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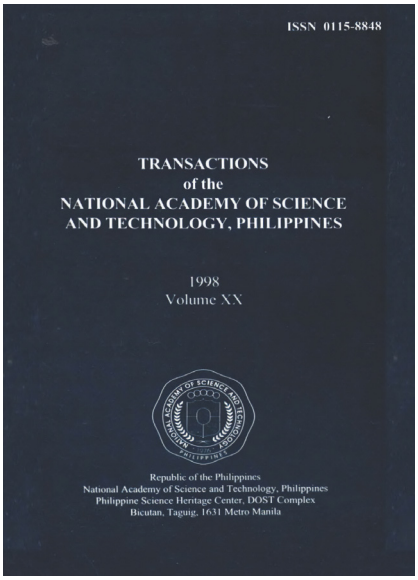

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Teodulo M. Topacio, Jr.

Member, National Academy of Science and Technology, Philippines

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THE ROLE OF VETERINARY MEDICINE IN PUBLIC HEALTH

TEODULO M. TOPACIO, JR.
Member, National Academy of Science and Technology, Philippines

ABSTRACT

The veterinarian has been more closely identified with agriculture, specifically food animal production. Under the present state of economic development of the Philippines, this identity is appropriate and relevant. The country is still unable to meet the protein needs of the people through the adequate supply of food of animal origin (terrestrial and aquatic). To achieve the self sufficiency in food of animal origin, their production and health, need to be maintained and promoted. This is the important role of the veterinarian.

However, as a consequence of the rapid developments in agriculture, a new field in veterinary medicine was born: veterinary public health. It is defined as: "a component of public health activities devoted to the application of professional veterinary skills, knowledge, and resources towards the protection and improvement of human health".

The areas of concern in this field are:

1. Food animal production (quantity and quality).
2. Ante-mortem and post-mortem inspection of terrestrial and aquatic animals for human consumption.
   - 2.1 Inspection of food animal products, manufacturing and processing plants.
   - 2.2 Prevention and control of harmful chemicals and drug residues in edible meat.
3. Supervision of food animal exports and imports including their by-products.
4. Zoonoses – diseases of animals naturally transmissible and common to humans.
5. Disaster veterinary medicine (disastrology).
6. Environmental protection and health.
7. Comparative medicine: biomedical research.
8. Ethology and animal welfare.

Key words: Production, health, inspection, residues, zoonoses, disastrology, comparative medicine, ethology, environment.

INTRODUCTION

Veterinary medicine as a profession has been more closely identified in the field of agriculture specifically in food animal production sometimes called animal agriculture. This identity is appropriate and relevant under the present state of economic development of the country. The demand for food of animal origin (terrestrial and aquatic) has not been adequately met. To achieve self sufficiency in food of animal origin two basic needs must be satisfied: (1) production in sufficient quantity and (2) production of approved quality which means healthy animals. In both instances the veterinarian is needed to achieve these two objectives. The ultimate goal is to promote and protect the health of the populace when food of animal origin is consumed.

The tremendous progress that has been made in agriculture both in plant and animal production has been strongly motivated by the increase of human population and the resulting urbanization. In the twin processes of human endeavor, rapid industrialization came about. Because of these triple pressures, efforts to increase food production (plant and animal origin) to satisfy the demand, new discoveries and technics were applied. Concomitant problems affecting human and animal health including plants have been encountered. Hence these discoveries have been both a boon and a bane. However these developments have given rise to new specialties in veterinary medicine which run parallel to the development of specialty fields in human medicine. One of these specialty fields is veterinary public health (VPH). So specialized in this field that no less than the experts (medical and veterinary) of the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), both important and related bodies of the United Nations (UN), met and deliberated and came out with a definition of veterinary public health as: "A component of public health activities devoted to the application of professional skills, knowledge, and resources to the protection and improvement of human health" (1975). It should be noted and emphasized that the veterinary public health specialist by this definition has a deep commitment and important role in public health.

The areas of concern in fulfilling these obligations are:

1. Food animal production (quantity and quality).
2. Ante-mortem and post-mortem inspection of terrestrial and aquatic animal for human consumption.
   - 2.1 Inspection of food animal products, manufacturing and processing plants and premises.
   - 2.2 Prevention and control of harmful chemicals and residues in edible meat.
3. Supervision of export and import of food animals including their by-products.
4. Zoonoses – diseases of animals transmissible and common to humans.
5. Disaster veterinary medicine (disastrology).

7. Comparative medicine: biomedical research.
8. Ethology and animal welfare.

HISTORY OF VETERINARY PUBLIC HEALTH IN THE PHILIPPINES

In the early 50's, the field of veterinary public health was unheared of among the local veterinarians. However by the mid '50s, the first batch of Filipino veterinarians sent for graduate studies in the U.S. had returned. The seed of this specialty in veterinary practice had been inplanted in their minds because at about this time the American College of Veterinary Public Health was established in 1950. The organization is a specialty collegial body of the American Veterinary Medical Association in which membership requirements are to pass special written and oral examinations on Veterinary Public Health (VPH).

Beginning in the '60s, food animal production (poultry, pig, and cattle) began to be commercialized. This was made possible by breakthrough researches in animal production and veterinary medicine. Through scientific breeding new breeds of food animals were produced that are fast growing, efficient feed converters, and prolific. Hand in hand with these veterinary breakthroughs, researchers were able to produce new drugs and vaccines that minimized losses due to diseases.

The introduction of antibiotics for therapeutic and non-therapeutic uses was an important milestone in food animal production. All of these discoveries and new technologies led to the commercialization of food animal production, sometimes called factory farming. Motivated by profit, quantity food animal production was emphasized. The quality of these food animals became secondary. The thrust in factory farming was one of the reasons for the creation of the National Meat Inspection Commission (NMIC) in 1972. The main objective of NMIC is to assure the consuming public a reliable supply of safe and wholesome meat from healthy animals. With the establishment of NMIC one of the important facets of veterinary public health was born.

With the advent of the '80s an all-out effort to increase agricultural production so that it could significantly contribute to the nation's economy was initiated by the government. The program was facilitated with the help of loans from foreign funding institutions like the World Bank, Asian Development Bank, FAO, and JICA. The programs were strongly influenced by agricultural economists. In the implementation of the agricultural programs, the agencies under the Department of Agriculture were reorganized which included the Bureau of Animal Industry (BAI), Bureau of Fisheries and Aquatic Resources (BFAR), NMIC, and other agencies. In the process of reorganization, the line functions of the aforementioned bureaus were devolved to the local government units (LGUs). The line functions of the BAI, which are geared towards the application of the professional skills of the veterinarians towards the development and growth of the food animal industry, were abolished. In place of the veterinarians who are specialists in ani-

mal health and production, technocrats in different fields of agriculture, who are called generalists, were appointed. They were either called agricultural officers or technicians. The identity of the veterinarian as a specialist in animal health was lost and lumped into the category of agricultural officers. The thrust of the generalist technicians was to promote quantity production of food animals.

With these developments wherein the role of the veterinarian in quality food animal production was not given emphasis, it was deemed necessary to find ways and means to make the public aware of this important role in public health. This is the exclusive job of a duly licensed veterinarian. Successful quantity production of food animal cannot be achieved without protecting their health. The duty of the veterinarian is to see to it that the food animals are in good health and that the public is assured of their wholesomeness and safety for human consumption. These series of events that led to the devolution of the line functions of the BAI veterinarians gave strong impetus to the creation of a specialty collegial body composed of veterinary specialists in public health.

ASSURANCE OF QUALITY FOOD ANIMAL PRODUCTION

The Creation of the Philippine Society of Veterinary Public Health

In 1987 a group of veterinary specialists in public health met with the following as their guiding principles:

Declaration of Principles

In the early stages of agriculture, the primary objective was the production of grains as the main source of food for humans. Animal production was only a secondary function to this endeavor.

It was for this reason that veterinary medicine has been identified with agriculture.

Recent discoveries in veterinary medical researches in the form of new drugs and vaccines made large scale production of livestock and poultry possible. As a result, food animal production is now commercialized and has become a primary industry by itself.

Increasing the production of food of animal origin (terrestrial and aquatic) is motivated by the need of humans to provide themselves with safe meat, milk products, and other important sources of animal protein for proper nutrition and maintenance of good health.

The use of drugs and vaccines which made commercialization of livestock and poultry production possible resulted in chemical residues that could seriously affect the health and survival of humans.

The widespread application of herbicides and pesticides to increase crop production pose dangerous health hazards that could seriously affect human health.

The close relation of people to animals and animals to people, both as a source

of food and pleasure, resulted in the discovery by veterinarians that there are now more than 176 diseases of animals common and transmissible to man.

Viewed in the light of developments in the field of agriculture, agro-medicine and human medicine, veterinary medicine should not be identified with agriculture alone but should also be considered indispensable to public health.

Veterinary medicine has made and is still in the forefront of making significant contributions to the never-ending fight of people against two deadly enemies: starvation and disease.

To emphasize the present role of veterinary medicine in agriculture, public health and environmental health, the PHILIPPINE SOCIETY OF VETERINARY PUBLIC HEALTH is hereby organized.

The Society was formally founded in 20 September 1998 when its Constitution and by-laws was registered with the Securities and Exchange Commission (SEC). The members were conferred the title: Diplomate in Veterinary Public Health (Dip. V.P.H.). A Specialty Board screens and approves the prospective candidates after taking written and oral examinations.

The purpose and objectives of the Society which are the reasons for its existence are as follows:

1. To participate actively in the local and international activities in the attainment of health for all.
2. To create an awareness among the people, government and private organizations, the present role of the veterinarians not only in the field of agriculture but also its importance in safeguarding the health of the rural and urban communities.
3. To establish veterinary public health as a specialty field in the practice of veterinary medicine and advancement of biomedical knowledge while maintaining the highest standards in education, research, and practice in this field.
4. To determine the competence of veterinarians in this specialty field.
5. To promote the welfare and interest of the members.
6. To establish formal relationship with other related national and international scientific societies.

At present there are only 41 diplomates in the Society with 2 Honorary Fellows. All of them are making full use of their specialty in their line of work and, more importantly, they are creating public awareness regarding the importance of this new veterinary specialty in protecting the people's health.

THE WORLD ASSOCIATION OF VETERINARY FOOD HYGIENISTS (WAVFH)

Prior to the introduction of Veterinary Public Health as a specialty field in veterinary medicine by the Joint Expert Committees of WHO and FAO in 1975,

an international organization of veterinarians was already established as a specialty group, called the "World Association of Veterinary Food Hygienists."

The FAO-WHO defines Food Hygiene as the discipline that comprises all measures necessary to ensure, safety, wholesomeness, and soundness of food at all stages from its growth, production or manufacture, until its final consumption.

According to Engel (1993), WAVFH is an association dedicated to providing scientific information for the exchange of ideas and information, support the development of better food hygienists to present the latest scientific information for the exchange of ideas and information to support the development of better food hygiene in all countries of the world, and to serve as a conduit for scientific information to world governments, international organizations, and national experts. WAVFH is composed of Veterinary Hygiene Associations from 26 different countries ranging from North America to the South Pacific. It has been functioning for over 35 years. The latest state of knowledge is disseminated among food hygienists by the WAVFH, by organizing symposia, workshops, and by actively participating in the World Veterinary Congress. The 11th International Symposium of the WAVFH was held in Bangkok last 24-29 October 1993 and was hosted by the Thai Veterinary Medical Association. One hundred eighty (180) scientific papers from several countries of the world were presented and there were 10 poster presentations. The 10th International Symposium of the WAVFH was held in Stockholm, Sweden on 2-7 July 1989. It was sponsored by the European Association for Animal Production, International Union of Food Science and Technology, and the WHO. The programme presentations involved product safety, hygiene, and quality to the satisfaction of the consuming public and international trade. The symposium was a holistic approach to food hygiene, i.e., food hygiene begins in the earliest stage of animal husbandry and continues until the final product is consumed. The papers were presented by Veterinary Food Hygienists, Veterinary Specialists, and Biological Scientists. These were of value to national and international workers, veterinarians in food control, and public health workers. More than 250 papers were presented including poster presentations. Sixty (60) countries sent 500 delegates. A panel discussion on the role of veterinary services and veterinary public health in consumer protection and environmental health was also held.

The global role of the WAVFH in the light of the present international agreements, WTO, GATT, GATS, resulting in trade liberalization and harmonization of food production standards, has become more relevant. The PSVPH will apply as a country member to the WAVFH.

CODEX ALIMENTARIUS COMMISSION AND FOOD SAFETY

Pakdee Pothisiri (1993), in his paper stated that Codex Alimentarius Commission is a subsidiary body of the FAO and WHO of the United Nations. It was formed to implement the joint FAO/WHO Food Standard Program. The member-

ship is open to all members and associate members of the FAO and WHO. By the end of 1991, more than 140 countries, including the Philippines, were members of Codex. The work of the Commission is directed towards two main considerations:

1. The protection of the consumers against health risks and frauds.
2. The need for the widest possible measure of international agreement and food standards in order to facilitate international trade. One objective of the Commission is to develop international food standards worldwide or, where appropriate, on a regional or group of countries, to publish these standards in a food code, and to record acceptance and implementation of these standards by the governments.

In all these activities of the national and international organizations, the veterinarian is deeply involved since foods of animal origin are always included in the discussions and deliberations of the Commission.

HEALTHY ANIMALS, SAFE FOODS, HEALTHY PEOPLE

This has been the theme adopted by the WAVFH in their 10th and 11th International Symposia held in Stockholm, Sweden in 1989 and in Bangkok, Thailand in 1993, respectively. The theme is symbolic of the role of veterinary food hygienists in producing healthy animals which are safe for human consumption. In so doing the protection and promotion of human health are thus assured.

According to an FAO study as cited by Blajan and Malassis (1988), "Agriculture Towards 2000", the demand for meat and dairy products and eggs will increase more rapidly than the demand for fruits, vegetables, and cereals. Indications are when the quantity of food availability per inhabitant increases, dietary and nutrition in structure changes with greater proportion being represented by calories of animal origin. The demand for meat is influenced by two factors: (1) the protein factor (better amino acids, hence higher nutritional value) and (2) the taste factor, meat being more palatable (Clarete, 1998). The worldwide trend is for the consumption of cereals, vegetables, leguminous plants to decline while meat consumption will increase significantly.

