Impact of free trade on private and public practitioners

T. H. Howard, DVM, PhD

Truly free trade of animals and animal products has not arrived. Nevertheless, changes on the international scene such as the proposed North American Free Trade Agreement, the 1992 single market in the European Community (EC), and the current negotiating round of the General Agreement on Tariffs and Trade (GATT) will produce unprecedented scrutiny of the technical requirements for this trade. Inevitable changes will affect the private practice of veterinary medicine and regulatory policies. The long-established practices of regulation and animal production are resistant to change, and it is already very late in the day for North American livestock producers and veterinarians to begin their adaptation to a new international trading environment.

A continuing preeminent role for the United States in livestock exports will require the best of cooperation among regulatory and private sector veterinarians, the livestock industry, and veterinary scientists. There are lessons to be learned from other industries that have lost international marketshare: it is essential to understand and meet customer needs and to avoid complacency. Maintaining the confidence of international customers will require sensitivity to their perceptions of the health status of North American livestock. Intense international competition can be expected from the EC, where large investments have been made in genetics and disease control.

In addition to trade in traditional livestock species, a strong constituency is developing to support applications of reproductive technology to the preservation of biological diversity. Trade will be essential to the flow of genes between captive breeding populations and their wild counterparts, and veterinarians in public service will have to be particularly creative and accepting of new technology to accommodate this need.

Risk assessment and nontariff trade barriers

Under Article XX of the GATT, zoosanitary, phytosanitary, and public health measures are permitted in trade regulation, but signatory nations are obliged to avoid use of such measures as nontariff trade barriers.[1] The Office International des Epizooties (OIE) has been given the responsibility under GATT to evaluate and assist development of technical standards for trade in animals and animal products in order to achieve an international consistency that will minimize trading disputes.[2]

In the past, some major livestock-raising nations have adopted "no-risk" trading policies with respect to animals, semen, embryos, and other animal products. Such policies are no longer tenable because of the flood of people and goods moving internationally, the need for access to new genetics, and the incentive for contraband trade that overly restrictive regulation creates.

The opportunity for the North American beef cattle industry to import European cattle breeds during the 1970s improved its productive efficiency and ability to meet consumer demand for leaner beef.[3,4,5] In contrast, nearly complete restriction of Australian dairy producers' access to outside genetics over a 20-year period limited gains in productivity, and loss of diversity probably contributed to the high prevalence of at least one genetic disease (citrullinemia) in Australian Friesian cattle.[1,6] Competitiveness in animal agriculture implies that a nation is actively engaged in exportation and importation of new livestock genes.

One national approach to risk assessment has been described. Important elements include examination of each disease of concern, followed by determination of whether controlling that disease in trade can be successfully addressed by either procedural or diagnostic techniques. By evaluation of the sensitivity and specificity of diagnostic methods and the known epidemiology of each disease, the probability of its introduction via trade is estimated, and further enhancements of diagnostic testing are considered. Procedural methods for implementation of trade might address the known period of infectivity, means of transmission, incubation period, efficacy of vaccination, or use of adjunctive methods with intrinsic disease control advantages, such as reproductive technology or the practice of seasonal and regional acquisition.[1]

Dr. Howard's address is N2197 Mielke Rd, Poynette, WI 53955.

A quantitative method that has been proposed sets an assessment of risk against the sum of the production benefits to be derived from an importation and the economic risk associated with any incentive for importation as contraband, in order to derive a cost/benefit ratio for the proposed importation.[7] However, economic estimates of production benefits or contraband incentives are more difficult to make and defend when importations are intended to meet such societal goals as species conservation and preservation of biological diversity.

Reproductive technology has introduced new elements into risk analysis, inasmuch as the probabilities of disease transmission are different among the various forms of animal germ plasm: animals, semen, embryos, or embryos that have been manipulated in vitro. Failure to recognize these differences in zoosanitary regulation leads to distortions that are truly nontariff barriers and vitiates the notable animal welfare benefits of trade in embryos or gametes.[8,9]

Differences in national status

Resolution of technical differences is most difficult when national disease control strategies are fundamentally different, or when there are great differences in the scope of the authority of national veterinary services. Such differences may be further complicated by the presence of insect vector-borne infections, the ranges of which are defined by regional weather and ecosystems, not political boundaries or animal health policies.

