautious in utilizing genetic approaches to resolving welfare problem whenever either of these two conditions apply.

WORKS CITED

Appleby, Michael. C. 1999. *What Should We Do about Animal Welfare?* Oxford, UK: Blackwell Science.

Balzer, Phillipp, Klaus Peter Rippe and Peter Schaber. 2000. "Two Concepts of Dignity for Humans and Non-Human Organisms in the Context of Genetic Engineering," *Journal of Agricultural and Environmental Ethics* 13:7-27.

Bovenkirk, Bernice, Frans W. A. Brom, and Babs J. van den Bergh. 2001. "Brave New Birds: The Use of Integrity in Animal Ethics," *Hastings Center Report* 32(1): 16-22.

Rollin, Bernard E., 1995. *The Frankenstein Syndrome: Ethical and Social Issues in the Genetic Engineering of Animals*. New York, NY; Cambridge University Press.

Sandøe, P. B.L. Nielsen, L.G. Christensen and P. Sørensen. 1999. "Staying Good while Playing God — The Ethics of Breeding Farm Animals," *Animal Welfare* 8: 313-328.

Warkentin, Traci. 2006. "Dis/integrating animals: ethical dimensions of the genetic engineering of animals for human consumption," *AI and Society* 20: 82-102.

Panel: Ethical Issues Affecting Poultry, and Alternative Solutions

Ethical Issues in Processing and Marketing

Steven Gold
Murray's Chickens
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There has been an ongoing debate over whether or not the Kosher and Halal methods of slaughter are truly humane.

In general, Shechita requires that all animals are killed by a simple, quick slit to the neck, thereby cutting off the flow of oxygenated blood to the brain, producing a quick and painless death. Zabiha is very similar to shechita, involving the severing of the major arteries and veins in the neck of the animal, as well as the esophagus and trachea with one swipe of a non-serrated blade. Most practitioners of either method claim that they are humane, causing little to no pain at all (as the goal is to sever all nerves between the body and the brain) and a quick death. Those against the method argue that this is not the case at all, causing more pain to the animal, especially if poorly executed.

Current humane practices installed in the United States and other countries call for a stunning of the animal before being put to slaughter, be it through a quick burst of electricity to the head or stunning in water or a penetrating or non-penetrating bolt. The arguments for and against stunning do not normally arise on account of whether or not the method is humane, but rather the reason why it is implemented. Many plants and companies will surely claim that by stunning the animal, the nervous system temporarily shuts down, which prevents the animal from feeling pain upon its death. Yet, what many will fail to mention upon discussion of this method are the benefits it provides in preparing the animals for the production process. The purpose of electrical stunning of birds in the poultry industry, for example, is more for immobilizing conscious birds (and therefore prevent thrashing) as well as facilitating the removal of their feathers through paralysis of the muscles.

Each method claims to be humane in its own right. For the proponents of shechita and zabiha, thousands of years of ritual killing is the only way to go about producing the meat that people of the Jewish and Muslim faiths can consume. Stunning is out of the question, as it puts the animals in such a state that it prevents the visible signs of life from being read, and therefore violates one of the stipulations found in shechita, which requires that the animal be killed while it is living. Some who follow Zabiha practices, however, do allow for stunning. On the other hand, there are those that will argue that stunning is the only humane way to go about the whole slaughter process.

Which side has it correct? Who will ultimately win out? For my purposes and current position of Vice President of Marketing at Murray's Chickens, the answers to these questions do not concern me. We have chosen to produce and sell a product prepared in the manner following the strictest rules of zabiha. It would seem as if I am fighting an up-hill battle. I have had to

come up with ways to stress the many positives and qualities of the product I sell, while at the same time defending our company from any negative press that ritual slaughter process is presently receiving.

While it may seem as if there are countless challenges in marketing a bird that is slaughtered 99% differently than the rest of the industry, there has really been only one: convincing the public that our method is as humane as pre-stunning. We felt that the only way we could effectively do this was by attaining the status of Certified Humane, a seal awarded by the third party organization Humane Farm Animal Care (HFAC). HFAC, while not approved by the USDA, is currently ISO Guide 65 accredited (with the USDA acting as the accrediting agency in the US). Humane Farm Animal Care is under the auspices of the ASPCA and the Humane Society of the United States.

At first, when we approached Humane Farm Animal Care we were denied an audit on the basis that there were no standards for ritual slaughter. There had been no research done on ritual slaughter versus current standard poultry practices in regards to pain and losing consciousness. HFAC assembled a panel to look into the way Murray's Chicken has processed its chickens. This panel established a scientific committee, with scientists spending time reviewing the actual process and checking times to losing consciousness. In the end, the committee recommended that Murray's Chicken agree to a post-cut stun, which we did.

We were never denied the Certified Humane seal because, in comparison to regular poultry processing, our birds are handled very gently and were cut with very sharp blades (not the mechanical blades that allow some birds to escape from being cut in standard processing). The committee was satisfied that with this method, the birds were being processed humanely. On that basis, we were granted an approval for an audit. At the conclusion of the inspection, Murray's Chicken was declared Certified Humane. As an interesting side note, our slaughter system is now currently the benchmark used in both pre-shocking and non pre-shocked operations due to its humane handling and treatment of the animals.