FOOD OF ANIMAL ORIGIN – HOW IT BEGAN

Since pre-historic times, animals have made significant contributions to the well being of people by providing them with food and its by-products. Theories of how humans learned to eat food of animal origin are mostly based on conjectures. In the beginning, the early humans must have gotten food from edible plants wild fruits, grains, vegetables etc. The early carnivores were the wolves, which travel and hunt in packs (Schwabe, 1984). They gang up on a herd of wild cattle, buffaloes, sheep, goats, etc. and attack the weakest of the herd usually the young, kill it and devour it. The early cave people must have observed this method of

hunting and in the beginning must have partook of the left overs of the wolf pack. Later when the cave people invented the club, spear, bow and arrow, they imitated the hunting technic of the wolves by travelling in groups and with their superior weaponry coupled with their intelligence, beat the carnivores in their own method of hunting. They now became the superior hunters and succeeded in getting more game. This time some members of the wolf pack decided to cast their lot with the cave people, eating whatever left overs were given to them. Thus this marked the beginning of the domestication of the wolf dog and the relationship has withstood the test of time. The loyalty of dogs, whose ancestors were wolves, is legendary. The domestication of other early food of animal origin must have started when the cave people captured wild cattle or buffaloes, kept them in their caves and slaughtered them when needed. The drinking of cow's milk must have started when the female cave dweller who just given birth, for one reason or another became dry and was unable to breast feed her infant. In a desperate move, she let it suck from the teats of a nursing mother wild cow. Domestication of the other wild animals could have followed the same pattern, e.g., sheep, goats, horses, fowl. In time, humans became more and more dependent on food animals so much so that a culture cult developed on each of them and some even came to be revered as being sacred. The cattle culture started with the Egyptians and later it spread to India. The sheep culture was associated with the ancient Jews and later the early Christians. The horse became a symbol of power among the pre-historic people when they were able to tame it for riding purposes, then the Arabs, Romans, and Greeks, used it as a draft animal and as a military weapon (Schwabe, 1984). As the early cave people became less and less nomadic, their superior intelligence and knowledge must have motivated them to delve in pastoral agriculture whereby edible plants for human consumption and forage plants for domesticated animals were cultivated. Livestock became secondary suppliers of food and at the same evolved into a more useful function as draft animals.

PROMOTING HUMAN HEALTH THROUGH FOOD ANIMAL PRODUCTION

Obviously the promotion of human health can be achieved by the sufficient supply of food of animal origin, the meat of which is safe to eat. Do we have a sufficient supply of quality meat? The responsibility of the veterinary profession is to assure the supply not only of quality meat but also of sufficient quantity that should meet the protein needs of the public. Although as previously mentioned, spectacular progress has been made in quantity production of food animals, the demand has not been satisfied, particularly in developing countries of Africa, Asia, and the Indian Continent. Due to uncontrolled population growth and adverse climatic conditions the supply of food both of plant and animal origin has been woefully deficient. In several countries malnutrition and even famine have occurred. No picture is more pitiful than to see malnourished or famine stricken

children, emaciated, all skin and bones suffering from a condition called "marasmus", a form of nutritional cachexia, an energy deficiency condition due to loss of subcutaneous fat and muscular wastage or a picture of a plump but sickly looking child with a bloated stomach, due to edema (excess fluid) of the body caused by protein deficiency, a condition called "kwashiorkor" a word of African origin (Ghana). Literally it means, "disease of a child displaced from its mother's breast by birth of a younger sibling".

According to Schwabe (1984), malnutrition is the world's leading cause of human illness. It is in addressing this problem of hunger and dietary imbalance that the veterinary profession can be deeply involved. Veterinary medicine is both an agricultural and health science. The veterinarian is therefore in a unique position, being able to work on the medical aspects of malnutrition and animal food production. It can be claimed that the veterinarian has a direct role in preventing malnutrition since these two areas of agriculture and medicine are united in a common effort of promoting and sustaining human health. The two areas are now lumped in the field called "agro-medicine". Schwabe (1984) claims that next to the physician, the veterinarian has made more research contributions to human health than other members of the health-related professions. Martinez-Baez (a medical doctor) and cited by Schwabe made the statement: "If the blame for the widespread extent of 'kwashiorkor' lies on the poverty of the people it affects, its absence in other peoples is due in large measure to veterinary medicine." The good physician emphasized the role of the veterinarian in the production of food of animal origin which have a higher protein nutritional value than food of plant origin.

In the Philippines, the veterinarians have been active in this crucial role in preventing malnutrition and hunger by promoting the quantity and quality production of food animals. To illustrate the significant role of the BAI veterinarians in food animal production, Table 1 shows the livestock and poultry population of the country during the important periods which highlight the results of their efforts.

The agency responsible for the development and promotion of food animal production is the Bureau of Animal Industry (BAI). It was established by Republic Act No. 3639 in 1930. Among its other mandated functions is "to promote the livestock industry of the country".

Under the BAI leadership and supervision, its veterinarians are responsible for the promotion and production of the livestock and poultry population of the country. At the same time they see to it that the health of the animals is maintained and protected. Table 1 illustrates the successful attainment of the objectives of the BAI. It should be noted however, that World War II devastated the country and the effect on livestock and poultry population was catastrophic. All the food animal species were affected. From a total of livestock and poultry population of 37,821,630 in 1940 just before WWII, the population decreased to only 11,112,541 which survived the war, i.e., 70% of the total livestock and poultry were decimated. With the end of WWII, a massive rehabilitation program of the livestock and poultry was undertaken by the BAI. The total figures of the livestock and poultry population in

Table 1: Livestock and poultry population of the Philippines (1930-1997) (BAI Report, 1995).

Animal Species	1930*	1940*	1946*	1953	1997**
Carabao	2,031,000	3,015,400	1,388,970	2,510,110	2,988,276
Cattle	1,218,000	1,896,000	433,530	762,290	2,257,570
Hogs	2,775,000	4,446,790	1,460,780	4,793,620	9,152,180
Goats	456,000	420,000	182,391	391,030	3,009,219
Horse	344,000	343,500	151,260	219,330	306,686
Chicken	17,759,000	27,000,000	7,166,000	37,312,150	140,616,946
Ducks	411,000	700,000	329,610	1,243,900	8,920,205
Total	24,797,000	37,821,630	11,112,541	47,313,230	167,251,082

Source: * Bureau of Animal Industry (BAI)
**Bureau of Statistics

1953 and finally in 1997, speak for the highly successful program of the BAI in promoting food animal production. Much of the credit should go to the veterinarians who supervised the rehabilitation and promotion program.

With these production figures on the livestock and production, the question is: "Have we satisfied the demand for food animals bearing in mind that our population is increasing by 2.5 to 3% annually?" In the 1995 accomplishment report of the NMIC, the number of heads of food animals slaughtered and the equivalent weight (kg) of meat produced was reported (Table 2).

It will be noted that the number of heads of food animal slaughtered in 1995 was 146,971,416 heads whereas the 1997 total livestock and poultry population was 166,944,416 (Table 1). Although the two figures were not within the same year, it can be surmised that eventually with the increased demand for food animals brought about by the rapid urbanization and population increase, there will come a time when the supply cannot be met. As it is, the data of the NMIC regarding the number slaughtered came from accredited abattoirs only whenever they had access to data. The figures from the non-accredited abattoirs were not available for obvious reasons. From these data there should be efforts to practically double the production to fully satisfy the demand and needs of the populace in the coming years.

ANTE-MORTEM AND POST-MORTEM INSPECTION OF FOOD ANIMALS AND THEIR BY-PRODUCTS

The data presented so far have been directed towards the quantity production of the food animals. How about the supervision on the health status of the livestock and poultry before and the condition of their by-products after slaughter? This is where ante-mortem and post-mortem inspection come in. These are

Table 2: Number of heads of food animal slaughtered and equivalent weight of meat produced for CY 1995 (NMIC Report, 1995).

Animal/Meat	No. of Heads	Weight of Meat (kg)	Percentage
Cattle/Beed	541,472	72,987,663	12.49
Carabato/Carabeef	196,654	28,055,977	4.80
Horse/Horse meat	2,710	269,777	0.05
Hog/Pork	6,144,642	326,444,397	55.84
Goat/Chevon	182,249	1,878,087	0.32
Poultry	139,903,608	154,952,063	26.51
TOTAL	146,971,608	584,587,964	100

important quality control procedures that should be done before the meat is sold to the consuming public. Unfit and diseased animals and their carcasses are condemned. Again in the 1995 report of the NMIC the following causes of condemnation were encountered and Table 3 shows the weight of meat condemnations:

CATTLE AND CARABAOS

Ante-Mortem Inspection

1. Dead on arrival (DOA)
2. Hemorrhagic septicemia

Post-Mortem Inspection

Visceral organs

1. TB
2. Facioliasis
3. Cirrhosis
4. Nephritis
5. Enteritis
6. Parasitism
7. Muscular hematoma, abscess, wounds

HOGS

Ante-Mortem Inspection

1. DOA
2. FMD (Foot and Mouth Disease)
3. Hog cholera
4. Swine erysipelas
5. Swine plague
6. Tetanus

Table 3: Weight of meat condemnations (1995) (NMIC Report, 1995).

Animal	No. of Heads Condemned	Carcass Weight (kg)	Primal Parts (kg)
Cattle	26,600	4,303,614.20	49,125
Carabao	22,500	4,047,525.37	17,054
Horse	0	0	1,492
Hog	105,888	5,816,427.84	233,779
Goat	253	3,200.45	20
Chicken	1,634,611	2,034,121.09	582,875
TOTAL	1,789,852	16,204,888.95	884,345

HOGS (Continuation)

Post-Mortem Inspection

A. Carcass
   1. Sexual order
   2. Icterus
   3. Cysticercosis

B. Visceral organs

Lungs
1. TB
2. Pneumonia
3. Emphysema
4. Parasitism

Liver
1. Cirrhosis
2. Icterus
3. Abscesses
4. Ascariasis ("milk spots")
5. Hemorrhages

Intestine
1. Enteritis
2. Parasitic nodules
3. Kidney-nephritis
4. Heart-pericarditis
5. Muscle trimmings:
   Hematoma
   Abscesses

GOAT

Post Mortem Inspection

1. Lungs-pneumonia
2. Liver-cirrhosis

POULTRY

Ante-Mortem Inspection

1. DOA
2. Emaciation

Post-Mortem Inspection

A. Carcass

1. Incomplete bleeding
2. Machine damage
3. Over scalding
4. Hematoma

B. Visceral organs

1. Liver-avian leukosis
2. Feet-bumble foot
3. Muscle trimmings:
   - Hematoma
   - Abnormal color
   - Bruises

The City of Manila being an autonomous Local Government Unit (LGU) has its own Veterinary Inspection Board (VIB), which is the agency responsible for the ante-mortem and post-mortem inspection of the food animals being sold in the local markets. In 1997, Socorro reported a total of 4,995,953 heads of food animals: hogs, cattle, carabaos, horses, goats, chickens, pigeons, and ducks, were slaughtered and inspected. This is equivalent to 25,676,864 kg of meat. A total of 5,900 kg of carcasses and entrails were condemned with the following causes: DOA, cirrhosis, and pneumonia.

INSPECTION OF FOOD ANIMAL ABATTOIRS, FOOD ANIMAL PRODUCTS MANUFACTURING AND PROCESSING PLANTS

The NMIC besides supervising ante- and post-mortem inspection, approves the abattoirs for accreditation and the food animal products manufacturing establishments and processing plants including their premises for hygienic maintenance. This agency offers technical assistance and services to meat plants regarding preparation, design, and meat plant upgrading and development. Based on physical struc-

tures, facilities, and slaughter operations, abattoirs are classified as follows:

AAA – Adequate facilities. Meat can be sold anywhere locally and internationally.
AA – Facilities complete. Sale of meat only locally.
A – Minimum requirements. Meat sold only locally where abattoir is located.

Out of the 1,130 meat plants in the country only 484 abattoir meat plants are accredited. Accreditation is renewed yearly. The following is a breakdown of the figure.

Abattoirs/slaughter house	–	268
Poultry dressing plants	–	101
Meat processing plants	–	115
TOTAL	–	484

Table 4 shows the list of accredited establishments for CY 1995 (NMIC Accomplishment Report 1995).

HYGIENIC MAINTENANCE OF THE ABATTOIRS AND MEAT PROCESSING PLANTS

The concern of the veterinarians does not begin and end with the food animals intended for human consumption. The areas where they are slaughtered and processed are also their responsibilities. They are further trained for these procedures as part of their continuing professional education (CPE). The NMIC conducted such training courses which included several topics on: ante-mortem and post-mortem inspection, proper plant design, meat plant hygiene, waste management, etc. During one such training Topacio (1991), presented a paper on the microbiology of plants and abattoirs, discussing hygienic standards of the plants. Process hygiene, environmental hygiene, personal hygiene, and correct procedures of cleaning and disinfecting were also taken up. Sanitizing agents as well as disinfectants were recommended.

HAZARD ANALYSIS CRITICAL CONTROL POINTS (HACCP)

Bard Parker (1989), defined HACCP as rational, objective, and systematic procedures to identify the precise requirements to control microbiological hazards and risks inherent in raw materials, introduced during processing or at any period in the food chain from farm gate to the consumers plate. It is a science-based management system that identifies specific hazards and measures for their control, to ensure food safety during processing. These are systems that focus on prevention rather than control. A hazard is defined as any biological, chemical, or physi-

Table 4: Profile of accredited meat establishments for the CY 1995 (NMIC Report 1995).

	Abbatoir						Poultry Dressing Plant						Meat Processing Plant						
	New			Old			New			Old			New			Old			
REG	AAA	AA	A	AAA	AA	A	AAA	AA	A	AAA	AA	A	AAA	AA	A	AAA	AA	A	TOTAL
I		4	4		19	11		2	2		2			3				8	55
II						12		1			3								16
III			1	1	7					3			1	4	2	1	5	1	26
IV		1	8	2	9	7		2		2	2		1	6		7	2		49
V			2		3	10		1		1	1						2	1	20
VI			5			10		2		1	6		2				2	1	29
VII				3	8	2	1	1		2	5	2	1			3	4		32
VIII			11		4	55		2			1								73
IX				1	1	1	1				2								06
X				1	2	2		3			3						3		14
XI		2	2	3	2	1	1	1		2	1		1	1	1	4		1	23
XII					2	1													03
NCR		1		2	32	11		1	27	2	1	12	3	12		8	22	1	135
CAR					1	1												1	03
TOTAL	0	8	33	13	90	124	3	16	298	12	27	14	9	26	3	23	40	14	484

cal agent or factor with the potential to cause adverse ill effects, e.g. infectious agents or pathogens, toxic plants and animals, decomposing products, chemical agents, pesticides, drug residues, heavy metals (mercury, lead, copper), metal fragments, etc.

