

years. I think we can. Per capita consumption on a milk equivalent basis was 542 pounds in 1974. This level has dropped over the years, primarily because of decreases in butterfat consumption. But the demand situation for many dairy products is strong - low fat milk, hard cheese, and ice cream - ice milk in particular. Even butter consumption increased in 1974 (to 4.2 pounds per capita) as margarine prices moved up. The demand side of the market will generate prices related to the supply estimates discussed earlier.

Let me summarize by noting the following four points.

1. U.S. milk production will reflect some downward

adjustment over the next ten years.

2. By 1985, the dairy industry will no longer have a Grade A side and a Grade B side but will be almost completely converted to Grade A.
3. Regional shifts in milk production will continue to occur. We will see more milk produced where population growth is dynamic, and we will see less milk produced where the mix of agricultural resources favors alternative enterprises.
4. Decreasing numbers of dairy farms and increasing herd size will continue to describe the dairy sector. But if our average herd size today is 40 cows, we obviously have a long way to go before we lose the family farm identification in milk production.

Veterinary Medicine's Role in World Health and Food Production

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Introduction

With your permission I would like to reverse the order of this presentation and we will discuss food production first. I choose this change principally because it follows more realistically the preceding speakers and in view of the recently held World Food Conference in Rome, food production is a vital constituent of improvement of human health in the world. Also many of the veterinary medical aspects of public health involve the food producing animals.

The information presented here will be limited to the Americas because of the extensive programs of the PAHO in this field.

In the region of the Americas, animal diseases represent some of the major problems of human and animal health significance that greatly affect food production.

Protein of Animal Origin

Production. Since protein of animal origin has a higher nutritional value than plant substances and considering the maintenance and improvement of its production remains our responsibility, let us limit our discussion to that type of food. Although the four major elements (LWEF), land, water, energy, and fertilizers, are directly involved in animal production, it will be advantageous at this time to leave those giants to the giant killers: the politicians.

Considerable information regarding food consumption and nutritional needs of the people of Latin

America is available (1,2). It may be reasonably concluded that in most countries of Latin America and the Caribbean area mortality in children between the ages of one and four is from 10 to 33 times greater than in the developed countries. Reports indicate that nutritional deficiency has been associated with 70 per cent of all deaths from infectious diseases. Were this not the case, that is to say, if protein-calorie intake and maintenance were at adequate levels—a child would have a chance of surviving equal to that of his counterpart in a developed country.

Recent figures show that the average annual rate of population increase in Latin America is 2.9 percent—the highest in the world. Yet, as the population growth accelerates rapidly, overall food production is declining. In some countries one farmer can feed himself and 29 other people, while in Latin America the average farmer is able to feed only himself and 6.5 others (4). Reversal of this trend must be accomplished with technology and efficient agricultural production through scientific exploitation of the land.

Very little relief can be expected from the work that has been done with new wheat varieties as a solution to the food problem, since it applies mainly to temperate regions. The development of technology for the basic food crops of the tropics has been limited and slow.

The most important source of protein is animals, in the form of meat and milk from domestic animals, primarily cattle, swine, and poultry.

The responsibility that faces those of us involved in agriculture, particularly animal production, at the international and national levels is awesome, and it will call for the best use of our knowledge and technology in the decade to come. The role of the health sector will continue to be one of seeing that the nutritional needs of the people are met. Unrelenting action will be needed in order to strengthen and expand nutrition services and programs.

It can be expected that there will be greater demands for protein of animal origin with a higher nutritional value, processed in a manner acceptable to the consumer and available at a price he can afford.

As a collateral to these demands, it is possible that some individuals or groups in governments who may achieve an increase in production will want to increase the exportation of animals and animal by-products as a means of improving the national balance of payments. Such a policy will do little to solve human nutritional problems, and care must be taken to guard against it.

Increase in livestock numbers and in per animal production is not feasible under the present system. Livestock productivity in the Latin American countries is lower than what may be considered normal relative to the capability of the land. The causes include low fertility; genetic, nutritional and administrative problems; poor livestock practices; and inadequate control of diseases in general and of infectious and parasitic diseases in particular.

The calf birth rate in Latin America is between 45 and 55 percent, as compared with the figure of 80 percent that is considered technically achievable. Reproduction in cattle, sheep, and swine populations averages 75 to 80 percent under optimum conditions. This means an annual potential loss of 20 million calves, or the equivalent of about four million tons of meat and 15 million tons of milk. In terms of available additional human food, it represents a deficit of four million tons of meat for 60 million people a year (assuming an individual daily consumption of 200 g of meat).