With the Certified Humane seal under our belts and much attention diverted from our slaughtering procedures, we could put the focus where we wanted it, on our chickens. Murray's Chicken has become one of the top selling brands in every venue where it is carried, with Certified Humane, taste and quality being the paramount reason for our success. We feel that the superior handling and method of raising our birds accounts for this vastly superior product and is the more important factor when trying to effectively market our chicken to consumers.

Panel: Ethical Issues Affecting Poultry, and Alternative Solutions

Ethical Issues in Production

Ruth Newberry
Center for the Study of Animal Well-being, Department of Animal Sciences &
Department of Veterinary & Comparative Anatomy, Pharmacology & Physiology
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A poultry producer faces ethical decisions ranging from choice of genetic stocks to the housing and management of the birds. We shall assume that the producer has surmounted various objections to poultry production *per se*, for example, that it requires use of limited resources such as food and land that are then less available to other species, results in waste products that are potentially polluting, and places humans at risk from zoonotic diseases contracted from poultry such as avian influenza. In deciding that poultry production is ethical, the producer may take into account the fact that human survival depends on consumption of nutrients obtained from other species, be they from poultry or other prey. Further, domestic poultry species are numerically highly successful when living in association with humans, protected to some extent from parasites, pathogens, predators (other than humans) and competition with other species. Thus, when considered at the species level, there is little conflict between the interests of poultry and the interests of humans. In fact, from the perspective of biological success, the greatest threat to the interests of poultry would be reduced human demand for poultry products.

So what about the interests of individual birds? Birds used in poultry production have a highly developed nervous system that enables them to cope with environmental changes in a flexible manner through learning and subsequent recall, made more salient by association of events with feelings of reward or aversion. The ability of birds to experience emotions, and use memories as a basis for future behavior, leads us to reflect on the impact of our actions on the welfare of individual birds used in poultry production. As poultry probably have rather limited anticipation of the future, quality of life in the present is arguably of more relevance from the birds' perspective than duration of life and curtailment of future possibilities. We can then ask, "Is the current life of a bird worth living or is it so fraught with suffering that the bird would be better off not existing?"

The answer to this question can be informed by scientific assessment of the health and emotional status of poultry of different genetic backgrounds under specific housing and management conditions. For example, in weighing up the pros and cons of molting of laying hens induced through feed withdrawal, the United Egg Producers' (UEP) Scientific Advisory Committee on Animal Welfare reviewed the scientific literature on the impact of induced molting on behavioral, physiological and clinical indicators of hen health and well-being. Based on evidence of hunger and an increased risk of mortality during a feed-withdrawal molt, the committee contemplated whether it would be better to terminate the lives of the hens at the end of the first production cycle rather than subject them to a molt. The discussion led to UEP-funded research which demonstrated the feasibility of non-feed withdrawal methods of molting laying hens, thereby enabling producers to obtain the remarkable benefits of molting on post-

molt health and productivity without severe adverse consequences for the birds during the molting process.

In considering the impact of production practices on poultry welfare, some active areas for scientific inquiry and ethical debate include: (1) selection and managing broilers and turkeys for rapid growth at a cost of increased risk for leg deformities that make walking painful, (2) selection for a large appetite necessitating feed restriction of breeders to facilitate survival and reproduction at a cost of hunger and resultant development of oral stereotypies, (3) selection and management for high egg production at a cost of bone fragility and pain from fractures, (4) indoor confinement on porous flooring to protect birds from predators, parasites and pathogens and facilitate production and food safety at a cost of reduced opportunities for birds to engage in rewarding activities such as foraging, exploration and dust bathing, (5) control of cannibalism, feather pecking and feed wastage through beak trimming at a cost of pain associated with the procedure, and (6) minimizing heat loss and maximizing feed efficiency in winter through low ventilation rates at a cost of exposing birds and caretakers to high ammonia concentrations. Sustainable solutions that minimize the above costs do so by promoting poultry health and well-being while at the same time maintaining the affordability and safety of poultry products, ensuring worker safety, and avoiding wastefulness and damage to the environment.

Other ethical issues in poultry production that can't be overlooked include (a) the destruction of unwanted chicks, (b) on-farm depopulation of spent fowl in the absence of a viable, nearby market, c) use of antibiotics, and (d) public interest in the naturalness of poultry production. With regard to the latter, there is current pressure from animal advocacy groups for legislation to ban cage housing systems for egg production without specifying requirements to assure the health and well-being of poultry in non-cage housing, which can range from good to poor depending on the genetic stock used, previous rearing conditions of the birds, specifics of the housing design and management, and husbandry skills and empathy of poultry caretakers. It is conceivable that the future will bring increased consumer demand for pasture-based production systems and use of less productive but more robust breeds of poultry. Greater scientific attention to these systems would help to identify best practices, rather than leaving it to individual producers to find out the hard way through trial and error.