IMPORTANCE AND SIGNIFICANCE OF HACCP SYSTEM

With the implementation of the provisions of the World Trade Organization (WTO) in which the Philippines is a signatory and with the General Agreement on Tariff and Trade (GATT), there is a Subsidiary Agreement on the Sanitary and Phytosanitary Measures which all products for export and import must follow. It was also agreed to adopt the Codex Alimentarius as the principal food safety standards organization. In turn, the Codex maintains that HACCP should be applied in order to ensure food safety. GATT also requires that the signatories must use international standards, among which are the standards of HACCP. The importance of this system was illustrated when exports of seafoods to the US coming from the Philippines were rejected because of "filth". If HACCP had been in place in the processing of these export items, the findings could have been prevented because following the HACCP system would have resulted in safe and clean products (NAFC, June 1997).

HACCP is recommended to be applied on the food chain starting at the source or the producer or on the farm up to the consumer at their dining table. It involves the raw materials (the food animal), processing plants (abattoirs and meat/fish) equipment, personnel training, hygienic practices, product identification and labeling. Previously, quality control depended to a large extent on the implementation GMP or Good Manufacturing Practices and by inspection of the end products. However it was found out that these procedures are costly and the control on food safety is not reliable. The application and adoption of HACCP has resulted in quality control that can be recognized internationally by the importing countries thereby facilitating international trade.

ESTABLISHMENT OF A HACCP SYSTEM

The following chart illustrates the logical sequence for setting up and application of a HACCP system (NAFC Agri-Sectoral Newsletter, 1997. Figure 1).

If the HACCP system is properly established and closely applied, potential hazards to the product can be traced. The hazards can be determined as to where and when it would occur. The necessary steps can be taken to prevent them or correct them within a short time.

Herends and Franco (1991), have advocated the establishment of HACCP in the ante-mortem and post-mortem inspection of food animals.

Garcia et al. (1994) reported that recent serious outbreaks of food-borne diseases, have led to the development of HACCP, which has become an integral part

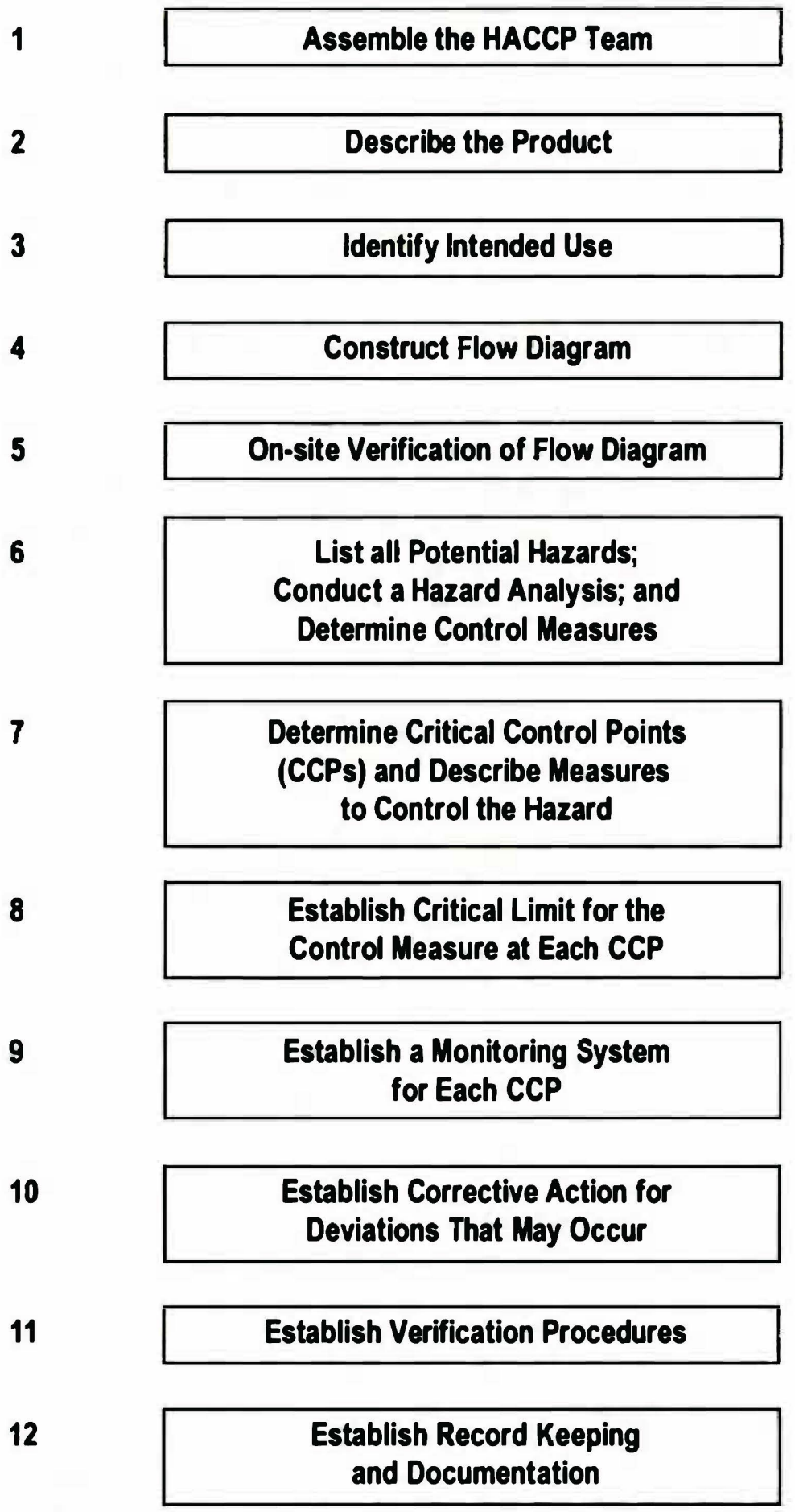

Figure 1: Logical sequence for application of HACCP (NAFC Agri-Sectoral Newsletter 1997).

of food processing systems of which microbiological hazard surveillance of critical control points is an integral part. The monitoring of these control points from the pre-harvest materials (food animals) necessitates the use of more rapid and portable tests to give on site results. Rapid detection of pathogens, e.g., *Salmonella, Campylobacter, Brucella, Yersinia,* can now be detected rapidly by means of ELISA, PCR (Polymerase Chain Reaction), and bioluminescence and chemiluminescence tests.

THE PROBLEM OF CHEMICAL AND DRUG RESIDUES

The use of drugs to control and treat animal diseases and to promote faster and more efficient growth of livestock and poultry is a common practice all over the world (34th Report of the Joint FAO/Who Expert Committee on Feed Additives, 1989). In the US, 80% of livestock and poultry receive some animal drugs during their life time. This Committee was to provide guidance to WHO and FAO Member States and to the Codex Alimentarius, on public health issues pertaining to residues of veterinary drugs in food of animal origin. The Committee also evaluated the safety and recommended Maximum Residue Level (MRL) of some anthelminthics an anti-protozoal drugs, sulfas, growth promoters, and trypanocides.

As early as 1986, the US has been monitoring drug and chemical residues in food animals. Three Federal agencies were involved, namely the US Department of Health and Human Services (Food and Drug Administration), the Department of Agriculture (Food Safety and Inspection Services, FSIS), and the Environmental Protection Agency. The FDA requires manufacturers to show that each drug is safe and effective. They must submit a reliable assay method for detecting residues which is reviewed by the FDA and the Department of Agriculture before it is approved.

Some of the tests by the FSIS-DA, were:

1. Calf Antibiotic and Sulfa Test (CAST) (1984)
   A rapid method detecting these antibacterials during post-mortem inspection.
2. Live Animal Swab Test (LAST) (1983)
   A rapid method of detecting antibiotic residues during ante-mortem inspection using urine.
3. Swab Test on Premises (STOP) (1979)
   A test for antibiotic residues performed on the inspection floor. The results can be obtained within 24 hours.

In 1987, a National Residue Program was instituted by the Department of Agriculture, USA. It identified the Food Safety and Inspection Service (FSIS) as the agency responsible for planning and implementing the Program, including detection and monitoring of residues, pesticides, and other chemicals in meat and poultry products for human consumption.

Van Dresser and Wilkie (1989), made a study on drug residues in food animals. The American Veterinary Medical Association realized the increasing problem of drug residues and funded this all important study. Their findings were: (1) Streptomycin, penicillin, oxytetracycline, and neomycin were the most frequently encountered residues, while sulfamethazine was oftentimes detected among the sulfas. (2) Among the food animals, specifically in livestock, residues were encountered in cows, veal calves, and pigs. (3) Failure to observe the withdrawal period of the drugs was another reason for the presence of residues. (4) Producers were responsible in 80% of these cases. (5) Long-acting penicillins and oxytetracyclines were used. (6) Easy availability of antibiotics at feed stores. and (7) The veterinarians themselves were a problem.

Beran (1987) gave his opinion on the use of drugs in food animals both for therapeutic and non-therapeutic use. He believed that its use in animal production is advantageous provided good management in the farm must be practiced and never to cover up or substitute for poor husbandry. In the UK, antibiotic use in animals was allowed only upon prescription of the veterinarian; however, occurrence of animal diseases increased.

Scott (1987), believed that the veterinary profession is the logical group to assume an active role in assuring that the supply of meat, milk, and eggs is free of residues. This is their responsibility. However he cautioned the veterinarian to practice responsible medicine, particularly the extra label use of drugs (ELUD). Knowledge of the withdrawal period is a must for the practicing veterinarian.

Topacio (1972), in an invitational paper presented to the Philippine Society of Animal Science Annual Scientific Convention, discussed the advantages and disadvantages of incorporating a non-therapeutic dosage of antibiotics in animal feeds. The objective is to increase the weight gains of food animals especially pigs and chickens. Pros and cons regarding this practice were presented by authoritative scientists and veterinarians. The main problem cited was the development of bacterial residents among pathogens that theoretically can infect man. In spite of this risk, the use of antibiotics is still being practiced because of its role in promoting growth and weight gain.

In another paper, Topacio (1992) reported the use of antibiotics and sulfas, medical and non-medical, contributed significantly to the growth of commercial food animal production. Specifically, the non-medical use of the antibiotics gave 5 -15% more weight gains among pigs and chickens. Indiscriminate use resulted in unfavorable reports particularly development of drug resistance among potential pathogens. However, banning their use in the Philippines can result in significant losses to the producers.

Landicho (1990) reported that the use of antibiotics and other related chemicals resulted in the production of "medicated" meat, dairy and poultry products, that may be hazardous to human health. Drugs and chemical residues are eventually deposited in the environment and can endanger the health of the general public. Despite the risks of antibiotics as feed additive, their use should not be totally banned.

It has increased production and augmented the income of the farmers. Lack of basic knowledge in the proper use of antibiotics should not be considered as an excuse for not practicing proper nutrition, housing and good management.

Kintanar and Parce (1994), in a paper presented during the International Conference on Food Preservation and Security, discussed the programs for sanitation and disease control that address the microbiological contamination of food from farm sources, and emphasized the need to improve sanitation and food handling practices in the home to prevent occurrence of harmful pathogens. Animal husbandry practices should be improved which should include sanitation, vaccination, or breeding resistant varieties of animals. Effective measures must be instituted to control infections in food animals and complement sanitation efforts in the slaughtering and processing stage. All of these measures are the responsibilities of the veterinarians and rightfully belongs to the specialty field of veterinary public health.

Grossklaus (1993) presented with clarity the origin of different residues in food of animal origin during the 11th International Symposium of the World Association of Veterinary Food Hygienists (Figure 2).

When Republic Act No. 6675 (1988), more popularly known as the Generics Law, was enacted, which requires the production and use of drugs identified by their generic names, the veterinary practitioners were included as part of the allied medical professions. Although the methodology of teaching veterinary medicine is similar to that of human medicine, the veterinarian treats terrestrial and aquatic animals while the medical doctor treats only human beings. However, both practitioners use drugs in treating their respective patients. Hence it has been rightly said that a drug is a drug whether it is for human or animal use.

In both professions, the issue of rational use of drugs is very important and significant. The objective of both practitioners is to treat their patients to a successful conclusion. To do this drugs must be used rationally. However, in veterinary practice, the issue includes the risk and danger of producing "medicated" meat in food animals that will be eaten by the consuming public and may result in seriously affecting human health.

The Generics Law created the National Drug Committee (NDC) of the Department of Health which monitors and implements the provisions of the law in medical practice. However, the rules and regulations drafted by the NDC cannot be applied in the practice of veterinary medicine for reasons previously stated. Hence the Department of Health issued Department Order No. 123 (1989) which created the Subcommittee on Veterinary Drugs (SCVD). It was tasked to prepare the implementing rules and guidelines in enforcing the Generics Law to the practitioners and to prepare an essential drug list for veterinary medicine. The implementing rules and regulations were drafted in the form of joint administrative orders signed by both the Secretary of Agriculture and Secretary of Health since the two agencies are involved in their implementation (The Philippine National Veterinary Formulary, 1993).