When major international trading partners have fundamentally different disease control policies or status, the potential for trading conflicts over animal health is high. This is presently the case for trade in cattle, bovine embryos, and semen between the United States and the EC.

The EC has well-established control and eradication policies for brucellosis, enzootic bovine leukosis, and bovine herpesvirus-1 (BHV-1) infection, and several member states have eradicated these infections or soon will do so. Most EC-member states have, until 1991, maintained vaccination programs against foot-and-mouth disease (FMD). In the United States, bovine brucellosis eradication is not yet complete, there is no national program for control of enzootic bovine leukosis, BHV-1 infection is largely controlled by vaccination, and FMD is not present. The presence in some regions of the United States of the vector-borne viruses of bluetongue and epizootic hemorrhagic disease contrasts to their virtual absence from the EC-member states.

The predictable consequence of these differences has been an ongoing series of veterinary restrictions of trade in cattle and their germ plasm between the United States and EC. In the short term, the balance of trade has continued to favor the United States. A substantial export trade in bovine semen and embryos to the EC has continued despite progressively rigorous conditions. European dairy cattle breeding programs have maintained access to the best of North American genetic material, which is in turn being sold into world markets untrammeled by the perceptions of disease risk in the United States.

With the arrival of the 1992 single market in the EC, veterinary conditions for importation of bovine semen and embryos from the United States have become more rigorous than ever before. Conditions that require freedom of the donor animal, its herd, and its state of origin from brucellosis, the animal and its herd of origin from enzootic leukosis, and state or seasonal certification of freedom from bluetongue may eventually be accompanied by a requirement that donor animals and herds be certified free of BHV-1 by serologic methods. Unfortunately, the long-established practice of BHV-1 immunization by North American herd owners and veterinarians will confound such certifications. There is no regulatory recognition for such immunizations unless the vaccinated animals are proven to be seronegative before vaccination.

Requirements of the United States for importation of cattle and bovine semen from countries that practice FMD vaccination are equally onerous. The requirement for supervision of animal tests and semen collections in the country of origin by a USDA-Animal Plant Health Inspection Service (APHIS) veterinary officer has precluded all but a few importations of cattle and semen. Paradoxically, importations of embryos, the safest form of ruminant germ plasm, were impossible until late 1991. In contrast, a more open trade in animals and germ plasm has been conducted among FMD-free and FMD-vaccinating members of the EC for several years. In France, use of semen from FMD virus-vaccinated bulls for insemination of an unvaccinated population of cows in the Finistere Department has not resulted in any instance of infection over a 30-year period.[10]

It may be fairly said that no party to trans-Atlantic trade in bovine germ plasm has distinguished itself with respect to adoption of state-of-the-art technical conditions for this trade. The developed economies of the nations involved have been able to pay a tolerable price because their surpluses of animal protein. However, emulation of such conditions by nations with developing economies not only hinders their livestock development, but has created artificial incentives for a dangerous contraband trade.

Problem of contraband

The risks of a supervised legal trade in animal products pale when compared with those of contraband. For example, there are credible reports of the existence of contraband trade in bovine semen from South America to FMD-free Central America and Mexico and from exotic FMD- and rinderpest-

infected areas of Asia to South America.[11,12] Livestock that are well-adapted to tropical or subtropical environments seldom originate from regions of immaculate animal health status. The choices are to move such genetic material under conditions of carefully managed risk or accept the consequences of contraband movement.

The massive demand for fetal bovine serum (FBS) from the cell culture laboratories of the biotechnology industry has created another opportunity for illicit trade. Despite the lack of data that demonstrate a role for FBS in the transmission of bluetongue and other arboviruses, very demanding animal tests and irradiation requirements are placed on FBS imported into the United States from nations where such viruses exist. The recent seizure of a large quantity of contraband FBS that originated from a nation where FMD is present suggests that distorted assessment of the risk of bluetongue transmission by FBS has created an artificial incentive that poses even greater risk.[13]

Role of trade in preservation of biological diversity

Trade in animals and their germ plasm is not restricted to agricultural interests, nor is it motivated solely by commercial incentives. The utility of reproductive technology in the preservation of the biological diversity of livestock and wildlife species has been recognized.[14-16] International germ plasm banks are being established with the goal of preserving well-adapted livestock breeds that might otherwise vanish.[15]