In conclusion, ethical review of poultry production practices incorporating the latest scientific knowledge and taking into account the hierarchy of public values can help to identify improvements and avoid unanticipated adverse consequences for both people and poultry.

Panel: Ethical Issues Affecting Poultry, and Alternative Solutions

Societal Responsibility

Mike Morris, Manager, Poultry Health and Welfare
KFC Quality Assurance
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When referring to the concept of "Societal Responsibility" we are talking about the idea that business entities have obligations that extend beyond their original and primary intent: profit. The traditional role of a business arguably is to generate wealth for the stakeholders in that enterprise; be they owners, employees, or investors.

Societal responsibility implies that businesses should manage their operations in a fashion that at least "does no harm" and ideally offer benefits to society beyond that group originally identified as stakeholders. Sometimes acting in the general interest of society could be at odds with the profit motive, and there in lies the quandary. A fair balance must be struck that allow businesses to meet their accountability to generate profit with practices that meet the public's expectations, or at least addresses societal standards.

Areas of social concern may include minority hiring practices and opportunity, environmental, nutritional, or animal welfare, among others. Those businesses which provide food, from the farm to the retail outlet, have been particularly compelled by society to address issues regarded by their customers as well as the general public as important.

The call for accountability or change regarding social issues has often historically been initiated by groups and movements that are considered "fringe", and may in fact remain so. However with some issues a significant segment of society may be persuaded that an issue or concept is relevant to the "general good" and demand action or assurance. This process may occur slowly, and generally the position taken by the general public versus that of the group calling for change is considerably attenuated. When an issue reaches this point of critical mass, businesses must be prepared to respond.

In the age of instant electronic communication and the concomitant lightening-fast dissemination of ideas and concepts, companies should acknowledge potential issues society may deem relevant. Forecasting those future concerns by paying attention to the activities of interest groups, even those whose ideals could be considered on the edges of society, allows a business to be proactive and more effective in their response.

The nature of a company's response may vary considerably, from attempts to better educate customers and the public concerning their business practices to reevaluating policy or instituting changes in practice.

Today businesses commonly evaluate their practices and policies relevant to societal responsibility based on two principles: (1) a set of core values and ethical standards that are inherent to those who have a first person stake in the operation of the business; the “moral fabric” of the business, and (2) and community standards, however large that community may be, such that the business is a “good citizen” that respects and adheres to the values of the general society.

Panel: Electric, Gas or Religious Slaughter Alternatives

Is Kosher Ethical?

Joe Regenstein
Cornell University
Ithaca, NY

The following power point was used during the meeting. See Appendix C for a modified and expanded version of the Power Point presentation.

Panel: Electric, Gas or Religious Slaughter Alternatives

Is Gas Stunning/Killing Ethical?

A. Bruce Webster
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INTRODUCTION

My starting premise is that it is *prima facie* ethical to slaughter animals for food. Were this not the case, there would be no reason to ask if gas stunning/killing of poultry for food is ethical. Some people reject the premise but it is beyond the purview of my subject to discuss the merits of their arguments. The pertinent issues are whether there is anything about gas stunning that would made it unacceptable for slaughter of poultry and whether gas/killing improves on other methods of slaughter so as to make it more ethical by comparison. My focus will be on the welfare-related effects of gas stunning/killing systems on poultry because my personal expertise lies in this area, but I will touch on the effects of these systems on human workers. Cost considerations are relevant to a discussion of ethics, but since I am not an economist I plan to say little about the economic tradeoffs between gas stunning/killing systems and other methods of slaughtering poultry and how these might affect the acceptability of one system over another. I also do not intend to discuss environmental aspects of gas stunning/killing because I believe the emissions from such systems have negligible atmospheric effects; although not being an expert on the subject I could be proven wrong on this point.

The main effort to develop gas stunning/killing systems for poultry until recently has been in Europe. The original intent was to come up with an alternative to high-current electrical stunning systems. The use of high amperage current for electrical stunning was mandated in some countries to minimize the chance of birds recovering consciousness during bleed-out, but had the unfortunate consequence of producing elevated levels of carcass defects which negatively affect product quality. As a side note, this same pressure for an alternative to electrical stunning was not perceived in North America because the type of neck cut and low-current electrical stun typically used here produce a faster bleed-out and fewer carcass defects. A second purpose for development of gas stunning systems was to reduce stress, struggle, and injury of birds by rendering the birds unconscious before being caught and placed on shackles of the first processing line.