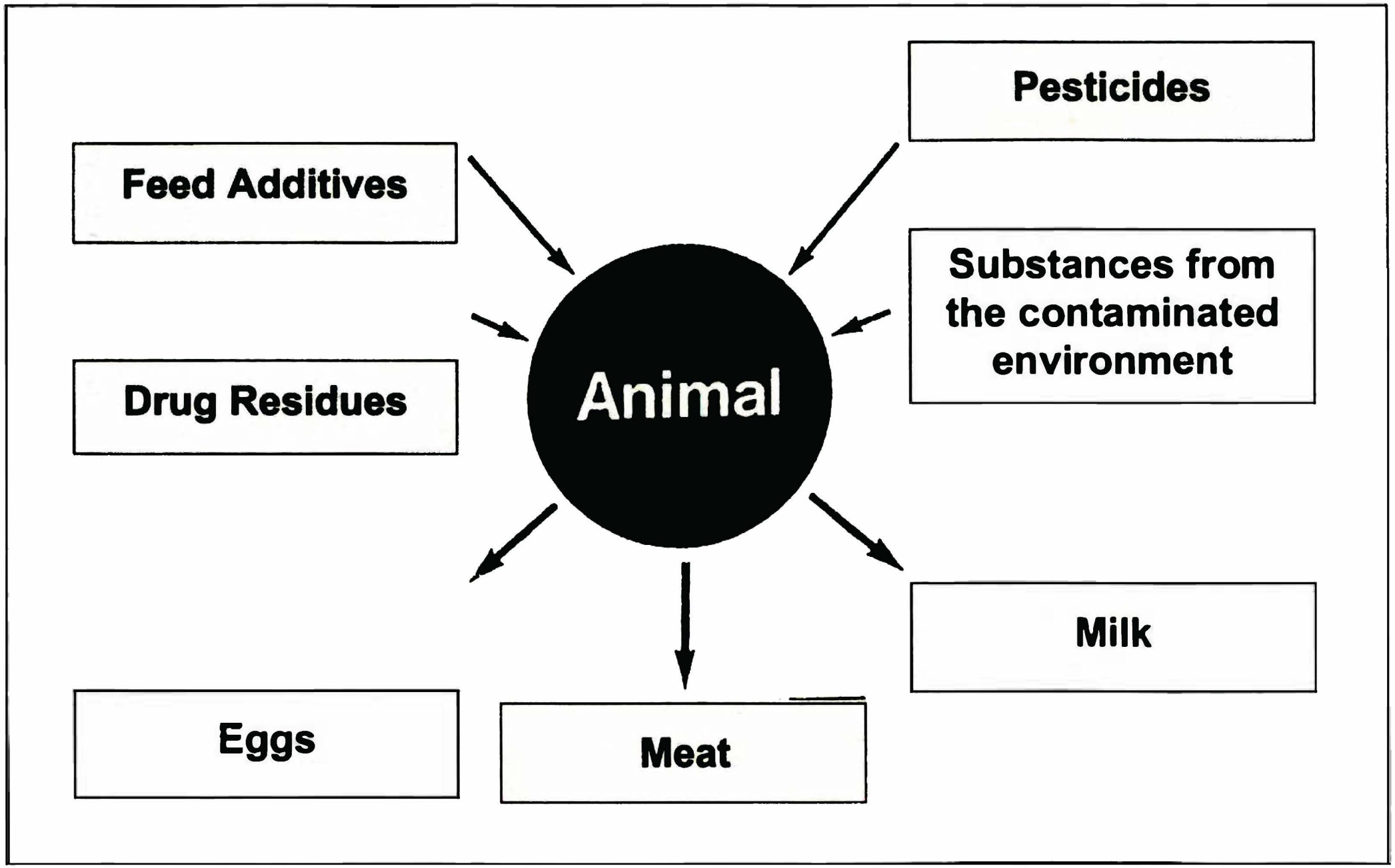

Figure 2: Origin of different residues in food of animal origin (Grossklaus 1993).

The first joint administrative order signed banned chloramphenicol, an antibiotic being used for therapy by both practitioners for use in food animals. The antibiotic poses a potential danger to humans if the meat containing chloramphenicol residue is eaten as it can cause aplastic anemia. The essential drug list was prepared in the form of a Philippine National Veterinary Formulary (1993). It is a listing of the essential veterinary drugs and was prepared in the form of a Philippine National Veterinary Formulary (1993). It includes the pharmaceutical forms and strengths as well as the all important withdrawal periods for food animals. The veterinarians and even the producers can refer to this formulary when using antibiotics and therefore prevent the occurrence of drug residues in the meat of food animals. Since its creation the SCVD has coordinated and facilitated the issuance of 11 Joint Administrative Orders signed by both Secretaries published in several newspapers for the information of concerned veterinarians, physicians, allied and related professionals including the concerned public. The joint orders are:

1. Banning chloramphenical for use in food animals.
2. Banning the use of live rabies vaccine.
3. Regulations for licensing veterinary drug outlets.
4. Requirements for labelling veterinary drugs and products.
5. Guidelines for advertising and promotion of veterinary drugs.
6. Rules for the registration of veterinary drugs and products.
7. Guidelines on prescribing veterinary drugs and products.
8. Guidelines on dispensing veterinary drugs and products.
9. Transitional labelling of veterinary drugs and products.
10. Guidelines on questioned veterinary drugs and products.
11. Guidelines on labelling multi-component veterinary drugs and products.

It should be noted that all these joint AOs are meant to protect the consuming public from the irrational use of veterinary drugs which can affect their health. The joint AOs are also directed to the veterinary practitioners to follow the law by promoting and using veterinary drugs and products by their generic names.

Previously, because of the overlapping function in the enforcement of regulations regarding the control of veterinary drugs, the Bureau of Animal Industry and the Bureau of Food and Drugs, ran into conflict in their enforcement. As a result of the Generics Law, the two agencies have come to an agreement by signing a Memorandum of Agreement (1991) whereby the respective functions were clearly delineated.

The problem of inappropriate use of antibiotics in the Philippines became a serious concern of the Department of Health, so much so that a joint cooperative project with the Australian government was established through AUSAID. A position paper presented in 1996 identified the stakeholders on this problem. One group of the stakeholders includes the agriculture and aquaculture sectors where antibiotics are used during the production of terrestrial and aquatic food animals. The veterinarians are involved because they prescribe the antibacterials to be used

during the production. The commonly used antibiotics are contrimoxasole and cotrimazine for treating pig diarrhea. The development of multi-resistance among pathogenic organisms has been reported as a result of incorporating antibiotics in the feeds. The transfer of resistant factors of *Escherichia coli* from chicken to human *E. coli* have been demonstrated. The recommendations were to conduct an educational campaign on the risks of using antibiotics and more enforcement from the Bureau of Animal Industry (BAI). Based on these recommendations, all animal feed outlets should have a veterinary consultant and all veterinary drug companies should have a veterinary director. The veterinarians should prescribe and supervise the use of antibiotics both for therapeutic and non-therapeutic purposes. This was also provided in the Joint Administration Orders of the Generics Law which were signed by the Secretaries of Agriculture and Health.

SUPERVISION OF THE IMPORTATION AND EXPORTATION OF LIVE FOOD ANIMALS AND THEIR BY-PRODUCTS

Importation and exportation of live food animals and their by-products are government regulatory functions. The agencies under the Department of Agriculture which are responsible for these functions are the Bureau of Animal Industry (BAI) and the National Meat Inspection Commission (NMIC). The BAI supervises and clears the importation of live food animals while the NMIC IS responsible for the importations (with the approval of the BAI) as to source and exportations of the meat and their by-products. Because of the presence of Foot and Mouth Disease (FMD), hog cholera, and poultry viral diseases, the Philippines cannot export live animals to all the countries except to a few which have approved these products for export. The BAI, for reasons of improving the native breeds and also to augment the supply of selected food animals to satisfy the local demand, has approved the importation of the live food animals. Table 5 shows the number of live food animals imported by the Philippines from 1981-1997.

All these animals were inspected and serologically tested at the country of origin by BAI veterinarians. Upon arrival they were quarantined to check if they would develop any harmful diseases that may be transmitted to other animals and humans. With the exception of feeder cattle which are fattened and sold to the public for food, the rest of the food animals imported are going to be used as breeders to improve our local stock. In all these importations the user and ultimately the buying public are protected.

In 1995, the NMIC processed and issued Veterinary Quarantine Clearances (VQC) that imported 77,284.79 metric tons of meat and meat products from 14 accredited and approved countries which are: France, USA, India, Australia, New Zealand, Canada, Denmark, Argentina, Brazil, Holland, Germany, Iceland, Belgium, and China. The abattoirs and processing plants of these exporting countries have been inspected and approved by NMIC and BAI veterinarians. The imported meat importation (1995) is shown in Figure 3.

Table 5. Number of live food animals imported into the country from 1981-1997 (BAI, 1997).

Animal Species	YEAR																
	1981	1982	1983	1984	1995	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Feeder Cattle							2781	11424	21984	21313	12674	33362	74672	112535	188343	118791	216404
Breeder Cattle	6654	9854	8797	800	692523	721472	3195		771	1709	3099	16163	8816	6893	11203	2648	1269
Buffalo													258		861	403	
Hogs							1789	2825	3519	1966	1334	3011	2390	5636	2828	2206	2597
Day Old Chicks							1306676	1014683	1138542	825596	1055634	1398030	1128552	1328552	2119029	2131778	1210529
Sheep							6	119	78	412			15				
Goats	1	1252	491			6	5						40	8	16		
Deer															260		

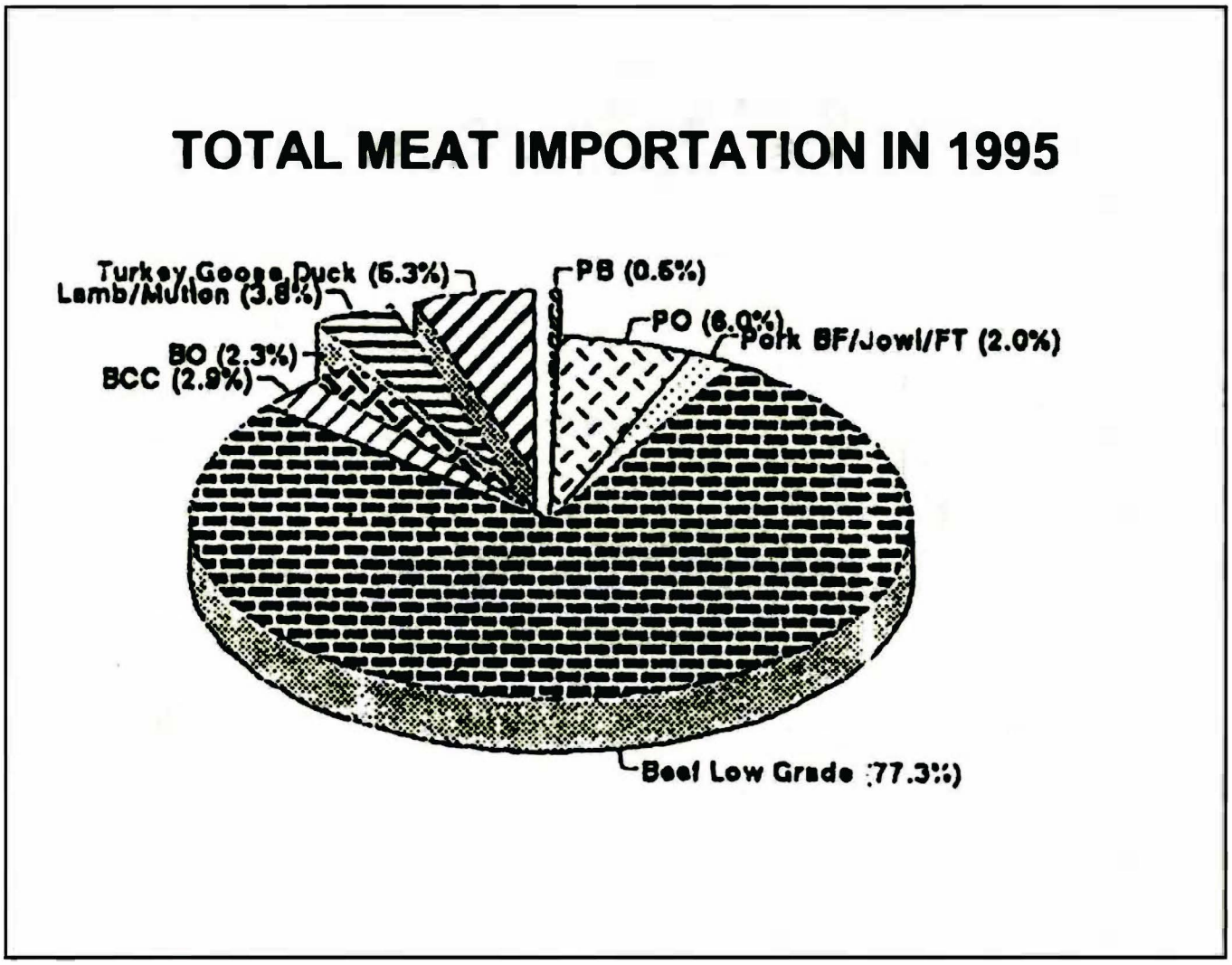

Figure 3. Breakdown of meat products imported in 1995 (NMIC Report, 1995).

The Philippines exported some processed meat, bagged soup and fresh frozen pork to 7 countries (1995) namely: USA, Japan, Hongkong, Taiwan, United Arab Emirates, Vietnam, and China. A total of more than 55.03 metric tons of these products were exported and official Meat Inspection Certificates (MICs) were issued. The accredited exporters are: Insta Food Corporation, San Miguel Foods Inc., Monterey, Genosi, Bavaria Food, Inc. High-bright Corporation, Purefoods, Finest Food, Pacific International, and Swifts Foods, Inc. These exporters have come up to the standards of the importing countries and are certified by the NMIC veterinarians. The value of the exported products amounted to PhP 66,776,861.71. The fact that we can export meat and products, is a big potential economic boost to our economy. The contribution of the veterinary profession in this venture cannot be belittled. The total meat exportation is shown in Figure. 4.

ZOONOSES

WHO (1967) defines zoonoses as "those diseases and infections the agents of which are naturally transmitted between vertebrate animals and man". Animals maintain the disease in their natural state and humans get the diseases by accident.