Any increase in livestock production must be based on the optimum use of presently available science and technology in the fields of animal genetics, nutrition, production, husbandry techniques, and marketing management. Along with major advances in recent years that have given us the methods and procedures for effectively controlling infectious and parasitic diseases, there have been achievements in specialized animal husbandry techniques designed to increase animal production through better nutrition, marketing management, and breeding practices. The application of these technological advancements, however, requires human resources and the necessary materials. Very limited progress has been made in the

development of new human resources or the proper application of existing ones, and the manpower deficiency is one of the major deterrents to advances in animal production and animal health.

While significant increases have occurred over the past 30 years in the production of meat-producing animals and in the output per animal unit in many of the countries, the objectives to be achieved in the next two to three decades in order to meet the needs of the peoples will require even greater strides in terms of animal numbers and per animal production of meat, milk, and eggs. Table 1 shows the tremendous quantities that will be needed in the various categories.

The potential of Latin America to meet these requirements, with its abundance of resources for livestock production, is considerable. Although its agricultural land area is approximately the same as that of the United States, the proportion of grazing land is much greater—over 80 percent. Much of this land is nonarable and suitable only for grazing. It seems appropriate, therefore, that it should be utilized to its maximum efficiency.

Many food production scientists propose that this land be used to cultivate cereals and grains for human consumption instead of to raise livestock. Their theory implies a much more efficient use of forage, recognizing the current inefficient rate at which plant products are converted to meat, particularly in the case of beef. The problem, however, is that most of this land is not capable of producing the cereals and other products that can in fact be converted into protein for human consumption.

Another important factor to consider in this connection is that animal proteins have the merit of containing a balance of nine essential amino acids, while plant proteins lack at least one, and sometimes more, of the essential amino acids.

The recently held World Food Conference in Rome confirmed what most food scientists have elaborated—that the protein crisis is just as real as the energy crisis with more serious consequences. In the next decade we can expect the international shortage to worsen and producing countries will place greater emphasis on the economic and political implications, similar to the current petroleum nemesis.

We are fortunate in the Americas because we have a major proportion of the protein-producing farm animals of the world (Table 2). In Latin America, particularly, meeting the protein needs of their peoples is but one of the concerns of the governments. They have the obligation to maintain their role of providing 25 percent of the world trade in meat and meat products. Many of them greatly depend on the exportation of livestock products to maintain their balance of payments with other nations.

Constraints. Major constraints to the increased production of animal protein are varied and operative. A serious constraint in beef production is

the limitation of one calf per cow per year. One adult must be fed and maintained for one year for every animal that goes into the beef production process. Veterinary medicine should provide the leadership of technological advancements in reproduction to bring about more twinning or superfetation. Application of biophysical technology may achieve this goal if research is followed.

Another constraint is the limited production per acre yields of soy beans, which are a major source of high quality protein for livestock. Soy beans yield per acre has increased probably no more than 1% per year since 1950.

In Latin America, a major handicap limiting the availability of animal protein to the human population is the distribution process. More than 60% of the beef production, for example, takes place in the southern state of Brazil called Rio Grande do Sul, Uruguay, Paraguay and the Pampa of Argentina. Double production of current livestock supply is technically achievable in Argentina and possibly in Paraguay.

Human population densities are located at the huge urban centers like Buenos Aires, Sao Paulo, Rio de Janeiro, Lima, Bogota, Caracas. While Argentines consume an average of more than 220 pounds of beef per year with excesses left for export, seven out of 10 children in the Brazilian northeast die before they are five years old, principally from enteric diseases and malnutrition (3).

Progress in the marketing of agricultural products has not been sufficient to offset the losses transpired in this process which runs as high as 25 percent in perishable products (2). Such losses are due to inadequate or absence of electricity, transportation, refrigeration, storage and unsanitary marketing procedures. Proper veterinary medical leadership on a national basis supported by auxiliary field staff could reverse this wastage to wholesome consumer available products.

Disease Factors Affecting Production

Bovine rabies transmitted by blood-sucking bats (vampires) is endemic from the north of Mexico to the north of Argentina causing severe economic losses estimated at 500,000 head of cattle killed each year representing a financial loss of \$50 million.

Foot-and-Mouth disease is endemic in all the countries of South America, with the exception of Surinam, Guyana and French Guiana. This disease continues to be an obstacle to the socioeconomic development of South America. In the affected countries the morbidity rate in cattle was estimated at 30 to 50% of those at risk. It has been calculated that a feasible reduction of the disease in this area would mean an increase in annual production of approximately 350,000 tons of meat and 500,000 tons of milk. Such an augment in production would represent a greater availability of animal protein per capita per year equivalent to an annual food supply

of 4.9 million persons with a diet of 200 grams of meat per day and a supply of half a liter of milk per day for three million children for a year.