CONTROLLED ATMOSPHERE STUNNING

Gas stunning involves controlled changes in the gaseous atmosphere surrounding an animal such that the animal loses consciousness due to lack of oxygen or excess of carbon dioxide, depending on the atmosphere. Controlled atmosphere stunning systems (CAS), as they are called, developed for use in poultry processing plants do not use poisonous gases, but use gases such as nitrogen, argon, carbon dioxide, and oxygen to stun birds. If the particular system is used to kill the bird after stunning it, oxygen is eventually reduced to a level that prevents support of life. There are five categories of controlled atmosphere stunning which

differ according to the species of gas used, the mixture of gases, or the manner of atmospheric control. These are outlined below. Controlled atmosphere stun-to-kill systems may be single stage, in which the effective atmosphere is introduced in one step, causing the bird to lose consciousness and die in close progression. Alternatively, they may be multi-stage (two or more stages), in which the initial atmospheric changes are intended to induce unconsciousness and the final stage causes death. Multi-stage systems progressively increase carbon dioxide in the gas mixture and give enough time at the lower levels of carbon dioxide to allow anesthesia to develop during the stunning process. This has implications for bird welfare and carcass quality which will be discussed below. Additionally, CAS systems may be designed to unload birds from transport coops before stunning, in which the birds are typically dumped or pulled from modules as is normal for electrical stunning systems and conveyed loose in a continuous flow through a gas tunnel, or after stunning, in which the loaded transport container is passed through the CAS stunning system and the unconscious/dead birds removed afterward.

Categories of Controlled Atmosphere Stunning

Anoxia

Systems designed to produce anoxia use high concentrations of inert gases such as nitrogen or argon to dilute air until residual oxygen is around 2%. Birds remain conscious until very low oxygen levels are achieved and will quickly progress beyond recovery after losing consciousness, but can recover quickly if reintroduced to air. Therefore, anoxia-based CAS is used in single stage systems that intentionally stun-to-kill. Loss of posture (LOP), in which the bird loses ability to maintain an upright posture, is closely associated with loss of consciousness and occurs quite quickly after the anoxic atmosphere is established, i.e., less than half a minute. Another advantage is that birds do not appear to detect the inert gas. Convulsive head jerking may occur just before LOP. Birds stunned by anoxia manifest strong convulsive wing flapping. Recent study of brain wave patterns in chickens has indicated that birds stunned in anoxic atmospheres may retain some degree of consciousness before and in the intervals between the initial episodes of convulsive wing flapping. This convulsive activity may be unpleasant to the bird, but the period of any unpleasantness would be short in a properly operated CAS system. Since there is some variation among birds in time to LOP, some conscious birds could be aware of the convulsive activity of other birds and could even be struck by the wings of convulsing birds during the short period before they lost consciousness. Finally, strong convulsive wing flapping can result in wing damage and down-graded product quality.

Hypercapnic Anoxia

This approach differs from anoxia in that a certain percentage of carbon dioxide, typically 30%, is mixed with the inert gas. This gas mixture is used to reduce oxygen to levels to around 2% in a single stage. Generally speaking, the time to loss of posture is marginally faster than with anoxia. Convulsive head jerking is not manifested, but strong convulsive wing-flapping does occur. There is less evidence that birds may still be conscious at the initiation of convulsive wing-flapping but the possibility cannot always be precluded. A bird in a hypercapnic, anoxic atmosphere may, on one or more occasions, briefly appear to lose and quickly recover its balance before loss of posture, whereas those in anoxia generally keep their balance until LOP. This often occurs immediately after an event of head shaking. The effects of convulsive wing-flapping on the welfare of conscious birds in a CAS system and on wing damage would be similar to the case for anoxia.

Poultry in carbon dioxide-enriched atmospheres, anoxic or otherwise, demonstrate pronounced deep breathing (gasping, according to some authors) and head shaking. Both these actions take place while the bird is conscious. It has been suggested that deep breathing in response to elevated levels of carbon dioxide may be associated with a feeling of breathlessness, and that head shaking may be a response to irritation of the nasal or buccal epithelium. If true, it would have to be concluded that carbon dioxide has a unique negative impact on bird welfare. Chickens have receptors in the lungs and circulatory system which are sensitive to carbon dioxide. These apparently promote rapid autonomic breathing responses to elevated carbon dioxide partial pressures, i.e., deep breathing. It is also evident that poultry can detect carbon dioxide-enriched atmospheres and will show a modest aversion to them. This aversion can be over-ridden by other priorities, so any breathlessness that might be perceived by the bird does not appear to affect its sense of well-being very much. Recent research has indicated that trigeminal nociceptors in the buccal cavity of chickens have response thresholds to carbon dioxide in the range of 40%-50%, which is much higher than the concentrations at which head shaking begins to occur. Epithelial irritation, therefore, does not appear to be the cause of head shaking in carbon dioxide-enriched atmospheres. An alternative suggestion for head shaking is that it may be simply an alerting action in response to sedation induced by carbon dioxide.