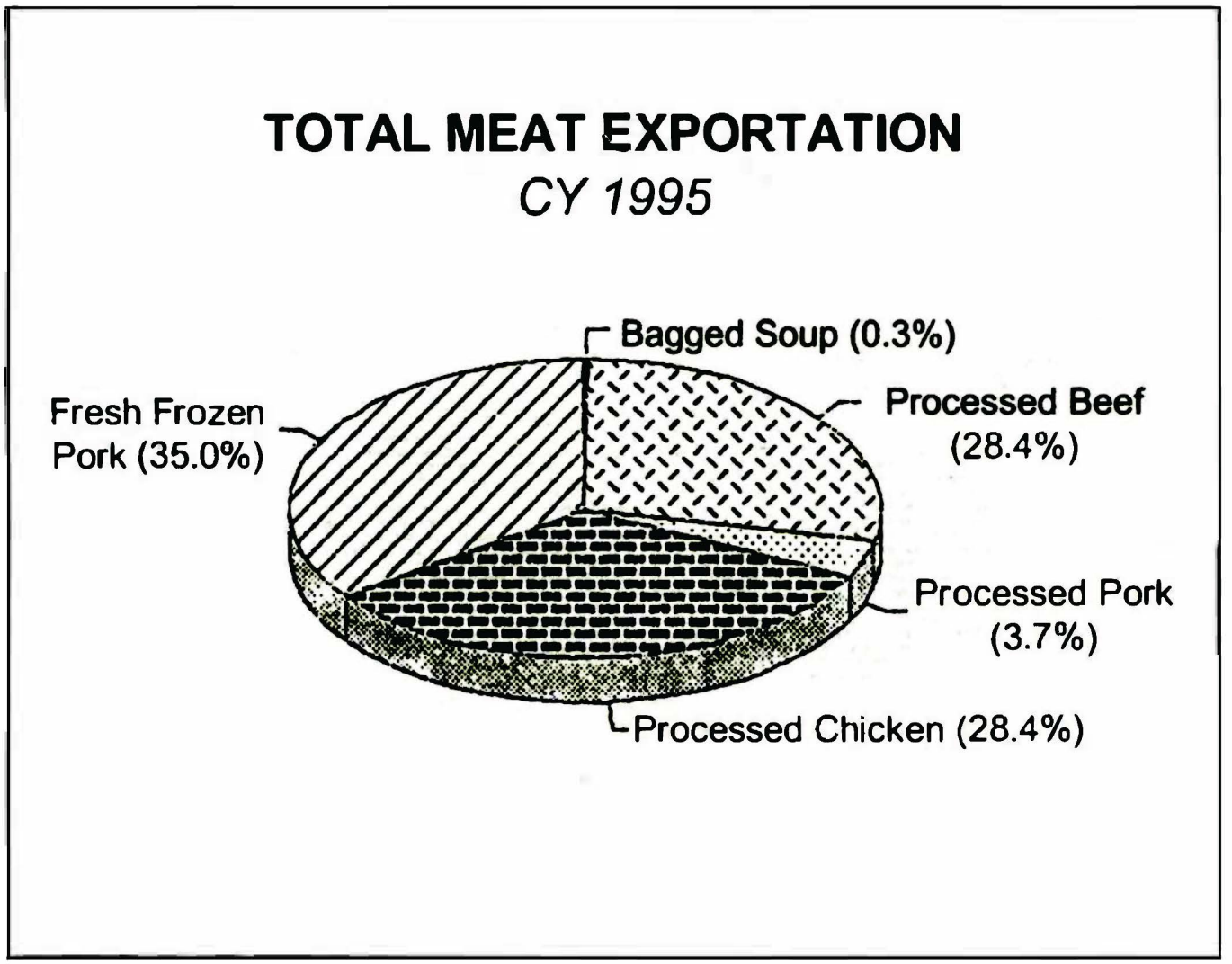

Figure 4. Percentage of meat products exported in 1995 (NMIC Report, 1995).

A German physician by the name of Rudolf Virchow, coined the word "zoonoses", believing that there is no dividing line between human and animal medicine since the experiences obtained from both practices can be considered the same. Acha and Zsyfries (1987) added another group of communicable diseases to this definition: "those that are common to man and animals". Both get the disease from common sources: water, soil, invertebrate animals, and plants. In the first edition of their book, 148 zoonotic diseases were listed. However in the 2nd edition, 28 new diseases were added making a total of 176. Steele, Arambulo, and Beran (1973) listed 181 zoonoses diseases of which 63% have been reported in the Philippines. Among those reported are: rabies, Japanese β-encephalitis, enterovirus, pseudorabies, rickettsial diseases, scrub typhus, leptospirosis, brucellosis, salmonellosis, shigellosis, TB, erysipelas, mycoses, internal and external parasitism. Arambulo and Paganini (1995) defined zoonoses as "diseases that are transmitted naturally from animals to man and vice versa". According to them there are more than 200 known zoonoses.

It can be seen that veterinary public health veterinarians who are authorities in their respective fields do not agree on the exact number of zoonoses. It goes to show that there are zoonoses that have not been confirmed to be present and not

given official recognition. But there are new and emerging zoonotic diseases that are being reported and added to the list.

In their book on zoonoses (1987), Acha and Szyfries speculated on the possibility that Creutzfeldt-Jacob Disease (CJD), a spongiform encephalopathy of man, can be transmitted from animals to man. At that time, a disease in sheep called scrapie with similar symptoms and pathology (spongiform encephalopathy) was already reported. They theorized that CJD in humans may have come from scrapie-infected sheep. Their speculation may have been proven right because the recent reports of CJD-like disease in humans in UK was thought to have been obtained from the consumption of beef from cattle suffering from bovine spongiform encephalopathy (BSE), popularly known as "Mad Cow Disease". Veterinarians making an epidemiological study of BSE, concluded that the disease was caused by feeding the beef cattle with ground sheep meat or mutton infected with scrapie. To date there have been 10 reported fatalities among humans in UK, who have succumbed to the so-called Mad Cow Disease. One common finding among the affected humans who died of a disease closely resembling CJD was that they had eaten ground beef which came from cattle suffering from BSE. The 10 reported fatalities were persons who are relatively young. CJD in humans usually affects the elderly in the age bracket of 60s to 70s. Further veterinary investigations revealed that the BSE-affected cattle were fed ground meat which came from scrapie-affected sheep. This practice was immediately stopped by the veterinary authorities in UK. To date there have been no additional reports of Mad Cow Disease in humans. This may have been due to the fact that feeding cattle with ground mutton was immediately stopped. Furthermore the affected cattle and those exposed to these animals were all condemned and burned.

Acha and Szyfries (1987) believed that human AIDS can be considered as a zoonotic disease. The AIDS virus can be transmitted to chimpanzees. The same virus was theorized to have originated from the green monkeys of Africa. Simian and feline species are the models to use in studying human AIDS which is caused by a retrovirus. An interesting and perhaps an uncanny observation by the authors, is the property of human influenza Type A virus to undergo radical antigenic changes which can result from a recombination with a virus of animal origin. Based on this phenomenon of recombination, it is possible that the recent deadly "bird flu" epidemic in Hongkong which has killed six persons so far is the result of this antigenic change. It could be speculated that the great influenza pandemic after World War I, which affected millions of the human population with many mortalities, could be attributed to tis phenomenon of recombination. It may be recalled that the occurrence of "swine flu" was reported at about this time.

ZOONOSES IN THE PHILIPPINES

Steele, Arambulo, and Beran (1973), in a study on the epidemiology of zoonoses in the Philippines, reported that out of the 181 diseases known to be zoonotic, 63% or a total of 114 have been reported in the Philippines.The epidemiology and approaches toward the control of these diseases were discussed in their report. Plague was the only zoonosis that has been eradicated. Among the viral zoonoses reported were rabies, Japanese β-encephalitis, Chikungunya infection, enteroviruses, pseudorabies, rickettsial disease, scrub typhus, and endemic typhus. The bacterial zoonotic diseases listed were: leptospirosis, brucellosis, anthrax, salmonellosis, colibacillosis, shigellosis, tuberculosis, pasteurellosis, swine erysipelas, mycotic infections, and endoparasitism. To date, this is the only extensive report of zoonoses in the Philippines.

Lopez (1997) listed the following zoonotic diseases that pose a greater risk to public health: anthrax, brucellosis, paragonimiasis, fascioliasis, taeniasis and cysticercosis, trichinosis, salmonellosis, and rabies.

With the exception of trichinosis, all of these diseases have been reported in the Philippines. There are several published reports, on zoonoses that have been made in local and foreign journals. In addition to the list presented by Lopez, veterinary researchers have reported other zoonotic diseases. The more important and significant ones will be briefly discussed.

Rabies is probably the most feared zoonotic disease in the Philippines. It is a true zoonosis since humans are accidental hosts. The disease is 100% fatal once the symptoms ensure in both man and animals. The dog is the main transmitter of the disease. Fortunately in the Philippines it has not been reported in wild animal species nor in bats. In a retrospective study of the disease from 1986-1990, Carlos et al. (1990) reported that out of the 9,367 animal specimens from 5 laboratories in the Philippines, 2,269 or 24.22% were confirmed to be rabid. It is a high incidence and the dog is the principal reservoir of the disease. Carlos et al. estimated that 98% of rabies cases are dogs. The results of this study emphasized the need for a strong program in responsible dog ownership in which vaccination plays an important role. The Department of Health reports that the Philippines ranks number 5 in the incidence of human cases. WHO reports that rabies occupies the 12th rank in the list of infectious diseases that cause death in the world (1995). Rabies is still widely distributed in Africa, the Americas, Asia, and Europe. Hence it is a worldwide problem. There are only a few countries which are free of rabies: UK, New Zealand, Australia, Hawaii, Japan, Sweeden, Norway, Finland, Spain, Portugal, Greece, and some Carribean Islands. A noted veterinary public health officer in the US, Dr. Karl F. Meyer, said that: "A country that has rabies is not civilized." If this statement is strictly applied, the aforementioned countries are the only ones civilized. De Vera and Carlos (1979) made an extensive review of rabies in the Philippines and compared the international and the Philippine situations. They made recommendations for a successful rabies control

program in which they believed that with a strong political will, rabies can be eradicated.

Fishbein et al. (1991), made a study on the economics of controlling rabies with the corresponding costs and benefits. The authors assumed that with a canine to human ratio of 1:210, with a vaccine coverage of 60% (ideally 75%), and a cost per vaccination of not less than PhP 25 and no more than PhP 90, nationwide elimination was estimated to cost between PhP 88.1 million and PhP 317.2 million respectively. The expected costs of vaccination, are for dogs, PhP 29.7 million; PhP 21.6 million for human post-exposure treatment, and Ph P0.3 million for animal rabies examination expenses. In addition PhP 1.2 million for earnings by humans whose death due to rabies will be prevented. Can the Philippine government afford these expenses? At first glance, it cannot, but after realizing the benefits that can be gained, only the political will on the part of the national government and LGUs is needed to allocate a certain amount of their budget to combat this scourge. Rabies is a disease that can easily be controlled by effective vaccination, quarantine, and an information education campaign. The public health veterinarian working hand in hand with public health medical doctors backed by the national government and LGUs can successfully eradicate rabies in the Philippines.

The national government through the Department of Agriculture (DA) has organized an interagency program entitled: National Rabies Prevention and Control Program in the Philippines (NRPCP). Previously only the DA and the Department of Health (DOH) had their respective rabies control programs with no coordination. Through the initiative of the DA, the other Departmental agencies of the national government were mobilized to combat rabies. The DA realized that other departments should be involved if rabies is to be eradicated. Hence the Department of Education, Culture and Sports (DECS), Department of Interior and Local Government (DILG), Department of National Defense (DND), and the non-government organizations, e.g., Philippine Veterinary Medical Association, Philippine Society of Veterinary Public Health, Veterinary Practitioners Association of the Philippines, were all mobilized to fight rabies. The main objective is to declare the Philippines as Rabies Free by the year 2020. The details of the program are clearly spelled out including the respective roles of the agencies concerned. An MOA has been signed by all the leaders of the departments and the NGOs. If the moral (political) will and the logistical support will be provided by all parties concerned, there is no doubt that the goal of Rabies Free Philippines in 2020 can be achieved.

FMD or Foot and Mouth Disease became an alarming epidemic in 1995 when it caused a high morbidity rate in adult pigs and a high mortality among suckling pigs. The disease is caused by a virus and is very highly contagious. It has caused pandemics in Europe and other continents. It has resulted in huge economic losses in affected countries. It markedly affects world trade in livestock meat and by-products because countries free of FMD limit trade to selected pro-

cessed foods and livestock. Hence FMD is a political and an economic disease. Because of its presence in the Philippines, our export of livestock, meat, and by-products is very limited.

As a rule, cloven-footed animals (ruminants, cattle, sheep, and goats) are affected. FMD is the most feared disease of cattle in the world where cattle production is highly developed (Timoney, et al. 1988). In the Philippines, a pork-eating country, it is one of the most feared disease among pig producers due to the economic losses incurred.

During the height of the 1995 epidemic, wherein hundreds of thousands of pigs in Luzon were affected, an irresponsible, inaccurate statement was announced that FMD can be transmitted to humans. The sales of pork went down dramatically adding to the travails of the pig producers. The fact is FMD is very rarely transmitted to humans and is actually an academic curiosity. It is therefore not considered a zoonotic disease.

As a result of this outbreak, President Ramos issued Executive Order No. 251 on 15 June 1995 declaring a state of calamity in Luzon and provided emergency funds for this purpose. A Bureau of Animal Industry Task Force was created to combat the disease. The Australian Government through its AUSAID program is assisting the Philippine government in coordination with UN-FAO in controlling FMD. A Technical Advisory Committee for the Control and Eradication of FMD was created per Administrative Order No. 199 (1995) composed of representatives from government and NGOs, to advise and counsel the Department of Agriculture and the BAI. At present, FMD has been controlled with a dramatic reduction of cases. The objective now is to eradicate it by the year 2003.

Anthrax is endemic in the main island of Luzon particularly in the central part, although it has been reported in other provinces of the North. Tacal and Peneyra (1966), reported an outbreak of the disease among humans in Tarlac. It was caused by eating meat of a carabao that died of anthrax. A total of 26 persons were affected, exhibited mainly by a cutaneous form of the disease. Mortality was not encountered. The report was quite exhaustive. As a result of this outbreak vaccination was carried out in the whole province of Tarlac and the neighboring provinces. No further report of the disease was made after this episode.

Brucellosis has been reported by several veterinary researchers. Arambulo et al. (1969) reported the serological presence of the disease. Gatapia et al. (1970-1972) reported the incidence of brucellosis among cattle and carabaos slaughtered at the National Abattoir. The serological presence of the disease among horses was described by Novilla (1972). San Gabriel and Zaratan (1966) gave recommendations for its prevention and control.