Bovine brucellosis is found in all the countries of the Americas where losses amount to approximately \$350 million annually. From a financial standpoint it is very significant because of limitations of the inter- and intra-regional movement of animals and animal products. Highest infection is found in dairy cattle with 25% in different areas of various countries. National programs are being prepared in nine countries, five of which have obtained loans from the IDB (Inter-American Development Bank) to initiate campaigns. Ten other countries have nationwide programs in operation. The animal health services lack the infrastructure in the planning, execution, and evaluation of control programs.

Bovine tuberculosis is endemic in most Latin American countries. In certain areas it is 20% or more, mainly in the milk sheds of large cities. Many of these countries have appropriate veterinary services staffed by a sufficient number of professional and technical personnel with training in bovine tuberculosis and a knowledge of control procedures. The programs these countries are carrying out are limited and regional in nature, but some of them have plans to launch nationwide control campaigns in the near future. They also provide for the sanitary control of the import and export of breeding stock, surveillance and control services at shows and fairs for breeding stock, and appropriate periodical reporting of cases in the control areas and in the large slaughterhouses and meat-packing plants.

An idea of the sizable losses caused by this zoonosis in this group of countries is provided by the statistics covering a period of six years in only one of the meat-exporting countries. In 15 meat-packing plants in which 21 million head of cattle (72.5% steers) were slaughtered, 43 million kilos of meat were confiscated for reasons of tuberculosis, and another 14.5 million kilos of meat were earmarked for the same reason for industrial processing or canning. In the same country in a single year, of more than four million head of cattle slaughtered, 4.7% showed tuberculosis lesions and 12 million kilos of meat were confiscated. There were fewer seizures in the other countries of the area, but they were nevertheless considerable.

In all the countries of Latin America the lack of specialized laboratories causes difficulties in the typing of mycobacteria and in the isolation of the bacillus from contaminated material. Because of the different antigenic sensitivity of tuberculin of different origins, the results of diagnostic tests vary considerably, which limits their effectiveness. Non-specific sensitization is a major problem in control programs, and the varying prevalence of the infection in the countries makes it difficult to establish criteria for interpreting the tuberculin diagnostic test.

Public Health

The role of public health veterinarians is clearly one of preventing disease and promoting human health by improving the environmental conditions that affect it: food production, control of zoonoses and animal diseases that reduce production, hygiene, and appropriate storage of foodstuffs. Their participation in decision-making, planning, and evaluation of health programs has been limited, owing to lack of integration in most of the countries of health teams based on a broader, multidisciplinary concept. Until the idea is fully accepted in practice and applied for the benefit of the community, it will be necessary to wait some time for the benefits of veterinary medicine to play the role the countries expect of it.

Urban Canine Rabies is the principal veterinary public health problem of the Americas with widespread prevalence in this area. Canine rabies is endemic in most countries of the affected area and causes such undesirable situations as the following:

- a. Persistence of cases of human rabies.
- b. Administration of antirabies treatment to more than 300,000 persons per year. Treatment is frequently administered indiscriminately with certain risks.
- c. Frequency of postvaccinal neuroparalytic complications.
- d. Constant danger of the occurrence of outbreaks in free areas.

The principal source of the disease (except in Canada and the United States) is the dog (21,300 cases notified in 1970) which also is the main vector.

The great number of people who have moved from rural areas to the cities in recent years has caused an explosion in the canine population of most of them. The concentration of dogs is in inverse relation to the socioeconomic status of the population and the educational level, which favors the perpetuation of rabies in the shanty towns of the large cities. At the same time, it creates problems through bites by stray dogs (1,220,000 persons exposed in 1970), which calls for the postexposure vaccination of a high proportion of the persons who have been bitten (360,000 persons in 1970).

Diagnostic services have improved but need more and better equipment. The protective capacity and safety of the present vaccine available vary, and production is insufficient to meet the demand for canine use in several countries in the infected area. There is a shortage of professional and technical staff with training in diagnosis and the production and control of vaccines.

With certain exceptions, the countries are undertaking only control programs, which are limited in scope and have not succeeded in reducing the problem. Dogs are vaccinated in only a few large cities, and coverage does not reach a useful level. The control of stray dogs is limited to sporadic activities

which do not ensure protection and safety. Because of the lack of continuity of the programs, it is not possible to break the chain of transmission. Countries in the free area maintain surveillance programs but need to improve them. The shortage of personnel trained in the planning, execution, and evaluation of prevention and control programs is evident.

