The Socioeconomic Responsibilities of Veterinary Medicine

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VETERINARY MEDICINE became cognizant of its socioeconomic responsibilities in the Americas less than 100 years ago, although some European veterinarians and physicians were describing animal-related problems as early as the 18th century. The cattle plagues (rinderpest) of the 18th century were among the most devastating experiences ever encountered by man, seriously affecting Europe's social and economic structure. Wealthy landowners found their incomes drastically reduced, merchants were deprived of products of animal origin for trade and consumption, peasants were depleted of animals for production or draught, and urban consumers could obtain food, clothing, and leather goods only at exorbitant prices.

The plague was of such great concern that Pope Clement XI had his physician, Giovanni Lancisi, investigate the epizootic when it first appeared in Italy in 1713 and report on the disease itself and its social consequences to the College of Cardinals. Lancisi's recommendations were sound. He urged the establishment of quarantine, inspection of meat, destruction of sick animals, and hygienic control of the environment. Perceiving the hardship that these restrictions would place upon the peasants and landowners, he also urged that these people be exempted from taxes during the epizootic.

The control procedures prescribed by Lancisi soon rid Rome and its surrounding countryside of the plague, but the remainder of Italy and Europe suffered devastating losses before they came to accept state control. When the plague first appeared in England in 1714, the English government paid an indemnity to owners of diseased cattle. This seems to be the first instance of government indemnity for disease control. Smithcor (*1*) estimates that between 1711 and 1769 more than 200 million cattle died of plague in Europe and an even greater number were afflicted.

Rinderpest's Long-Range Consequences

The direct effect upon farmer and peasant, livestock dealer and trader, merchants and butchers, tax collectors and government, political and military decisions, and the social and religious mores of that period are incalculable. The enormity of this loss may be appreciated if it is applied to present-day cattle populations. In the United States this would correspond to a loss of about 20 percent of the dairy cattle, or in terms of 1950 values, an annual loss of $1.5 billion. If applied to the beef cattle industry the loss would be even more staggering. Another way to picture the effect would be to imagine a 20 percent capital tax on all animals. Understandably, the far-reaching consequences of the cattle plagues helped to instigate the social unrest that followed in the late 18th century.

The devastation caused by rinderpest was so great in France that nearly half the cattle

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population was destroyed between 1710 and 1714. The government established a commission of physicians and agriculturists to determine what action was needed. After 40 years of reports, petitions, bickering, enormous economic losses, and subsequent social disturbances, a royal decree of the French council of state empowered Claude Bourgelat, veterinary physician, author, and eminent authority on animal diseases, to establish a school at Lyons for the study of the diseases of cattle, horses, and other domestic animals. Cattle were to be given priority in these studies because of the epizootics that had plagued the country for decades. The school was opened in 1762 and immediately gained fame for its advice on handling disease outbreaks. Students from all over France and Europe came to Lyons to study. These students in turn became the faculty of new schools that were established at Alfort in 1765, in Vienna, Berlin, Hanover, Munich, Copenhagen, and eventually in all the countries of Europe.

The dissemination of sound disease control measures, such as quarantine of sick animals and restriction of their caretakers, destruction of diseased animals and vectors, cleaning of cow barns and sheds, and abandonment of fields and pastures where sick animals had grazed, had their effect. The cyclic nature of rinderpest is no more understood than that of other plagues, but the epidemiologic principle that epidemics or epizootics can only be maintained by large numbers of susceptibles is certain. Whether or not the rinderpest epizootic cycle was naturally on the rise or decline, the establishment of disease control measures and their successful enforcement in France stopped the disease and gave respectability and prestige to the new schools and their graduates.

This was the beginning of veterinary medicine's measurable contributions to a society changing from rural to urban under the impact of the industrial revolution. Without some semblance of animal disease control, this transition could have been delayed or postponed for decades, holding back one of the greatest advances of man since the dawn of history. The successful application of animal disease control measures in Europe during the late 18th century allowed the industrial revolution to maintain its pace into the 19th century and beyond. Animal products, such as meat, milk, fiber, hides, bones, horns, and hooves, continue to this day to provide sustenance for both man and machines.