Hypercapnic Hypoxia

This approach simply involves mixing carbon dioxide into air to achieve an atmosphere capable of stunning or killing poultry. Depending on how a given CAS system manages the atmosphere, the effective carbon dioxide concentrations range from less than 20% to about 80%. If the carbon dioxide level is relatively low, e.g. 20%-30%, times to LOP and death are slower than for anoxia, and it is possible to keep birds unconscious for extended periods without killing them. Convulsive wing-flapping is greatly suppressed. If carbon dioxide levels are relatively high, e.g., >50%, times to LOP and death do not greatly differ from those in anoxic atmospheres, and convulsive wing-flapping is more prevalent. Hypercapnic hypoxia lends itself to a multi-stage approach in which birds are sedated in gradually increasing concentrations of carbon dioxide so that they become unconscious with little wing-flapping. Unconsciousness can be achieved before the threshold for carbon dioxide-induced nociception is reached. Thereafter, the carbon dioxide can be increased to a level that kills the birds. As in hypercapnic anoxia, poultry show deep breathing and head shaking and they demonstrate modest aversion to hypercapnic, hypoxic atmospheres. In contrast to hypercapnic anoxia, chickens have a greater tendency to subside to recumbency with fewer events of imbalance before LOP.

Hypercapnic Hyperoxygenation

This method involves mixture of both carbon dioxide and oxygen (in the range of 30% each) with an inert gas such as nitrogen. In practical terms, this is achieved by mixing air with enough carbon dioxide and oxygen to achieve the desired concentrations. This gas mixture can stun but not kill poultry, so it is typically used in a two-stage system in which a high concentration of carbon dioxide is introduced to kill birds after they have become unconscious. Time to loss of posture is slow compared to anoxic atmospheres, but is comparable to hypercapnic hypoxia at the lower levels of carbon dioxide. Convulsive wing flapping is suppressed and when it occurs it is invariably associated with an EEG indicative of unconsciousness. Birds show deep breathing and head shaking, and are able to detect the hypercapnic, hyperoxygenated atmosphere. Oxygen enrichment may somewhat lessen carbon dioxide-induced behavioral responses and withdrawal reactions in chickens.

Atmospheric depressurization

Unlike the other approaches to CAS, this method, which is also known as vacuum stunning, does not displace oxygen with another gas or use carbon dioxide to produce anesthesia. It merely reduces the atmospheric partial pressure of oxygen by evacuating air from an air-tight chamber which holds birds. As such, it needs no gas supply. There is little published information regarding the welfare aspects of atmospheric depressurization on poultry, although research is currently in progress at the USDA ARS Poultry Research facility at Mississippi State University. Atmospheric pressures in the range of 0.2-0.3 atm are sufficient to stun and kill chickens. Since birds experience the transition from full atmospheric pressure to the target pressure, vacuum stunning can be considered multi-stage in nature. However, since there is no clear distinction between stunning and killing, no anesthesia associated with exposure to carbon dioxide, and chickens apparently recover quickly when returned to normal atmospheric pressure if not killed, the approach probably more closely resembles a single stage stun-to-kill method. Behavior of chickens during vacuum stunning is said to resemble that of birds in other CAS systems, but since bird behavior varies greatly between the different CAS categories, it is difficult to know what this means. One concern expressed regarding this method is that an animal may experience discomfort from expansion of air trapped in body cavities during depressurization. Proponents of the system argue that the open-ended lungs and air sac system possessed by birds precludes the possibility of trapped air being able to cause discomfort. More information is needed before atmospheric depressurization can be properly evaluated from an ethical perspective.

GENERAL CONSIDERATIONS

It is clear that the categories of controlled atmosphere stunning have different effects which may impact bird welfare or affect product quality. The single stage systems, which rely on anoxia, induce insensibility more quickly, but cause involuntary convulsive activity that might be distressing, if only briefly, to some birds which have not become fully unconscious before they undergo it. This activity also could be distressing and physically abusive of birds which are slower than others to become unconscious in the group setting of a commercial CAS system. Any reduction of product quality as a result of carcass damage due to convulsive wing flapping would have a negative effect on a company's profit margins. On the other hand, multi-stage systems which use carbon dioxide to anesthetize and immobilize birds are slower to induce unconsciousness, and place birds in atmospheres that they can detect and which cause distinct behavioral responses. The modest aversion shown to these atmospheres, which is also shown to a hypercapnic, anoxic atmosphere, suggests at least the potential for bird welfare to be negatively affected in the initial stage(s) of a multi-stage system. However, maintenance of carbon dioxide below the threshold for nociception until unconsciousness would preclude the experience of pain-related stimuli associated with the gas and birds appear to subside gradually into unconsciousness without distress. Any economic benefits achieved by minimization of carcass damage in a multi-stage CAS system would increase the chance that a poultry processing company would recover its initial investment in a timely manner.

A controlled atmosphere stunning workshop titled, "Scientific Approaches to Determining the Most Humane Gas Mixtures for Controlled Atmosphere Stunning (CAS) of Poultry," held at the British Veterinary Association, London, England, in 2005 to discuss the merits of the different methods of CAS concluded that each method had apparent animal welfare advantages and

disadvantages which differed between the methods. However, these differences were not sufficient to lead to the conclusion that any method was distinctly better, i.e., more ethical, than the others. Furthermore, the welfare disadvantages of any of the systems associated with the first four CAS categories above were sufficiently minor that all were considered acceptable in light of other stunning/killing methods currently available. This is my opinion as well. Vacuum stunning was not evaluated at the CAS workshop because it was not recognized as an option at the time.