Tuberculosis was studied by Balassu (1978) through histologic and bacteriologic examinations of slaughtered carabaos. *Mycobacterium bovis, M. tuberculosis, M. fortuitum,* and *M. avium* were isolated. The study provided evidence that carabaos can serve as source of tuberculosis infection. By the use of Old Tuberculin (OT) and the kaolin agglutination test, Molina and Mateo (1981) found 14

buffaloes to be serologically positive for TB. They concluded that TB can be highly prevalent among dairy buffaloes.

Leptospirosis in the Philippines was first reported in humans by Hirano (1932) when he cultured *Leptospira icterohemorrhagiae* from the urine of a fatal case of Weil's disease and reproduced the disease by injecting the urine of the patient into guinea pigs. By histopathological examination, Alonzo (1956) diagnosed leptospirosis in slaughtered pigs. Topacio (1980) performed several researches on leptospirosis and presented an extensive review of the disease in animals and humans in the Philippines to the Working Group on the Formulation of Leptospirosis Guidelines, WHO. He cited veterinary investigators who worked on and reported the disease in the Philippines. Among these workers were Galton and Aragon et al. (1963) who reported a new species, *Leptospira manila*e isolated from rats. Famatiga and Topacio et al. (1972) made a nationwide serological survey of 2,982 occupationally exposed Filipinos and reported an incidence of 10.777%. The highest incidence was among rice farmers, 13.16%. Topacio et al. (1980) made an extensive serological survey of different domestic animal species and found the following incidences: carabaos, 30.5%; cattle, 5.86%; pigs, 7.9%; horses, 14.3%; dogs, 12.7%; goats, 16.07%; and sheep, 40.3%. These findings indicate the widespread prevalence of the disease and indeed pose a public health problem if not diagnosed and treated.

There were other reports of leptospirosis from other local and foreign research veterinarians. Carlos and Kundin (1970) obtained leptospiral isolates from rat kidneys and isolated *L grippotyphosa* from house shrews. Babudieri (1973) isolated *L. bufonis* from kidneys of a toad.

Although leptospirosis is a public health problem it has not become epidemic in humans and animals. One explanation is the organism is susceptible to narrow and broad spectrum antibiotics.

Salmonellosis is a zoonotic disease that is worldwide in distribution. It has become a serious veterinary public health problem. The frequent sources of infection are contaminated meat and its by-products including poultry products, milk and its by-products (Grossklaus 1993, Figure 5). Among the veterinary investigators who worked on salmonellosis and their reports are: Arambulo et al. (1969, 1970, 1971) reported its widespread occurrence in the Philippines; Tacal and coworkers, made an extensive study in the Philippines and reported its presence in chicken eggs (1965), carabaos (1965), swine (1965), sheep and goats (1966), pigeons, geese, and wild life (1969), native ducks and turkeys (1970); chicks (1970); Arboleda et al. (1992), described septicemic salmonellosis in piglets; Carlos (1965) isolated *Salmonella blockly* from rabbits; Topacio (1965) isolated *Salmonella pullorum* from serologically positive reactor chickens; Timbol (1982) reported for the first time serological evidence of *S. abortusequi* among horses.

Parasitic zoonoses is inherently a problem in the Philippines. Being a tropical and humid country, it is a veritable paradise for all sorts of parasites. Because of these conditions there is an abundance of veterinary researches on parasitic

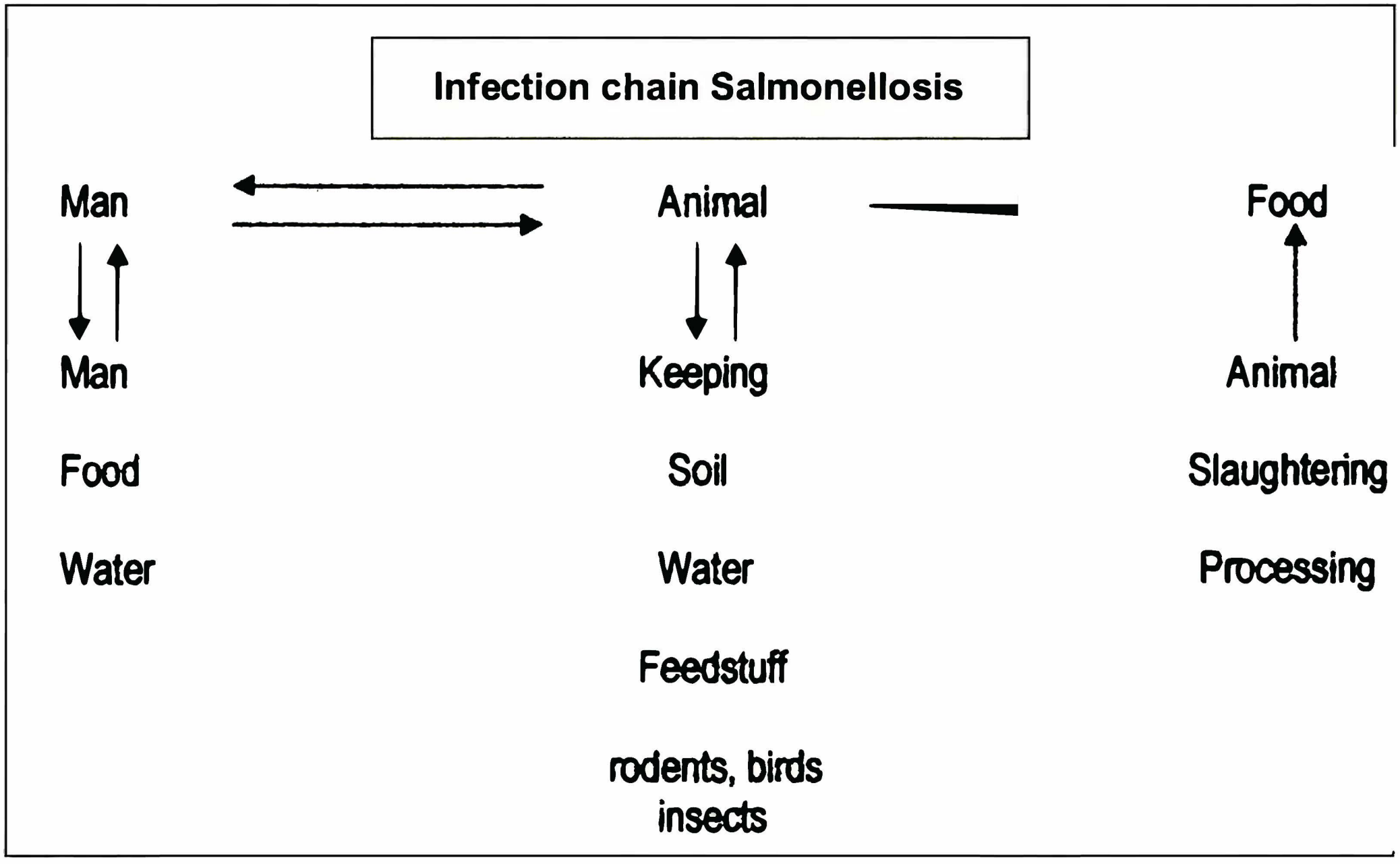

Figure 5. Infection chain of salmonellosis (Grossklaus 1993).

zoonoses. Those reported were ancylostomiasis, ascariasis, fascioliasis, amoebiasis, paragonimiasis, schistosomiasis, toxoplasmosis, and sarcocystis. Publications on all parasitic zoonoses are included in a National Academy of Science and Technology publication entitled: Annotated Bibliography on Animal Diseases: Prevention and Control by Topacio et al. 1997.

EMERGING ZOONOSES OF PUBLIC HEALTH SIGNIFICANCE

As mentioned previously, Acha and Szyfries (1987) listed 176 zoonotic disease while Arambulo et al. (1992) listed 2000. The last listing is certainly not the end because new zoonotic diseases will be added. It is interesting to note that the emerging zoonoses are mostly, if not all, caused by viruses. It is apparent that the microbial ecology has been disrupted in favor of the pathogenic viruses. One explanation for this probably is the extensive use of antibiotics which are effective against pathogenic bacteria but not against viruses. To date there are only a few antibiotics that have virucidal action. On the other hand there are a few emerging zoonoses that have caused alarm and fear among the public since some of these are fatal.

Mad Cow Disease

The scientific name that veterinarians have given the disease is bovine spongiform encephalopathy or BSE for short. The name "mad cow disease" was given because of the unruly or crazy behavior that the affected cow exhibits. The organ that is affected by the disease is the brain, hence the nervous symptoms. As reported by Taylor (1991) of the UK Ministry of Agriculture, Fisheries, and Food, BSE is a new disease that was first recognized in the UK in 1958 among cattle. It was believed and later confirmed that the cause was feeding the affected cattle with feeds containing infected material from sheep suffering from scrapie, a disease of this animal which resembles BSE or by feeding recycled BSE bovine material. Not much is known yet about BSE and knowledge about it can be inferred from scrapie. Sigurdson and Rida (1954) call it a slow viral infection. It is a form of slow-acting transmissible spongiform encephalopathy. The causative agent is unconventional in its behaviour and cannot be classified among the conventional microbial infectious agents. There are three theories or hypotheses regarding its character: (Timoney et al. 1988): (1) filamentous viral-like particle; (2) prion or proteinaceous infectious particle with no nuclei acid, perhaps a polysaccharide, too small to code for its own biosynthesis; (3) virion composed of an extremely low molecular weight protein encoded by the host cell DNA, the nucleic acid being replicated by a host cell enzyme. The pathology of the affected animal organ, particularly the brain, is one of a sponge-like appearance, hence the name. The symptoms and pathology of scrapie and BSE closely resemble that of slow acting encephalopathies of humans, specifically Creutzfeldt-Jacob Disease (CJD).

CJD is usually a disease of the elderly. However the 10 deaths reported in the UK were of younger individuals but showing symptoms of CJD. It was found that the affected individuals had eaten beef or hamburger which presumably were from cattle infected with BSE. It was again presumed that cattle became infected after being fed with ground mutton which must have come from infected sheep with scrapie. The veterinarians of the UK recommended immediately the stopping of this practice which was strictly implemented. The veterinary officers of the Philippine Bureau of Animal Industry (BAI) stopped the importation from the UK of live breed cattle and also the frozen by-products. To date there has been no report of BSE in cattle in the Philippines.

Bird Flu or Avian Influenza (H5N1)

The classic avian influenza is typically an acute, highly fatal disease of poultry – chicken, turkeys, pheasants and certain wild birds. It is caused by a virus of the *Orthomyxovirus* Type A group, exhibiting a wide range indicating that avian influenza virus can infect humans because both strains may share hemagglutinins. Keratoconjunctivitis due to avian flu virus was produced in a laboratory worker as a result of an accident. The virus isolated was identified: HAV/1/NEQ/1. In another laboratory worker, a turkey isolate of avian influenza virus was recovered (Timoney et al. 1988). The authors state that "The ease by which antigen hybrids of influenza viruses can be produced in viruses supports the hypothesis that new influenza viruses can arise in nature from birds and mammals and cause disease in humans".

The description of Timoney et al. is indeed prophetic. Their hypothesis lends support to the belief that the set-called "bird flu" was the cause of the fearsome epidemic in Hongkong that killed 6 persons. The influenza virus H5N1 strain was isolated from a human fatality for the first time on 20 August 1997. The H5N1 is known to affect birds primarily and has been isolated from domestic chickens. Where did this virus came from? Some quarters pointed to Red China as the source since the country exports chickens to Hongkong. However, the Chinese are denying this although a strain of bird flu virus in the province of Guangdong has been isolated, as reported by the *Beijing Youth Daily.* It was not mentioned whether the virus was the same strain that killed 6 persons in Hongkong. Not a single case of bird flu in humans has been reported in Guangdong. WHO experts led by Dr. David Lavanchy, influenza expert, did not believe that the source of H5N1 was China. The hypothesis postulated by Timoney et al. (1988) offers the other alternative explanation. How humans become infected is another question that needs to be answered with accuracy. Bird flu cases among persons with high occupational exposure to chickens and other poultry are wanting. However, the members of this group have antibodies in their blood, while most of those affected do not have antibodies. There is a little or no evidence of human to human transmissions. Most of the fatalities were mature individuals, not infants nor el-

ders. H5N1 has been isolated from both chicken and humans. Amantadine and remantadine are the antibiotics that have been useful if given early enough. To date no vaccine is available to protect the susceptible public. Mortality from bird flu is high, 30%.

The Hongkong Agriculture and Fisheries Department, upon recommendation by their veterinarians headed by Senior Veterinary Officer Dr. Leslie Sims stopped importation of chickens from Mainland China. The Department also ordered the slaughter of the chicken population of Hongkong, about 1.5 million of them. Since the last human cases reported in January, 1998, no new bird flu cases have been reported. The information on bird flu from Hongkong given in this paper came from Dr. Leslie Sims (1997).

Ebola Disease or African Hemorrhagic Fever

Ebola disease according to Acha and Szyfries (1987) is classified as extremely biohazardous because of its high fatality rate in humans (60-90%) . The disease was first reported in June, 1976 in Sudan, Africa. It is characterized by hemorrhages, hematemesis, epistaxis. It is acute with a short incubation period of about a week. The reservoir of the virus is known to be the rainforests of Africa.

In October 1989, a shipment of Philippine monkeys, *Macaque fascicularis,* for experimental purposes sent to the US arrived a month later in Reston, Virginia. After some time, the monkeys developed symptoms of Ebola disease and several died. Necropsy revealed lesions similar to those characteristic of the Ebola disease. The concerned laboratories in the US, alarmed at these findings, mobilized all their units to monitor the progress of the disease and did extensive laboratory work. In all these procedures, extreme caution was exercised to prevent the spread of the deadly virus. Finally, after exhaustive investigations, it was found out that the virus isolated was an Ebola-like virus belonging to the same family - Filoviridae, and not the true deadly Ebola pathogen. The disease was peculiar to the Philippine monkeys and the virus does not infect humans (Ostroff 1990). This disease was included in this paper to illustrate the different strains of viruses that could resemble other deadly strains and yet are not pathogenic to humans but can cause undue alarm as what happened in this instance. All the aforementioned information came from Dr. Stephen M. Ostroff, Center for Disease Control at Atlanta, Georgia, USA, dated 22 January 1990.

EMERGING VIRAL DISEASES FROM AUSTRALIA

Field, Halpin, and Young (1997) reported two emerging viruses from Australia namely: Equine Morbilivirus (EMV) and Australian Bat Lyssavirus (ABL).