In this context, insect vector-borne infections such as bluetongue, epizootic hemorrhagic disease, African horsesickness, ephemeral fever, vesicular stomatitis, and several infections by Bunyaviridae constitute a particular difficulty for the preservation of tropically adapted species, because the insect vectors are continuously active in tropical ecosystems, and indigenous animals are likely to seroconvert early in life. Regulation of movements of animals or germ plasm based on serologic response to these viruses is counterproductive and inappropriate, given that weather systems and regional ecology, rather than trade, are responsible for spread of the viruses.[13,17]

Preservation of the genetic diversity of some species in the face of human encroachment and habitat destruction or fragmentation may be possible only by genetic exchange between breeding populations in captivity and in the wild. For this purpose, breeding strategies that are being developed will be carried out over the time spanned by many human generations, until a new and more equitable equilibrium is reached between mankind and Earth.[18]

Preservation of biological diversity and endangered species is a goal more likely to capture the collective imagination of society than any strategy of animal agriculture or veterinary medicine. If these expectations are to be met, formidable technical and political obstacles to free movement of wildlife gametes must be overcome, because testing and certification strategies that have been developed for gamete and embryo donors of the domestic species are poorly suited to collections made in the wild.[19] A greater understanding of the epidemiology of exotic disease agents among wildlife and application of rapid and sensitive diagnostic assays such as polymerase chain reaction to the diagnosis of these agents will be essential to such strategies.

Role for biotechnology

The demands of trade have stretched traditional diagnostic methods and their interpretation far beyond acceptable limits. Beyond the limitations listed here, the use of single-sample test schedules in many trade protocols weakens the validity of even the best assays.

- Immunologic assays are being interpreted to exclude from trade animals that have recovered from nonpersistent infections but continue to be immunoresponsive. Other animals are being allowed to move in trade if their serologic responses do not exceed arbitrary limits that have no predictive value for latent infections.
- The overemphasis of trading requirements on seronegative animals has resulted in shipment of fully susceptible livestock into areas of enzootic infectious disease, with consequent losses to livestock development programs.
- With few exceptions, existing veterinary diagnostic methods lack the capability to discriminate between animals that have been vaccinated and those exposed to virulent infectious agents.
- There is continued use in trade of immunologic methods for diagnosis of some infections, despite the greater risk of transmission associated with seronegative carrier animals.
- Obsolete, ineffective, diagnostic methods persist in some veterinary conditions for international trade.
- International trade now includes some species for which diagnostic methods that have been developed for domesticated species are ineffective or not validated.
- Rapid diagnostic assays that can be performed by regulatory veterinary officers on the scene at critical points in transit or on arrival are not available.

In an ideal world, development of state-of-the-art diagnostic technology would be quickly followed by its incorporation into disease control programs, especially in the high-value activity of international trade. That this has not happened reflects lack of strategic planning and support for diagnostics development by international traders,

the inability of veterinary diagnostic laboratories to secure funds for modernization, and failure of public practitioners to embrace biotechnology as a way out of long-standing diagnostic and regulatory conundrums.

The underlying issue of who pays for development, validation, and implementation of new diagnostic methods will have to be jointly addressed by the public and private sectors. It seems inappropriate for the domestic clients of diagnostic laboratories to subsidize development of diagnostic tests that are intended primarily for use in trade. However, many livestock producers do not see themselves as potential exporters until such a sales opportunity arises, so building a constituency to support development of trade-oriented diagnostics will be difficult. Some trading interests do support research and development that addresses their business needs, but these efforts have not matched the scope of the need.

Public policy, livestock producers, and international trade

Shared state and federal responsibilities for livestock disease control programs may place the United States at a competitive disadvantage in international trade. The shared responsibilities certainly create apprehension by some potential customers more accustomed to national veterinary services with comprehensive authority to administer the control and prevention of livestock diseases. The veterinary services of some important customer nations have committed themselves to the eradication of infectious livestock diseases not currently within the scope of USDA-APHIS, Veterinary Services domestic programs. It should be assumed that the disease control standards for international trade to be recommended to GATT by OIE will address some of these diseases.