A note of caution is important at this point. Different types of poultry may react differently to stunning gas atmospheres and one cannot expect that a system developed for one will necessarily be acceptable for another. For instance, newly hatched chicks have a higher tolerance for carbon dioxide than older birds and require higher concentrations of the gas for effective stunning/killing. Ducks have a diving reflex which, if stimulated, will enable them to survive inordinate amounts of time in what is thought to be a stunning atmosphere. Although not documented to this point, it is possible that, similar to breeds of pigs, some types of birds might have more aversion to a stunning gas atmosphere than others. While CAS systems are generally considered to be ethical for poultry, the acceptability of any specific system must be evaluated in relation to the type of bird for which it is intended.

It is outside the scope of this presentation to make a direct comparison between CAS stunning and stunning by electricity, which is the most common approach to stunning/killing of poultry in developed countries, or other methods, such as religious slaughter. Since electrical stunning is very quick once proper electrical contact is made, it would not appear on the surface that the actual process of stunning could be said to be more ethical using CAS versus electrical stunning. However, current electrical stunning methods require that conscious birds be caught by humans, turned upside down, and thrust into metal shackles to hang by the legs and travel some distance to the electrical stunner. Poultry react to humans as if to a predator. As a result, the hanging process causes fear and struggle and creates risk of injury. The experience of hanging by the legs in a metal shackle is undoubtably uncomfortable. All of the CAS methods eliminate handling of conscious birds by humans at the shackling station. CAS methods which stun birds in transport cages also eliminate the disturbance, struggle and risk of injury associated with the removal of the birds from the cages. The ability of CAS to mitigate handling-related stress and injury at unloading and hanging is already recognized as a major welfare, and thus ethical, advantage for CAS systems. Lacking improved bird handling systems for electrical stunning, I foresee that electrical stunning systems will increasingly be seen as ethically deficient relative to CAS systems. If improved handling of birds using CAS leads to improved product quality, economic considerations would provide a pragmatic component to the ethical status of CAS.

Another issue of great practical importance to poultry processors, and of ethical relevance as well, is the quality of the work environment for humans involved in unloading and hanging of poultry on the first processing line. With current electrical stunning systems, or any system in which birds must be hung while conscious, the shackling station is loud with the distress calls of birds, the work is difficult with the continuous need to control struggling birds (for large turkeys, the work can be punishing), the air is filled with dust and bird dander kept aloft by the wing flapping of struggling birds, and the lighting is kept very dim to minimize bird reactivity as much as possible. Bird handlers must cover their arms and hands to protect themselves from claw scratches, and must wear breathing protection against the dust in the air. The disagreeable nature of the work environment leads to poor worker morale and high worker turnover. By

contrast, hanging of birds stunned/killed by CAS can be done in bright, relatively quiet circumstances with clean air and no struggle. Poultry companies which have adopted CAS systems have noted serendipitous benefits related to the management of the work force assigned to bird handling at the plant.

Panel: Electric, Gas or Religious Slaughter Alternatives

Is Electrical Stunning Ethical?

R. Jeff Buhr
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The question that I was asked to address was: Is electrical stunning ethical?

A stunning method would be considered ethical if the following criteria were attained. 1) Stunning results in a rapid onset of unconsciousness within a minimal time and with a minimal perception of pain. 2) The duration of the unconsciousness persists until death intervened. 3) There was a near zero occurrence of "under stunned" conscious broilers. Stunning by definition must permit the broiler to recover consciousness. Adequately electrically stunned broilers should recover consciousness, to the level of regaining the ability to maintain an erect posture, within 120 seconds following the stun. However, electrical stunning and exsanguination (bleeding) are integral steps in the slaughter of poultry and should be evaluated together in the progression to death.

The term electric anesthesia is defined as, anesthesia induced from the passage of an electric current through the nervous system. This is analogous to electrical stunning and corresponds an unconsciousness level approximating the anesthesia Stage 3-medium. Electrical stunning does induce unconsciousness in poultry, but how can one determine the level of unconsciousness and therefore the inability of the broiler to perceive a pain stimuli?

To answer this question the relationships of unconsciousness level and the perception of pain need to be described and agreed upon. Arthur Guedel in 1937 was the first to designate the four stages of anesthesia from consciousness through unconsciousness to death and the perception of pain. Guedel's stages of anesthesia are listed below (and, ACVA, 1995):

Stage 1. Analgesia may be local or general
- Loss of pain sensation, some disorientation or numbness, subject may remain conscious

Stage 2. Excitement, delirium, epileptiform brain activity (human grand mal epileptic seizure in an unconscious state)
- Loss of the ability to perceive pain, muscle reflexes are still present, involuntary struggling occurs, rapid respiration rate

Stage 3. Surgical anesthesia, 3-planes
Light - Skeletal muscle relaxation but reflexes are present, no voluntary muscle movement, regular respiration, palpebral and corneal reflexes present
Medium - Skeletal muscle reflexes absent, palpebral reflex absent, corneal reflex sluggish