Epizootics and Advances of the 1800's

The 19th century opened with veterinary medicine and education firmly established in Europe. The ability to control animal plagues had been demonstrated, although the periodic waves of foot-and-mouth disease had not yet appeared as epizootics. Meat inspection was widely practiced although it was in a transitional period. During the 17th century, the role of meat inspection changed from an attempt to control syphilis to the more rational concept of preventing animal-borne disease and food poisoning.

As the industrial revolution of Europe gained momentum, people concentrated in urban areas and public health problems were compounded. Fortunately, Jenner, a physician who was an outstanding investigator of veterinary problems, had demonstrated the efficacy of vaccinia immunization, which became the basis of public health practice in many countries.

But other diseases affected the public's health to such an extent that government and businessmen became concerned. Tuberculosis spread so rapidly in some countries that it had all the characteristics of an acute epidemic disease; it also appeared among milch cows in Europe and was eventually carried to the Americas in purebred stock. In areas with concentrated populations, summer colics of children and epidemics of scarlet fever and streptococcus sore throats were traced to dirty milk. Diphtheria and typhoid were also on the rise; their incidence crested toward the end of the 19th century. The scientific confirmation that many tapeworms originated in cattle and swine and that pork was the vehicle of trichinosis provided a sound basis for veterinary public health practices which are in effect today.

The development of epidemiology led to the conclusion that milk was one of the most important vehicles of disease-causing organisms. This discovery provided veterinary medicine with an even greater challenge than that of meat hygiene. Although these problems were partially resolved, at least academically, in the 19th

Farmer spraying his livestock to control horn flies, recently introduced into the United States

century, solutions were slow to be adopted. Today we look with amazement on the perpetuation of these problems in many areas.

The public health hazards of the 19th century brought the physician and veterinarian together. Veterinarians in Europe and North America began to report their findings and to promulgate regulations to protect the public health. The meat and milk codes of this period are well known. Of even greater interest are the basic discoveries of veterinarians in the fields of bacteriology, pathology, immunology, virology, and parasitology. These were to provide a foundation for preventive medical practices in both public and animal health. Pasteur and his veterinary associates gave an enormous boost to furthering man's well-being throughout the world. Many of the first health departments in the Americas were established as Pasteur laboratories for the production of antirabies vaccine. Similarly, Pasteur's development of veterinary biologics made possible an expanding animal population throughout the world. Smith and Cooper's demonstration that Texas fever was transmitted by ticks gave important support to those who believed yellow fever and malaria were insect-transmitted diseases. Without these advances in science, the social advancements of the late 19th and early 20th centuries would have been delayed. These discoveries also became the basis of organized public health practice.

Frank S. Billings, a Boston veterinary physician, pointed out as early as 1884 in "The Relation of Animal Diseases to the Public Health," that social progress was dependent upon scientific progress (*2*). Billings made a strong plea for the establishment of a veterinary division in

the then National Board of Health. Although this plan was not adopted nationally, in many local communities veterinarians were appointed to local boards of health and initiated programs for milk and meat hygiene inspection.

Dividends of Veterinary Research

Mankind's economic and social well-being has also been improved by advancements of veterinary medicine. The protection of animal health permitted an expanded rural economy which, in turn, provided a base for the industrial revolution. As the industrial revolution proceeded, the demand for animal products including meat increased, and animal industries developed and expanded throughout the world. The economic development of many countries was stimulated by the growing world market for meat and meat products, milk and milk products, hides and hair, horns and hooves, and later glands for the manufacture of lifesaving drugs including insulin, thyroxin, pituitary extracts, and ACTH.

At the beginning of the 20th century, national programs of preventive veterinary medicine were established in many countries. Research inevitably expanded to support these programs, for they could not succeed without nationally supported research. Because conditions vary from country to country as well as within countries, studies had to be undertaken to determine how to deal with local conditions. The impact of veterinary research through the years has been startling. It has opened vast areas of continents to animal husbandry, given a base to many industries, and improved human nutrition beyond expectation. Probably in no other creative area has an investment returned so great a dividend for mankind. An attempt to project livestock losses of the 18th century to the present world animal population (*3*) staggers the imagination.