Equine Morbilivirus (EMV)

The disease affected 23 horses in a stable showing influenza-like symptoms. Fourteen of the horses died. EMV was isolated from the affected horses and also from the trainer. It was theorized that the horses were infected due to contact with wild birds, bats, or flying foxes. This observation was made after another outbreak of EMV occurred 1000 kilometers away from the first outbreak and wild life was suspected. This was confirmed when the EMV was isolated from a flying fox that aborted and a virus was isolated from the uterine fluid. The virus was called Bat Paramyxovirus or BPV. Laboratory studies revealed that the EMV isolate from horses and BPV from the flying fox were one and the same. The virus was classified as a paramyxovirus.

This case illustrates the effective epidemiological studies made by the Australian veterinarians. How they investigated the relationship between the two seemingly unrelated viruses and arrived at a definite conclusion is indeed a brilliant piece of epidemiological detective work.

Australian Bat Lyssa Virus (ABL)

In May 1996, in New South Wales, another new virus was isolated and identified as related to the classical rabies virus. It was isolated from a flying fox that was found on the ground, unable to fly. There is no doubt that finding the BPV from a flying fox must have alerted research veterinary epidemiologists to isolate new viral strains from this flying mammal. Tissues were submitted for BPV isolation but results were negative. However, encephalitis lesions were observed. The brain tissue that was tested for rabies virus yielded positive results. Inoculation in mice resulted in the isolation of a rhabdovirus which belongs to the same group as the rabies virus. The new virus (it must be new since rabies virus is not present in Australia) was called Australian Bat Lyssa Virus (ABL). By coincidence a wild life caretaker developed an illness with nervous manifestations of limb pain, numbness, and headache. A serum sample from this case was sent to the Australian Health Laboratory and was diagnosed as positive for the lyssa virus group to which the classical rabies virus belongs. A PCR (Polymerase Chain Reaction) test on the cerebrospinal fluid was positive for ABL. The woman died later and it was found out that she was taking care of and handling several flying foxes. These findings illustrate the potential public health problem that may arise as a result of contact with flying foxes or bats which can cause a rabies-like disease that could be fatal. The findings in Australia should initiate a research survey for these viruses in Philippine bats.

DISASTER VETERINARY MEDICINE: PROTECTING HUMAN AND ANIMAL HEALTH (DISASTROLOGY)

The Philippines is a country that has experienced many kinds of disasters. During these periods both humans and animals are affected. There are two kinds of disasters: natural and human-caused.

Natural disasters are as follows: (Heriter and Peck 1989)

1. Earthquakes
2. Tidal waves
3. Typhoons
4. Floods
5. Volcanic eruptions
6. Landslides
7. Drought and famine
8. Epidemic diseases

Human-caused disasters:

1. Fires
2. War, insurgency
3. Collapse of dams, buildings
4. Transportation calamities
5. Escape of radioactive materials
6. Chemical escape (gas)
7. Large scale poisoning
8. Refugee problems

A study of this list will lead one to conclude that our country has suffered, is suffering, and will suffer from all of these disasters. Both humans and animals have been and will be affected. Because our country is disaster prone, the national government has created the National Disaster Coordinating Council (NDCC) directly under the Office of the President. In times of disaster, the President declares a state of calamity and mobilizes all government agencies to cope with the emergency with the corresponding budgetary assistance to the human victims. While provisions are given to assist the human populace, under the NDCC, there are no provisions to assist the animal population affected. This is an important aspect that was overlooked since animals, particularly food animals, should also be saved because they can be used as sources of food in times of disaster. This is where the veterinarian plays a very important role, to see to it that the food animals that will be used for food must be safe for public consumption. In times of disaster unscrupulous individuals will try to sell food animals that have died because of the calamity or sell even sick animals. In times of emergency the hungry populace may buy and consume these unfit meat. The veterinarian must ensure the public that only meat from food animals that is safe to eat is distributed for consumption by humans, food animals, and pets. The recent FMD outbreak in Luzon (1995) is an example of a disaster due to epidemic diseases. The President issued E.O. 251 declaring a state of calamity in Luzon.

Because of the indispensable role of a veterinarian in case of disasters, the Philippine Society of Veterinary Public Health (PSVPH), through its President, wrote President Aquino on 1 April 1991 recommending the inclusion of a civilian Veterinary Public Health Unit and the Veterinary Corps of the AFP in the NDCC.

As a result of this letter a Memorandum of Agreement between the PSVPH and the Presidential Action Center (PACE), Office of the President, was drawn with the following Terms of Reference that included the functions and responsibilities of the PSVPH if and when disaster strikes:

1. Ensure the availability of safe food of animal origin.
2. Organize the care and/or slaughter of injured animals.
3. Help re-establish food cooking and other food sanitation procedures for food safety.
4. Destroy animal carcasses and other deteriorating materials of animal origin resulting from disasters.
5. Collect and care for farm and other stray animals which have lost contact with their owners.
6. Coordinate with international and local organizations, public and private agencies, in the provision of animal-related support and resources for the PACE during disasters and assist in their distribution to preclude spread of dangerous communicable animal diseases and diseases of animals transmissible to man (zoonoses).
7. Control zoonoses and other communicable diseases by limiting animal movement (quarantine) and prevent humans from coming into contact with affected animals, contaminated animal wastes, and carcasses.
8. Contribute to the identification of places for refugee camps which are risk-free specially for zoonoses and assist in the organization of such camps.
9. Seek the assistance of veterinary professionals and other veterinary organizations that can be called upon during times of disaster.
10. Provide advice on the acceptability of donated food and other items of animal origin coming from donor countries.
12. Coordinate with the Bureau of Animal Industry those activities that relate with veterinary regulatory functions.

The above Terms of Reference were included in the MOA to be drafted by PACE and were to be signed by the Executive Secretary, Office of the President, and the President of the PSVPH. The MOA was being finalized when Mt. Pinatubo erupted in 12 June 1991. It was an emergency situation and PACE called upon the PSVPH to implement its Terms of Reference even though there was no formal MOA signed. The officers of the Society in coordination with the BAI implemented almost all of the Terms of Reference.

In a news clipping (*Manila Bulletin,* 22 June 1991), it was mentioned that "PACE sent 20 medical doctors and a group of veterinarians to the distressed areas. Officials of the Philippine Society of Veterinary Pubic Health (PSVPH), who met with PACE officials, expressed concern over the possible spread of animal diseases in evacuation centers where evacuees brought along their live-

stock. The veterinarians said it was necessary to segregate people from the animals to prevent the spread of diseases. Thus, at the time of the catastrophic Mt. Pinatubo eruption, the PSVPH, in coordination with the BAI, contributed significantly in protecting the health of the affected populace including their livestock. When the FAO Disaster Mission came to assess and assist the Philippine government, the BAI through its veterinarians, was commended for being one of the first government agencies to have a contingency plan. It facilitated the FAO assistance program for livestock at a faster pace. The BAI contingency plan was called OPERATION SAGIP HAYOP.

The major achievements of the OPERATION SAGIP HAYOP, the joint program of the PSVPH and the BAI, are as follows:

1. Evacuation and relocation of more than 31,000 animals from 7 lahar affected provinces to safe areas.
2. Establishment of 615 livestock feeding centers in 4 provinces (Nueva Ecija, Pampanga, Tarlac, Zambales).
3. Treatment of more than 30,000 livestock and poultry in 6 provinces (Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac, Zambales).
4. Vaccination of 1.3 million animals against rabies, hog cholera, hemorrhagic septicemia, and New Castle Disease (avian pest).
5. Emergency purchase of livestock and poultry totalling 384 animals.

In spite of their lack of training in disaster situations, the Philippine veterinarians were able to cope with the Mt. Pinatubo disaster by applying their basic veterinary medical training within their limited resources. There has been a formal training course in disaster veterinary medicine or diastrology, as the new course was called, conducted in Europe. The first workshop on disaster veterinary medicine was done in Rome in 1984. The course was called: "Veterinary Public Health in Disaster Situations," organized by the Council of Europe, WHO, FAO, and OIE. It was participated in by representatives of 8 European Centers for Disaster Medicine, WHO, and FAO. In these training courses, the Philippines did not send any representative. Realizing that disasters, natural and human-caused, occur naturally in the Philippines, veterinarians here should clamor for their participation in the next training course that will be offered by the WHO, FAO, and OIE. At the moment there are no public health veterinarians who have been fully trained in diastrology.

As a sequel to rehabilitation work which followed the Mt. Pinatubo eruption a group of UPLB volunteers participated actively in this program. In a paper by Zamora and Obordo (1992), they reported the rehabilitation work done by the student volunteers. They conducted seminars, training programs in agricultural technology which can be applied in the farms of the affected populace, e.g., agricultural land technology, intensive gardening, water impounding projects, mini-fishponds, backyard animal production, compost production, etc.

In preparation for a catastrophe such as the Mt. Pinatubo eruption, Ignacio-Ladrido (1992) made a study of the affected communities with emphasis on the coping capabilities of the victims. The objective is to transform the disaster victims into survivors through timely and support systems, and changing the attitude of hopelessness to one of empowerment with a positive attitude.

ETHOLOGY

Ethology is derived from the Greek world "ethos" meaning custom or culture. The definition is applicable to humans and has been applied in veterinary medicine. It is the study of animal behavior by direct observation and monitoring. It was applied more to the study of wild life animal behavior. Schwabe (1984) applied this discipline to mean behavioral studies between persons and pets, usually dogs. It also involves the study of pet relationship, attitudes of the owner to the pets, and vice versa. Abnormal behavior of both sides is also included in this subject. The study of the attitude of the community towards pets or animals can be considered part of ethology. As a result of ethology, it was found that special and emotional relationships can be put to good use in helping mental patients, physically handicapped persons, terminally ill patients, emotionally disturbed patients, mentally retarded children, and adults including aged individuals. Dogs and cats have been used as companion animals for the purpose. The Seeing Eye Dogs helping the blind are known to everyone. The animals playing this role have been called: "co-therapists". Geriatric and psychiatric institutions in the US and Europe are making use of dogs, cats, and other pets to help in caring for their patients. So important has ecology become that some veterinary schools are offering special courses related to this discipline. For example at the veterinary school of Washington State University, a course on People-Pet Partnership Program is being offered. At the University of Minnesota, a course on Human-Animal Relationship is being taught. A similar course is being offered at the University of Pennsylvania.

The discipline of ethology will not be complete without discussing: "animal welfare". This could be considered as the attitude of the community towards animals. Carlos (1996) in a paper on this subject presented the status of animal welfare in the Philippines. As a result of industrialization and increase of population the demands for use of animals for food, work, sport, companionship, research, exhibition, pleasure, have increased dramatically. Due to these developments the sufferings of animals have likewise increased. These developments gave rise to animal welfare and animal control. Animal control enforces laws to protect the people from animals while animal welfare involves laws that protect animals from abuse by the humans. If we position animal welfare at the central point, on the left are the animal rightists. This group claims that animals have rights including freedom from exploitation, sport, research, and euthanasia. On the farther left of the rightists are the liberationists. They are the group that support the claim that animals should not be made to work or produce any benefits for

humans. Keeping pets is a form of slavery as regarded by this group. The paper also discussed the development of animal welfare organizations in the Philippines. The more active groups are the PAWS or the Philippine Animal Welfare Society and the PSPCA or the Philippine Society for the Prevention of Cruelty to Animals. The use of the different species of animals for sport, recreation, pleasure, draft, food, and experiments, are described in the paper. The laws related to the treatment of animals, their early development and enactment, are described. The impact on the public and politicians with regards to animal welfare, have made a significant headway so much so that through their initiative, an animal welfare bill, sponsored in both chambers, was finally passed after some delays. The law was signed by President Ramos on 11 February 1998. It is a milestone in the history of animal welfare in the Philippines. It is Republic Act No. 8485 entitled: An Act to Promote Animal Welfare in the Philippines otherwise known as the "Animal Welfare Act of 1998". As provided for in this law, a Committee on Animal Welfare attached to the Department of Agriculture is created. It will issue the necessary rules and regulations for the strict implementation of the provisions of this Act. The Committee has created Task Forces representing sectors that will draft the implementing rules and regulations. Several Task Forces have already been organized and are now drafting the rules and regulations which will protect and promote the welfare of all animals by supervising and regulating the establishment and operations of all facilities utilized for breeding, maintaining, keeping, treating, or training of all animals, including birds, either as objects of trade, as household pets, or used in scientific experiments.

ENVIRONMENT PROTECTION AND HEALTH

Shantikumar (1993) in a paper on environmental protection, asked the questions: "What roles do veterinarians have in this trend towards sustainability and environmental friendliness?". "How environment friendly are veterinarians?" He presented situations wherein the veterinarians should recommend and advise practices that will not pollute the environment.

Abattoirs and livestock farms produce plenty of high polluting effluents. In developing countries, these are discharged into rivers or waterways. Government veterinarians should make sure that the disposal of the effluents are properly taken care of. It should start during the planning stage. In piggeries, the Chinese method of minimizing pollution is to raise fish and ducks at the same time. The pig manure is diverted to the fish pond. The fish and ducks get their food in the pond. Another practice which has gained adherents in the Philippines is to use the fermenting pig manure as a source of methane gas which then can be used as fuel for households. With this method, electric bills are reduced and pollution is also minimized. The use of pesticides should be regulated by veterinarians in the concerned agencies. In the Philippines, the Fertilizer and Pesticide Authority (1996), listed 17 pesticides that are banned, e.g., ethyl parathion, arsenite, DDT, ENDRIN, ANTU, strychine, etc.

Veterinarians in the pharmaceutical industry should see to it that regulations are followed which should prevent chemical pollution and residues. They should also prevent unnecessary suffering of their experimental animals.

In South America, the Pan American Health Organization (PAHO) and WHO (Arambulo and Paganini, 1995) described the "ruralization" of urban areas because of the maintenance and breeding of food animals, backyard slaughter, and marketing activities. The same activities are also encountered in urban areas in the Philippines, specially among the squatters. The prevention and control of environmental pollution in this situation is fraught with difficulties mainly due to political and social reasons. In rural areas of the Philippines, the same situation exists particularly among backyard livestock and poultry producers. There are also commercial and semi-commercial piggeries which contribute significantly to environmental pollution. Some of them have made provisions for the treatment of their effluent but some have not. Others who are more economically conscious have installed biogas generators using the fermenting pig manure. It serves a double purpose: this method is a source of fuel to the pig farmers thus saving on electricity bills besides minimizing environmental pollution. Piggery biogas generators reduce the risks of exposing humans to harmful animal pathogens because during the fermentation of pig manure, pathogens are killed and even some harmful chemicals are destroyed.