Deep - Early overdose, respiration depresses (forced ventilation required), corneal reflex absent

Stage 4. Medullary paralysis, death, overdose, flat line EEG
- All reflexes absent, no initiation of respiration, cardiac function depressed

Electroencephalograms (EEGs) record brain waves by measuring the electrical activity of the brain and are very temporally precise. EEGs from brain implanted electrodes have been used to determine the level of consciousness and activity of subjects, including broilers (Kuenzel and Walther, 1978; VanKampen, 1979). Collier et al. (2003) reported the protocol to record EEGs from conscious and stunned broiler chickens using noninvasive cutaneous electrodes and telemetry. Using these techniques, Buhr et al. (2003) were successful in recording EEGs in broilers stunned (at low or high voltages) and bled as they proceded to death. This work is being continued by ARS-Mississippi State (Poultry Research Unit) with goals to delineate the levels of unconsciousness in broilers resulting from anesthetics and then comparisons are to be made to various commercial stunning methods.

The American Veterinary Medical Association panel on euthanasia (2001) describes three physical methods for euthanasia appropriate for poultry: 1) stunning with an apparatus that assures passage of the current through the brain and followed immediately by a method that ensures death such as exsanguination, decapitation, or electrocution; 2) cervical dislocation by trained personnel, and 3) electrocution if the animal is first rendered unconscious (stunned). When cervical dislocation or decapitation is preceded by electrical stunning, there is no death struggle that typically occurs with cervical dislocation without prior stunning. Historically the level of unconsciousness and the associated inability to perceive pain has been evaluated in stunned broilers by the palpebral (eyelid) avoidance reflex or the absence of the limb withdrawal reflex when a distal pinch is applied. These methods are not easily applied or observed on shackle lines operating at speeds as high as 140 birds per minute. Recently we confirmed that spinal cord severing of stunned broilers on line could be used as an indication of the level unconsciousness. Stunned broilers (25 V DC at 500 Hz, brine stunner) were bled by severing both carotid arteries and the right jugular vein and then at 30-second intervals spinal cord severing was applied. From 30 through 120 seconds, when spinal cord severing was applied to stunned and bleeding broiler carcasses, no subsequent death struggle was induced. Therefore, electrical stunning followed by bleeding maintained unconsciousness through the time of death when spinal cord severing was applied. Additional experiments have revealed that electrical stunning durations as short as 2 seconds result in unconsciousness sufficient that immediate spinal cord severing and did not result in a subsequent death struggle. These results imply that the onset of unconsciousness by the application of electrical stunning is indeed rapid and when accompanied with bleeding, unconsciousness is maintained until death occurs within 120 seconds.

The possibility of the occurrence of electrical immobilization, retaining the ability to sense and perceive pain but unable to respond to stimuli, can occur if the electrical current path does not reach the brain of the subject. Electrical immobilization does not appear to occur in electrically stunned broilers (using a brine stunner), since spinal cord severing following stunning and bleeding does not result in a death struggle. The limitations of brine stunners and the potential presence of electrical immobilization can also be answered by EEGs and should be evaluated under various stunning parameters.

Skeletal muscular activity during bleeding prior to scalding is not necessarily an indication that the broiler is regaining consciousness since skeletal movements do occur during Stages 2 and in the light plane of Stage 3 anesthesia, when the ability to perceive pain is absent. Similarly, the occurrence of a cadaver indicates that a functional brain stem and cardiovascular system were present at the time the brain perceived an elevation in body temperature upon entering the scalder water. Two studies have concluded that "red-skin" cadaver chicken carcasses, are caused by the physiological response to elevated temperature when carcasses enter a scald tank (Heath et al. 1983; Griffiths and Purcell 1984). Unconscious broilers at Stage 3-Medium level of anesthesia would upon entering the scalder result in cadavers. The occurrence of skeletal movements during bleeding and cadavers upon scalding can occur as long as the broiler's brain stem is functional, but at a level of unconsciousness that pain is not perceived. The occurrence of skeletal movements during bleeding and the occurrence of cadavers can both be completely eliminated if decapitation or spinal cord severing is applied following stunning, during bleeding and prior to scalding (Buhr et al., 2005).

The determination of the ethical status of slaughter methods depends greatly on a critical review of the literature and that the results and conclusions agree with the subsequently published literature and the body of knowledge of physiology and anatomy. For example Dickens & Shackelford (1988) reported the electrical stunning reduced feather retention force (FRF) by 16 to 18%. However, in their experiments there were no controls, no non-stunned or gas stunned treatment groups. Their methodology erroneously plucked the big feather first and smaller feather after electrical stunning. This was clearly demonstrated by Buhr et al. (1997) and in addition that immersion scalding reduced FRF by up to 99%. Therefore, any small change in FRF resulting from electrical stunning does not significantly contribute to feather removal.