Human Brucellosis affects all the countries of the Americas. In countries with a high prevalence of brucellosis in bovines and swine, many human cases occur, especially in agricultural workers and persons employed in the animal industry. In caprine brucellosis areas, the disease also attacks the population at large as a result of the consumption of milk and dairy products of goat origin. There are shortcomings in the laboratory diagnosis of human brucellosis due to the lack of standardization of the diagnostic antigens used in hospital centers and clinical laboratories. In some countries where mass vaccination of goats with Rev. 1 strain has been undertaken, it has been possible to reduce human infection by about 50%.

Hydatidosis causes serious problems for the economy and for public health in five countries that account for more than 56% of the human population and more than 70% of the cattle population of Latin America. In the remaining countries information is too unreliable and limited to make a judgement about its prevalence. The animal and human disease is epidemiologically associated with the breeding of sheep on pasture land and in the hill areas of the affected countries where the disease is endemic. The lack of dog control in rural areas and the feeding of dogs with offal infested with parasites on farms and cattle farms, and in clandestine or uninspected slaughterhouses, are the main factors in its spread.

In the affected areas, the prevalence of *Equinococcus granulosus* in dogs ranges from 30 to 60%. The same or higher rates for hydatid cysts are found in cattle, principally sheep, and also in man. Some areas of the heavily affected countries show rates as high as 84.3 per 100,000 population. Certain species of wildlife can play an important role in the epidemiology of the disease, and improved studies in this regard need to be undertaken. The losses in three countries where the disease is very prevalent are estimated at more than \$500,000 per year, and this is solely for the hospitalization of patients. To these losses must be added the value of seized offal; retarded animal development; waste in the production of meat, wool, and milk; and reduction of working days due to the prolonged convalescence for human patients.

Generally speaking, facilities for diagnosis of the disease in humans are still inadequate, and the reporting of cases in human beings and in animals is insufficient. Personnel with a knowledge of the epidemiology and diagnosis of this disease and its control are in short supply. The structure of rural slaughterhouse services and services for the supply of

meat for public consumption suffers from serious sanitary defects. Instead of being centers for the control of the disease they become foci for the spread of the disease due to lack of adequate inspection, the uncontrolled presence of dogs on slaughtering grounds and their surroundings, and the failure to destroy seized offal.

The low level of education in rural areas concerning the epidemiology of the disease, combined with uncontrolled household slaughterings, are a serious obstacle to the development of health programs.

Leptospirosis must be considered widespread in the hemisphere, since, wherever investigations have been carried out, the disease has been found in man and animals. However, the areas of infection and their distribution and extent are not well known because of lack of information. In countries with suitable laboratories, sporadic human cases or epidemic outbreaks are reported, and in some of them epizootics in cattle have occurred; nevertheless, in most countries diagnostic laboratory facilities are inadequate. Certain investigations have disclosed a widespread distribution of leptospira, not only in rodents, but also in other wild mammals which serve as carriers of the organism as well as in domestic animals. Generally speaking, there is a shortage of professional and auxiliary workers qualified to diagnose this disease. From the standpoint of control, very little is being done in the countries, although there is a growing awareness of the need to establish laboratory facilities for improving diagnosis.

Veterinary Medical Manpower

Despite the great importance of agriculture in the domestic production of Latin American and Caribbean countries, where more than 53% of the population is rural, only about 3% of the student population is enrolled in courses on the agricultural sciences and only a very small percentage of these are studying veterinary medicine.

In Latin America, university centers for the training of veterinarians are insufficiently developed.

Little encouragement is given to young people to take up these studies, and in most of the countries they are poorly remunerated. A few countries provide opportunities for the private practice of veterinary medicine, and most veterinarians are employed by the government or by commercial laboratories. In Latin America most veterinarians (more than 50%) work full time in government agencies. Their main activities are in animal health and production, public health, teaching, and administrative services; in the private sector they work in private clinics, provide technical advice to and administer livestock production undertakings and biological laboratories, teach, or work in one or another aspect of the animal industry.

In Latin America there are 65 schools of veterinary medicine and 22 in North America (United States of America and Canada). The total enrollment is about

21,000 in the whole of the hemisphere, of which almost one-third are in North America. In Latin America there is a high dropout rate for various reasons in the early years of the course, with the result that the percentage of graduates is less than 30% of the number of students registering each year as opposed to 85% in North America.

The 65 Latin American schools have about 2,000 faculty members, of which 60% are full time, whereas the 22 veterinary schools in North America have about 1,850 professors, of which almost 90% work full time.

The problem of veterinary medical education is one of orienting it in accordance with the needs of each country in the context of national animal and public health plans and of the general development of Latin America.