Some states are attempting to fill this gap by creating standards for voluntary herd certification programs.[20,21] Such programs are clearly preferable to abdication from the market. However, leadership at the federal level to create uniform national standards will be necessary to avoid the inconsistencies of multiple state regulations. The initiative of Agriculture Canada to develop the Canada Health Accredited Herd for Enzootic Bovine Leukosis is an example of a voluntary national program that establishes the technical means and certification standards to be met for such certification.[22]

The concept of regionalization is being advocated as an essential regulatory concept to deal with regions of different status within a single nation. However, there is not yet an international consensus on all the methods to be used for the establishment of regionalization. Components may include establishment of sentinel herds, evaluation of climate and other characteristics of regional ecosystems, use of vaccination barriers, analysis of vector capacity, animal movement controls, random serologic surveillance, and comprehensive clinical surveillance.

Establishment of regionalization to the satisfaction of the international regulatory community will not be cheap. Livestock producers are likely to resist some of the resulting impediments to domestic livestock movements, especially if the disease targeted is not seen to be economically important to a majority of producers. Nations such as the United States that have advocated regionalization of their own territory for purposes of trade will surely be expected to recognize the same approach elsewhere, such as freedom from FMD within part of a nation's territory, while FMD virus vaccination is practiced in adjacent areas.

There are powerful trading disincentives against the surveillance needed to support regionalization. It is a paradox of international trade that a nation that has poor disease surveillance can often make certifications that more diligent scrutiny would preclude. So long as unrealistic or unscientific veterinary requirements persist in international trade, these disincentives will also. Producer confidence in regulatory veterinary medicine is especially damaged when diligent surveillance and forthright reporting are rewarded by disruption of trade. Trading nations that use veterinary conditions to restrict imports, yet conceal or are ignorant of the status of their own national herds, rightly deserve the contempt and sanctions of the international community.

Livestock producers who wish to participate in international trade, and the veterinarians who provide preventive medicine programs to them, will find an increasing divergence of their programs from the national norm. For example, if an immunization program that has been necessary for control of an important infectious disease must be discontinued for reasons of trade, alternative preventive medicine must be practiced. Export-oriented herd owners may find their participation in such popular industry activities as livestock exhibitions, sales, and herd visitations will have to be changed or eliminated so that isolation of their herds can be maintained.

Veterinarians and others who call on livestock producers in the conduct of their businesses will become even more cognizant of the potential for iatrogenic and fomite transmission of infectious diseases. The ancillary potential of reproductive technologies such as embryo recovery, manipulation, and transfer for disease transmission will be more fully appreciated, leading to more careful selection and screening of surrogate dams, and insistence that reagents such as FBS are free of contamination.

However well it is managed, free trade will bring about increased risk of introduction of exotic livestock diseases. Room will have to be found in crowded veterinary curricula and continuing education programs for more training in the correct

diagnosis and control of exotic animal diseases. Such training will produce veterinarians with a more international perspective who are better prepared to participate in development of livestock production outside North America.

Standards for certification of freedom from disease and diagnostic testing by accredited veterinarians and diagnostic laboratories will have to reach the highest possible level of competence and accuracy. Free trade will require expansion of the now-embryonic electronic data links among diagnostic laboratories and public and private practitioners. Traditional documentation by paper reports and veterinary certificates will have to give way to electronic exchanges among animal health data bases if such trade bottlenecks as delayed reports, paperwork errors, and fraud are to be reduced. All components of such a system now exist, including electronic animal identification and sophisticated data bases of diagnostic data and trade requirements. These islands of excellence continue to be connected by archaic paper systems, excuses for which will not long be accepted by computer-literate professionals in veterinary medicine, government, and business.

The attitude that is necessary for continuing success in international livestock trade is one that recognizes trading losses to be just as real as those that result from disease. This attitude accepts the need for investment in the infrastructure necessary to create and maintain international trading opportunities. The life cycle of some domestic species is long, and the genetic cost of immediate, draconian culling would be too high to quickly establish herds that are fully qualified for all international markets. Thus, it is already late in the day to begin accommodation to the basic animal health requirements of the international marketplace. To ignore them is to risk erosion of our competitive position by the beginning of the next century. Ultimately, the most important trade-related issue to be confronted by all veterinarians and livestock producers is how to persuade our fellow citizens and public officials to recognize the economic value of a modern animal health infrastructure.