The report by Gregory and Wotton (1986) states that electrically induced cardiac fibrillation of the heart resulted in the more rapid brain death as evaluated by spontaneous and evoked brain potentials. They were unable to explain why electrically induced cardiac fibrillation lead to a more rapid death than decapitation. I have yet to find a physiological or anatomical reason that the blood flow to the brain would be stopped more rapidly by electrically inducing cardiac fibrillation than by decapitation in anesthetized poultry. Their protocol and the influence of the applied electric current (lowering the level of consciousness), the 3 second stun interval, and the delay in recording potentials should be revaluated as confounding factors. These experiments should be replicated using a supersaturated solution of potassium chloride injected intravenously to induce cardiac fibrillation in the absence of an applied electrical current.

In answering the question, "is electrical stunning of broilers ethical" my present answer is yes. However, my experience with electrical stunning of broilers has been in laboratory conditions with optimally operating commercial equipment. The work by ARS/Mississippi State with the recording EEGs from broilers under various stunning protocols should be encouraged and expanded to operating commercial slaughter plants. I ardently advocate that the U.S. Poultry & Egg Association's industry research grants program continue to fund high priority research projects in the area of poultry slaughter, specifically in the determining of the states of consciousness of poultry prior to, during, and following stunning.

REFERENCES

American College of Veterinary Anesthesiologists guidelines of anesthetic monitoring. JAVMA. 206(7)936-937. 1995.

American Veterinary Medical Association, Report of the AVMA panel on euthanasia. JAVMA. 218(5)669-696. 2001.

Buhr, R. J., Berrang, M. E., Cason, J. A., and Bourassa, D. V., Recovery of bacteria from broiler carcass respiratory tracts before and after immersion scalding. Poultry Sci. 84:(11)1769-1773. 2005.

Buhr, R. J., Bourassa, D. V., Foutz. T. L., and Fletcher, D. L., Electroencephalograms recording following low and high voltage electrical stun-bleeding in broilers. Poultry Sci. 82(suppl 1):138(S211). 2003.

Buhr, R. J., Cason, J. A., and Rowland, G. N., Feather retention force in broilers ante-, peri-, and post-mortem as influenced by carcass orientation, angle of extraction, and slaughter method. Poultry Sci. 76:1591-1601. 1997.

Buhr, R. J., Cason, J. A., and Rowland, G. N., Feather retention force in broilers ante-, peri-, and post-mortem as influenced by electrical and carbon dioxide stunning. Poultry Sci. 76:1602-1606. 1997.

Collier A. F., Martyn, D. E., Adams, M. K., Holt, M. W., Williams, D. S., Burmeister, J. S., Foutz. T. L., Bourassa, D. V., Fletcher, D. L., and Buhr, R. J., Cutaneous recording of electroencephalograms in electrically stunned broiler chickens. Poultry Sci. 82(suppl 1):138(S210). 2003.

Dickens J. A., and Shackleford, A. D., Feather-releasing force related to stunning, scalding time, and scalding temperature. Poultry Sci. 67:1069-1074.
1988.

Gregory, N. G., and Wotton, S. B., Effect of slaughter on the spontaneous and evoked activity of the brain. Br. Poultry Sci. 27:195-205. 1986.

Griffiths, G. L., and Purcell, D. A., A survey of slaughter procedures used in chicken processing plants. Aust. Vet. J. 61:399-40. 1984.

Guedel, A. E., Stages of anesthesia, Inhalation Anaesthesia. London, Macmillan, pp 10-13, 1937.

Heath, G. B. S., Watt, D. J., Waite, P. R., and Meakings, P. A., Further observations on the slaughter of poultry. British Vet. J. 139:286-90. 1983.

Kuenzel, W. J., and Walther, J. H., Heart beat, blood pressure, respiration, and brain waves of broilers as affected by electrical stunning and bleed-out Poultry Sci. 57:655-659. 1978.

VanKampen, M., Mitchell, B. W., and Siegel, H. S., Thermoneutral zone of chickens as determined by measuring heat production, respiration rate, EMG and EEG activity in light and dark environments and changing ambient temperature. J. Agric. Sci. 92:219-226. 1979.

Appendix A

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Time

2:00 - 2:10 **Welcome and Introduction**

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2:10 - 2:45 **Welfare as an Ethical Issue: Are Blind Chickens the Answer?**

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2:45 - 3:00 **Discussion**

Panel: Ethical Issues Affecting Poultry, and Alternative Solutions

3:00 - 3:15 **Ethical Issues in Processing and Marketing**

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3:15 - 3:30 **Ethical Issues in Production**

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3:30 - 3:45 **Societal Responsibilities**

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3:45 - 4:00 **Discussion**

Panel: Electric, Gas or Religious Slaughter Alternatives

4:00 - 4:15 **Is Kosher Ethical?**

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4:15 - 4:30 **Is Gas Stunning/Killing Ethical?**

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4:30 - 4:45 **Is Electrical Stunning Ethical?**

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4:45 - 5:00 **Discussion**

5:00 - 5:30 **General Discussion**

Appendix B

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