However, veterinary medical education is not yet giving sufficient attention to efforts to train the professional staff that Latin America will need in the next 20 years, bearing in mind the need to solve major public health problems, and for the improvement of public health services, in particular food hygiene and food handling, which cause losses of essential proteins which have a major effect on public health and the economy.

In most Latin American schools, little provision is made for postgraduate courses or continuing education.

Summary

Veterinary medicine faces a challenge from the hungry world as it has never known. In the present decade, health and welfare of the world's population will be the principal concern of the political and scientific community because those experiencing the suffering shall not permit continued quiescence.

Malnutrition is the world's most serious human health problem. It will not be resolved through increased food production in general, but will require a great augmentation in protein of animal origin. That population segment suffering the greatest losses from malnutrition cannot benefit from any increased production unless their parity of buying power reaches a level commensurate with that of their fellow countrymen of a higher economic level. The alternative would be to reduce everyone to the same level which we all know requires political power undesired by most countries.

Veterinary medicine should play a significant role in the resolution of the principal problems of improvement of livestock production and control or eradication of those diseases of human and animal health significance that confront the world.

The challenge is there. The only limitation to meeting the challenge is the willingness of the profession to accept the responsibility. An opportunity to demonstrate to the world the compassion, traditional and engrained in all veterinarians, will never be any better than now. The staff of Aesculapius sym-

bolizing hope instead of suffering and concern in place of apathy could be the figurative mark in all countries illustrating our impact on this moment in history.

Table 1
Projected Animal Requirements for the Year 2000
for a Population of 300 Million

Product	Probable annual per capita consumption	Numbers required	% increase or decrease over 1968
Beef	105 lb.	53.5 mill. to slaughter	+ 51
Veal	9 lb.	19 mill. to slaughter	+244
Lamb & mutton	6 lb.	36.5 mill. to slaughter	+301
Pork	75 lb.	131.5 mill. to slaughter	+ 52
Broiler meat	40 lb.	26 billion to slaughter	+ 78
Turkey meat	9 lb.	180 mill. to slaughter	+ 69
Eggs	360	394 mill. laying hens	+ 25
Milk	610 lb.	11 mill. milking cows	- 22

Source: United States Department of Agriculture. Yearbook of Agriculture, 1971. Washington, D.C. (92nd Congress, House Document No. 29).

Table 2
Livestock Populations in the Americas

Category	Estimated No.
Cattle	484,188,000
Swine	179,219,000
Sheep	150,234,000
Goats	41,597,000
Poultry	1,218,937,000*

*Excluding commercial broilers.

Source: B. E. Hill, The world market for beef and other meat, World Animal Review (Rome), 4:1-10, 1972.

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The Veterinarian's Position in the Economic Crisis

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With all due respect to our small animal colleagues, let me first say that my comments are restricted in scope to that field of our profession that I refer to as "Food Animal Medicine." In that this is the AABP meeting, I suppose that's assumed, but in a true economic crisis I'm sure they have problems too. True, but not ones I'm going to talk about.

I suppose I'm just aging, but somehow I get the feeling that if we haven't been we're becoming a "crisis" oriented society. This crisis, that crisis, money crisis, morals crisis, energy crisis. Today you want to hear about an economic crisis. Picking someone who's deeply involved in the cattle industry was sure a good prospect. My boss, Ken Monfort, recently referred to himself as a "cattle feeder with far less equity than a year ago." That was one hell of an understatement.

Everything considered though, it's not my nature to take the role of a pessimist. To the contrary. To me a "crisis" is really just an unexpected or undesirable challenge. We are in an economic bind, yes. We do have a severe energy problem that is unseparable. We have a balance of trade relationship which is causing an entirely new world economics picture. But

gentlemen, I think emerging through all this mass of confusion is the real challenge to us today. That is a "food crisis."

In the next quarter of a century I think we will be far more concerned about nutritional intake of humans than with miles per gallon. We'll hear more about starvation and malnutrition than about lifestyle and the quality of the environment. Turning down the thermostat or turning off the Christmas decorations won't supersede what's on the stove.

Food is the crisis—population is the problem.

I don't want to get into the pickle Earl Butz did, but as good bovine practitioners, we've got to be the world's experts on how to control that. Unfortunately, that technique doesn't seem to be socially acceptable.

I don't know how many of you saw the recent NBC news presentation on "who shall feed the world." It was good, but shocking. Big, softhearted, generous Americans just aren't equipped to look at starving and maimed children without feeling that we should make available anything we have to alleviate the problem. As I watched the show I got the feeling that I was supposed to be ashamed of the healthy, well-fed American wheat farmer. I sure had guilt pangs when