References

1. Doyle KA. Arboviruses as they relate to export and imports of livestock and genetic material, *in Proceedings*. 5th Symp Arbovir Res Austral 1989;347–350.

2. Ozawa Y. Summary of the second international symposium on bluetongue, African horsesickness, and related orbiviruses, in *Proceedings*. 2nd Int Symp Bluetongue, Afr Horsesick Rel Orbivir.

3. Smith GM, Laster DB, Gregory KF. Characterization of biological types of cattle I. Dystocia and preweaning growth. *J Anim Sci* 1976;43:27–36.

4. Smith GM, Laster DB, Cundiff LV, et al. Characterization of biological types of cattle II. Postweaning growth and feed efficiency of steers. *J Anim Sci* 1976;43:37–47.

5. Koch RM, Dikeman ME, Allen DM, et al. Characterization of biological types of cattle III. Carcass composition, quality and palatability. *J Anim Sci* 1976;43:48–62.

6. Healy PJ, Harper P, Dennis PA. Bovine citrullinaemia: a clinical, pathological, biochemical and genetic study. *Aust Vet J* 1990;67:255–258.

7. Acree JA, Beal VC. Animal health perspectives of international embryo exchange. *Ann Human Health* 1988; 1:39–44.

8. Howard TH. Health issues in international genetic exchange, in *Proceedings*. Int Sem Importance Biotechnol Livestock Dev, Pan Am Health Org/Pan Am Foot-and-Mouth Dis Center 1988;103–113.

9. Howard TH. Veterinary regulation and germplasm exchange. In: Homan EJ, Baretto CH, Gonzalez JJ, eds. *Exchange of livestock genetic resources in the central american countries*. San Jose, Costa Rica: Imprenta Nacional, 1991;25–36.

10. Blajan L, Callis J. International trade and foot and mouth disease (FMD), in *Proceedings*. Ann Meet Int Office Epizoot 1991;21–42.

11. Sutmoller P. Uncontrolled movement of germplasm from Brazil to the OIRSA countries. In: Homan EJ, Baretto CH, Gonzalez JJ, eds. *Exchange of livestock genetic resources in the Central American countries*. San Jose, Costa Rica: Imprenta Nacional, 1991;131–138.

12. Sutmoller P. Uncontrolled movement of germ plasm in Latin America, the dangers, problems, and suggested solutions, in *Proceedings*. 2nd Int Symp Bluetongue, Afr Horsesick Rel Orbivir 1989;324–330.

13. Doyle KA, Howard TH. Report of the international impacts working group, in *Proceedings*. 2nd Inter Symp Bluetongue Afr Horsesick Rel Orbivir 1991; in press.

14. Office of Technology Assessment, Congress of the United States. *Technologies to maintain biological diversity*. Washington: US Government Printing Office, 1987;137–165.

15. Hodges J. Animal genetic resources: improved use and preservation. In: Homan EJ, Baretto CH, Gonzalez JJ, eds. *Exchange of livestock genetic resources in the central american countries*. San Jose, Costa Rica: Imprenta Nacional, 1991;52–75.

16. Wildt DE. The role of reproductive biotechnology in wildlife conservation: problems and challenges, in *Proceedings*. Ann Meet Soc Theriogenol 1991;15–22.

17. Sellers RF. Weather, host and vector: their interplay in the spread of insect-borne virus disease. *J Hyg Camb* 1980; 85:65–102.

18. Seal US. Life after extinction. Symp Zool Soc Lond 1991;62:39–55.

19. Howard TH. CSS sire health: present and future, in *Proceedings*. 10th Tech Conf Arti Insem Reprod, Nat Assoc Anim Breed 1986;19–26.

20. Osburn BI, Miller LD. Report of the committee on bluetongue and bovine retrovirus, in *Proceedings*. 92nd Ann Meet US Anim Health Assoc 1988;126–127.

21. State of Wisconsin Administrative Code, Department of Agriculture, Trade and Consumer Protection. Ag 10.22: Leukosis-free herd certification, 1990;92–93.

22. Agriculture Canada. *Disease Control Manual of Procedures, Canada health accredited herd for enzootic bovine leukosis*. 1990;23:1-23.5.