Animals are the oldest and most basic form of capital, a form of surplus wealth that can be used to develop new industry. Such economies still exist, especially in the underdeveloped areas of the world. These areas probably need veterinary services more than any others today.

It has been estimated that the present world population is about 3 billion people and that the domestic animal population is about 1 animal and 1 fowl for every individual. This ratio hardly provides sufficient sustenance for each child, woman, or man, especially on a per annum basis. But these statistics become more staggering or frightening when one hears that the human population will double by the end of the century. Can we double or triple or quadruple our livestock in the same period? This is the great social and economic challenge that veterinary medicine and animal scientists face. I believe that it can be done, but disease control will be basic to the success of such a venture.

Poultry Production and Needs

The control of avian diseases has had a far-reaching effect in the western world. Today chicken and turkey meat are among the cheapest, most nutritious animal protein available. There is hardly a country in the world that cannot have the benefits of advanced technology in this area. Europe is expanding its poultry production, as is Russia and many of its satellites. Africa and Asia are looking forward to applying the new production techniques. North America should not have any difficulty in increasing poultry production five- to tenfold in the decades ahead. By the turn of the century the world may be producing white meat at a rate never imagined—possibly 50 to 100 billion birds annually. This rate would mean 10 to 20 birds per person annually, a level of production which was attained in North America only a few years ago. The technology is available, space is at hand, and the feeds can be produced in quantity.

Future Cattle Production

Cattle are increasing throughout the world, although the number of milch cows is declining; fewer cows are needed for milk production because of greater yield per animal. The cattle population in 1962 was 992 million and growing at a rate of 5 to 10 percent a year; hence it should double within the next two or three decades. This can be beneficial, but it can also prove to be disastrous where land is overused. In the Americas, the cattle-carrying capacity can be doubled and possibly tripled with improved

Teaching Public Health to Veterinarians

The teaching of public health has grown rapidly in schools of veterinary medicine in the Americas. In 1963, 35 schools had established chairs of public health, and in 5 others teaching of public health was integrated with related subjects in the curriculum. In 1959 only 25 percent of the 50 schools in the hemisphere taught public health in some form, and few had chairs of public health.

This information was elicited from replies to questionnaires sent by the Pan American Sanitary Bureau to the schools in preparation for the August 1963 PASB–WHO Seminar on the Teaching of Preventive Medicine and Public Health in the Schools of Veterinary Medicine of the Americas. Replies were received from 43.

Schools in the United States and Canada devote an average of 108 hours per year to the teaching of public health, those in Latin America averaged 130 hours annually. Twenty-five schools give a year's course in the subject, nine give a semester course, and four U.S. schools offer quarterly courses. Two U.S. schools and four in Latin America do not have specific courses in public health but include it in teaching of related subjects.

In the Latin American schools, 9 full-time professors head departments of public health, and 11 professors of public health have postgraduate degrees in the subject. Among the U.S. schools, 11 full-time professors head departments of public health, and 12 professors of public health have advanced degrees in the subject.

Enrolled in all schools in the Americas in 1963 were 10,404 students; 3,632 in U.S. schools, 384 in Canadian schools, and the rest in Latin American schools.

land management and feeding practices. The possibilities of increasing the numbers of cattle in Europe and Russia are excellent, although these areas must first solve problems of feed grain.

Africa is a paradox. It possesses vast grazing land areas but at present the technology of animal science and veterinary medicine is hardly known except in South Africa and a few other locales. Asia has an enormous cattle population—India alone has more than 200 million head—but only 25 to 35 percent are economically profitable animals; most are strays subsisting on whatever they find in their daily wanderings. To convert this animal population into a positive factor in Indian economy involves not only the usual technical issues but political and religious mores. China has a vast area that could be used for cattle production; unfortunately, this is not compatible with Chinese social structure or mores. To summarize, the cattle population will continue to grow along with the human population and may even exceed that of man. Milk production will probably continue to increase at a faster pace and, therefore, there is no reason why the milk requirements of the human race cannot be fulfilled as well as the desire for good nutritious beef. A world cattle population of 2 billion animals or more is not improbable by A.D. 2000. But, the control of disease will be paramount to both human and animal health and welfare.

Sheep and Goats

Sheep are second only to cattle in the world livestock population. The 967 million head of sheep constitute 33 percent of the world's domestic animal population. Numbers of sheep have increased throughout the world except in North America, where competition with beef cattle has resulted in a sizable decrease in the past two decades. Mutton is preferred by many people of Africa and Asia, and growth of the sheep population in these areas is logical. Expansion is underway in some countries and should prevail throughout the world, except in North America and in areas where brucellosis is a major sheep disease. A sheep population of 2 billion by the end of the century would not be an impossible goal, especially if the number of goats are reduced and some are replaced by sheep.

The world goat population is about 340 million head, or 12 percent of the total animal population. These are raised mainly on the marginal lands of Asia and Africa, although the numbers in Latin America and southern Europe are sizable. It is doubtful that they will be allowed to increase in view of their destructiveness to vegetation. Many land management specialists believe that they are un-

desirable because they speed up soil erosion, although they are possibly the only animals that can survive in some areas. In summary, one may say that goats will not add to future food supplies and may be replaced in some areas by sheep and cattle.

Potential Swine Production

The production of swine and pork products has a high priority in most of the world. The Food and Agriculture Organization lists the world's swine population at 485 million, although the annual production may be as high as 600 million. If swine diseases can be controlled and eventually eradicated, hog populations could be doubled and tripled in the decades ahead. Eradication of hog cholera, confinement of African swine fever, elimination of genetic problems and chronic diseases, control of bacterial and parasitic diseases—all these are essential if pork production is to keep pace with the growing demand.

Pork, one of the most nutritious foods, is in demand throughout the world. Europe already produces large numbers of swine in relation to its human population, but this ratio cannot be expected to continue in view of the human population growth. The U.S.S.R. hopes to double and triple swine population, but production is limited by disease problems and feed supplies. In China, formerly the world's largest pork producer, production has declined because of agriculture management, feed deficiencies, and disease. Africa cannot be considered as a future swine-producing area until African swine fever and other diseases are eliminated or brought under control. At present, only in the Americas can swine populations be increased to keep pace with the human population. The Americas now produce about 35 percent of the world's pork supplies; in the future they may have to increase this to 50 percent by doubling or tripling their production.

To supply the world demand for pork and animal fat, the annual accumulative swine population should approach that of man. In the United States today these ratios are approximately 110 million pigs to 195 million persons; in the world 600 million pigs to 3 billion people. With an anticipated human population of 6 billion by A.D. 2000, the swine population should expand to between 2 and 3 billion to provide somewhere near the food needed. Other animal populations such as buffaloes, camels, horses, mules, and donkeys will probably continue to decline as they are replaced by machines. Most of these animals have been salvaged for food in the past, either for man or animals, but none except buffaloes were important as a source of human protein.

I have not discussed public health problems such as the control of specific animal diseases that affect man's health nor the shortage of trained veterinarians but will refer to the report, "A Century's Progress in Public Health," by the Surgeon General, Dr. Luther L. Terry, which reviews the current and future of veterinary public health in the Public Health Service (*4*). The challenge in this area is just as great as in animal production, and its effect upon man is probably even greater. I have not touched the recreational aspects of animals and their relation to man but, obviously, as man's welfare improves, his interest in pets and their welfare also increases.

Finally, we must ask where will we train the veterinarians needed for the tasks ahead? Who will finance the schools and research needed? Where will we find the candidates for the intense training needed? These are questions every government must face and answer in the decades ahead. Naturally, leadership and guidance should come from the veterinary profession. To provide them, veterinarians must raise their sights and look to the problems of our expanding population and their effects on our democratic way of life.

REFERENCES

(*1*) Smithcor, J. F.: Evolution of the veterinary art. Veterinary Medicine Publishing Co., Kansas City, Mo., 1957, p. 235.

(*2*) Billings, F. S.: The relation of animal diseases to the public health. Appleton Co., New York, 1884.

(*3*) Steele, J. H.: Animal disease and human health. Basic Study No. 3. Freedom from Hunger Campaign, Food and Agriculture Organization, Rome, 1962.

(*4*) Terry, L. L.: A century's progress in public health. J Amer Vet Med Assoc 142: 1287–1291, June 1, 1963.