COMPARATIVE MEDICINE: BIOMEDICAL RESEARCH

Gay (1967) as cited by Bailey (1978), defined comparative medicine as "the study of phenomena basic to the diseases of all species and is considered to have its primary ultimate objective the improvement of human health and welfare". By this definition, veterinary medicine plays a significant role. Included in comparative medicine are human medicine and veterinary medicine. The three disciplines together with the other allied disciplines are all interrelated and all contribute to the promotion of human health (Figure 6, Bailey 1978). WHO (1958) defined "health" as a "state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". Comparative medicine in relation to veterinary medicine is also the study of similar disease processes affecting both animals and man. Viewed in this light it is categorized under zoonoses. The other aspect of comparative medical study is the use of animal models which can serve as the medium whereby a disease of humans and its pathogenesis can be studied. The results can lead to better understanding of a disease and thereby come out with therapeutic and preventive measures.

The comparative studies of zoonotic diseases in human and animals have been extensively investigated by several veterinary researchers. The book of Acha and Szyfries (1987) is one of the excellent sources of the results of the comparative medical studies. Timoney et al. (1988) give a brief description of the more important zoonoses in their book.

The use of animal models in studying human diseases has long been used extensively in human medicine for the last 25 years or so (Bailey 1978). There are several animal models that have been used in studying similar disease syndromes in humans. For example, a form of dog mycotoxicosis affecting the liver had a striking similarity to that of human mycotoxicosis. Test systems that will be used in humans are first studied in animal models, e.g., malaria, schistosomiasis, trypanosomiasis. Other biomedical activities use animals particularly non-human primates. Malaria research in non-human primates is a good example of the contribution of animal model studies that contributed to a better understanding of the disease. On viral diseases, much has been learned about specific disease conditions by the use of animal models. For example infant diarrhea has been shown to be caused by a rotavirus identified as belonging to the same group of viruses affecting calves, piglets, lambs, foals, and rabbits. It is therefore obvious that these animals can be used as models for a comparative study with the human pathogens and thus contribute to elucidation of the disease processes and the corresponding immunological responses. Perhaps a vaccine can be developed to prevent this malady in humans. These are just a few examples showing the significance of animal models in studying human diseases. In fact Leader (1969), as cited by Bailey (1978), said that: "If we look carefully enough we will eventually find an animal model for every disease".

In a book entitled: "Future Directions in Veterinary Medicine" (Pritchard 1987), stated that models may be found among the approximately two million existing vertebrate and invertebrate species of animals. Models at the molecular and cellular levels can be encountered. For functions at higher levels that include organizational activities and disease processes, animal models requiring higher vertebrates are needed. An example is the discovery that Texas fever in cattle was transmitted by an invertebrate, the tick, and the elimination of the tick vector of the disease, led medical researchers to study arthropod-borne diseases and likewise controlled similar human diseases. Another example is the retrovirus infections of animals which have been investigated by veterinarians. When AIDS of humans was discovered to be caused by a retrovirus, the animals exhibiting these diseases served as the models for studying the AIDS retrovirus. The use of halothane anesthetic in man has caused a fatal malignant hyperthermia which closely resembles also the fatal porcine stress syndrome. Dantrolene was used in pigs to treat this disease and it was also used in man to treat malignant hyperthermia. Marek's disease was devastating poultry disease with symptoms and pathology of a malignant neoplasm caused by a virus. Veterinary researchers have perfected a vaccine that prevents Mareks disease in chickens. It can be claimed that this is the first vaccine to be developed against a virus-induced "cancer" in chickens. Medical researchers are studying this veterinary discovery in the hope of also preventing virus-induced cancer in man. For every disease of humans there is probably an

identical disease in animals. The animals so affected are the only specimens that can be studied in terms of its etiology, pathogenicity, and control. Table 6 illustrates the animal models and their diseases with the human counterparts.

The majority of the models have been discovered and described by veterinary researchers. Medical researchers can now study these diseases in the animal models and apply this knowledge in controlling the equivalent human diseases.

CONCEPT OF "ONE MEDICINE" - AN OFF-SHOOT OF COMPARATIVE MEDICINE

The last half of the 19th century and the early part of the 20th century was marked by spectacular and dramatic discoveries in microbiology, both in bacteriology and virology. In fact this can considered the Golden Age of microbiology. During this period medical doctors and veterinarians worked hand in hand in investigating several human and animal diseases. They were the proponents of and active workers in comparative medicine. Bailey (1978) called these workers: "veterinary physicians". To name a few: Edward Jenner, observed during the deadly epidemic of smallpox in Europe, that the milkers of the dairy cows, although exposed to the highly fatal disease, did not contract smallpox. He found out later that milkers contracted a form of cow pox that resulted in similar lesions

Table 6. Spontaneously occurring animal disease models of diseases of people in a variety of animal species (Pritchard 1987).

Species	Human Disease Counterpart
Sheep (Scrapie)	Slow virus neuropathies
Cats	Porphyria
Dogs	Hemophilia
Chickens	Muscular dystrophy
Monkeys	Malaria
Turkeys	Cardiomyopathy
Cattle	Kreuzfeldt - Jacob disease
	Malignant lymphoma
Fishes	Malignant melanoma
Pigs	Von Willbrand's disease
Horses	Immuno-thrombocytopenia
Rice rats	Periodontitis
Hamsters	Bronchogenic carcinoma
Rabbits	Diabetes mellitus
Deer	Sickle cell anemia

as those resulting from as smallpox in their fingers and hands, without any fatal effects. Because of this observation, Jenner used the cowpox lesions to vaccinate the susceptible individuals. They did not contract smallpox. The medical doctors called this cowpox virus "vaccinia". Louis Pasteur, although not a physician nor a veterinarian but a chemist by profession, discovered with the help of his veterinary assistants, how to prevent anthrax in sheep, rabies in humans, and fowl cholera in chickens by the use of vaccines they formulated. Rudolf Virchow, a German medical pathologist observed some diseases of animals transmissible to man. He called these diseases: "zoonoses." Virchow also made the statement: "Between animal and human medicine there is no dividing line – nor should there be. The object is different but the experience obtained constitutes the basis of all medicines." Robert Koch, another German physician, together with his veterinary assistants, Fresch and Loeffler, discovered the virus causing the fearsome foot and mouth disease (FMD). William Osler, a physician was credited for coining the expression: "one medicine". About this time the concept of "one medicine" captured the imagination of veterinarians and physicians so much so that a *Journal of Comparative Medicine and Surgery* was launched by members of both professions in 1880. However the concept did not last long and the two disciplines became diverged at the beginning of World War I. Another medical doctor, M. Martinez-Baez, cited by Schwabe (1984), said, "The final objective of veterinary medicine does not lie in the animal species that the veterinarian commonly treats. It lies very definitely in man and above all in humanity." Truly, Baez was a firm believer in one medicine, Schwabe (1984) was also a proponent of one medicine. His diagram (Figure 6), wherein he linked the three disciplines: agricultural, veterinary medicine, and medical sciences and related health disciplines, ultimately leads to the promotion of human health and attests to this belief. The important role of the veterinarians is recognized in preventing malnutrition and how through their efforts in producing healthy food animals, this malady may be alleviated in developed and developing countries. It is because of his training in animal agriculture and veterinary medicine that the veterinarian is able to play an important and direct role in preventing and alleviating human malnutrition. Schwabe even mentioned that next to the physician the veterinarian made more research contributions to human health than members of other health-related professions.

CONCLUSION AND RECOMMENDATIONS

The definition of veterinary public health which mandates the veterinarian to use all his veterinary skills, knowledge, and resources to protect and improve the health of humans, is indeed a big challenge to the profession in the Philippines. In animal agriculture where the veterinarian has been traditionally involved, the profession has performed creditably but in veterinary public health, a relatively new field in the Philippines, much work needs to be done in order to make the public, and even some members of the veterinary profession itself, aware of

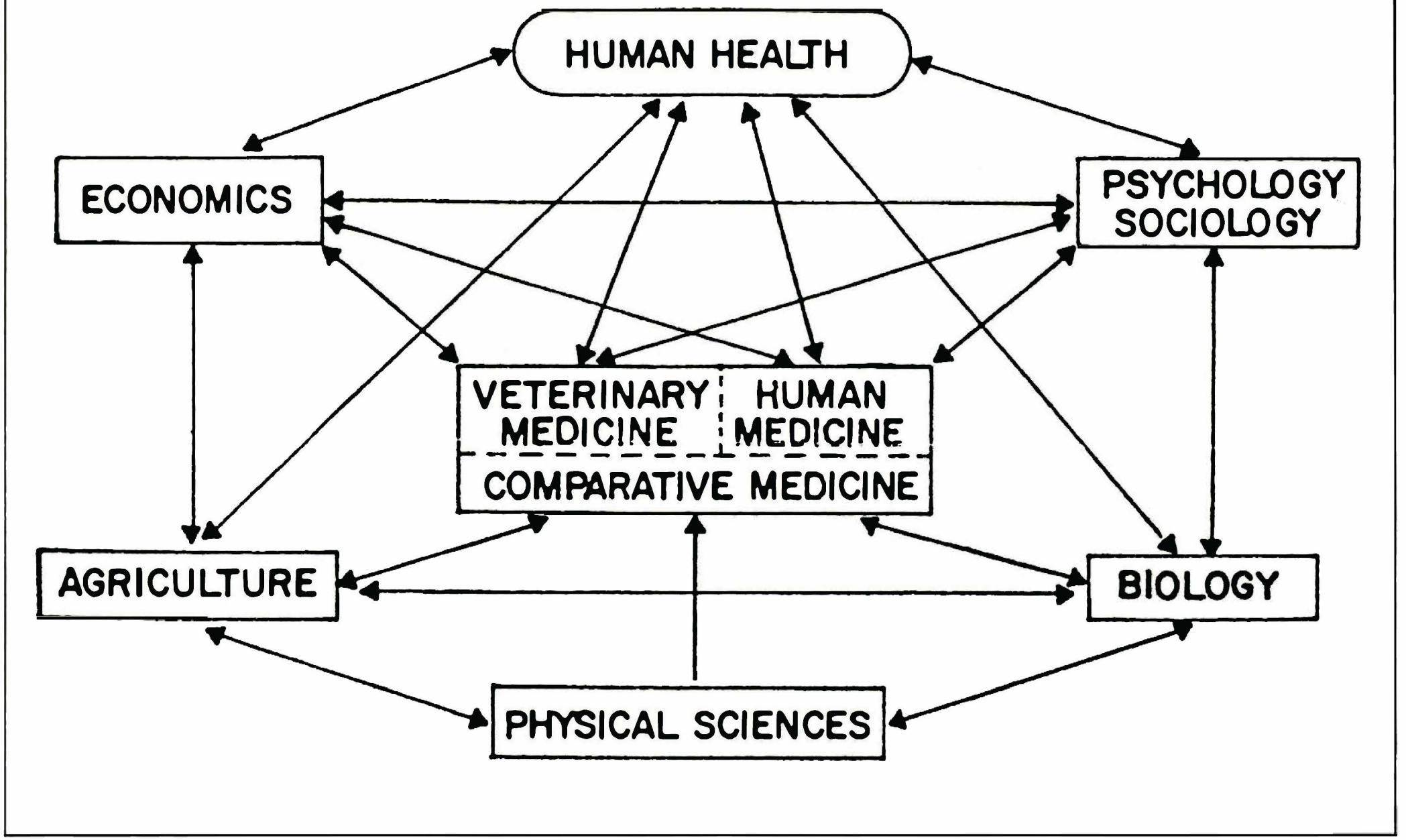

Figure 6. The relationships of selected disciplines and professions contributing to human health (Bailey 1978).

the direct role that the profession can contribute to the protection and promotion of human health. As a consequence of the developments in veterinary public health in other parts of the world, its importance and significance in the Philippines needs to be strengthened. It should start in the academic training of the veterinarians, undergraduate and post-graduate. Where the U.P. College of Veterinary Medicine, the premiere veterinary school of the country, has become stronger in animal agriculture due to the transfer of the College to Los Baños, its position in the discipline of veterinary public health must be strengthened so that it can achieve international caliber and eventual recognition. It must assume the academic and research leadership in this emerging field of veterinary medicine specially at the post-graduate level. This is not to de-emphasize the role of veterinary medicine in animal production but to complement the strength of the College of Veterinary Medicine in this area of agriculture. After all the objective in both disciplines is to produce safe and sufficient food of animal origin that will be consumed by the public and thereby protect and promote the health of the people. The veterinarian's responsibility is to see to it that food of animal origin and its by-products are safe for human consumption.

In the light of the worldwide developments in public health, it is proposed that a Graduate Institute of Veterinary Public Health and Comparative Medicine be established at the University of the Philippines Los Baños. It will specialize in veterinary public health offering graduate courses in all areas of concern previously discussed. With more than 200 animal diseases transmissible and common to humans, several of them fatal, coupled with the report that malnutrition is the world's leading cause of human illness, a gap is revealed in the field of public health in which veterinarians with specialization in veterinary public health can play a vital role. This will be more than enough motivation on the part of the University administration to seriously consider this proposal. The thrust of these courses will be towards the rural areas where the problems of veterinary public health and malnutrition are highly concentrated.

A COLLEGE OF HUMAN AND COMPARATIVE MEDICINE

Once the Institute is in place and fulfilling its role in protecting and promoting human health the idea of establishing a College of Human and Comparative Medicine at the Los Baños Campus can became a distinct possibility. After all in the diagram, Figure 7 (Schwabe 1984) which was shown previously, illustrating the relationships of selected disciplines in the promotion of human health, all these disciplines are in the UPLB Campus. It should be noted that the disciplines shown are geared to only one objective: HUMAN HEALTH. This diagram of Schwabe also clearly and logically supports this concept. The Graduate Institute of Veterinary Public Health and Comparative Medicine will serve as the starting point or the nucleus in the establishment of a medical school the thrust of which

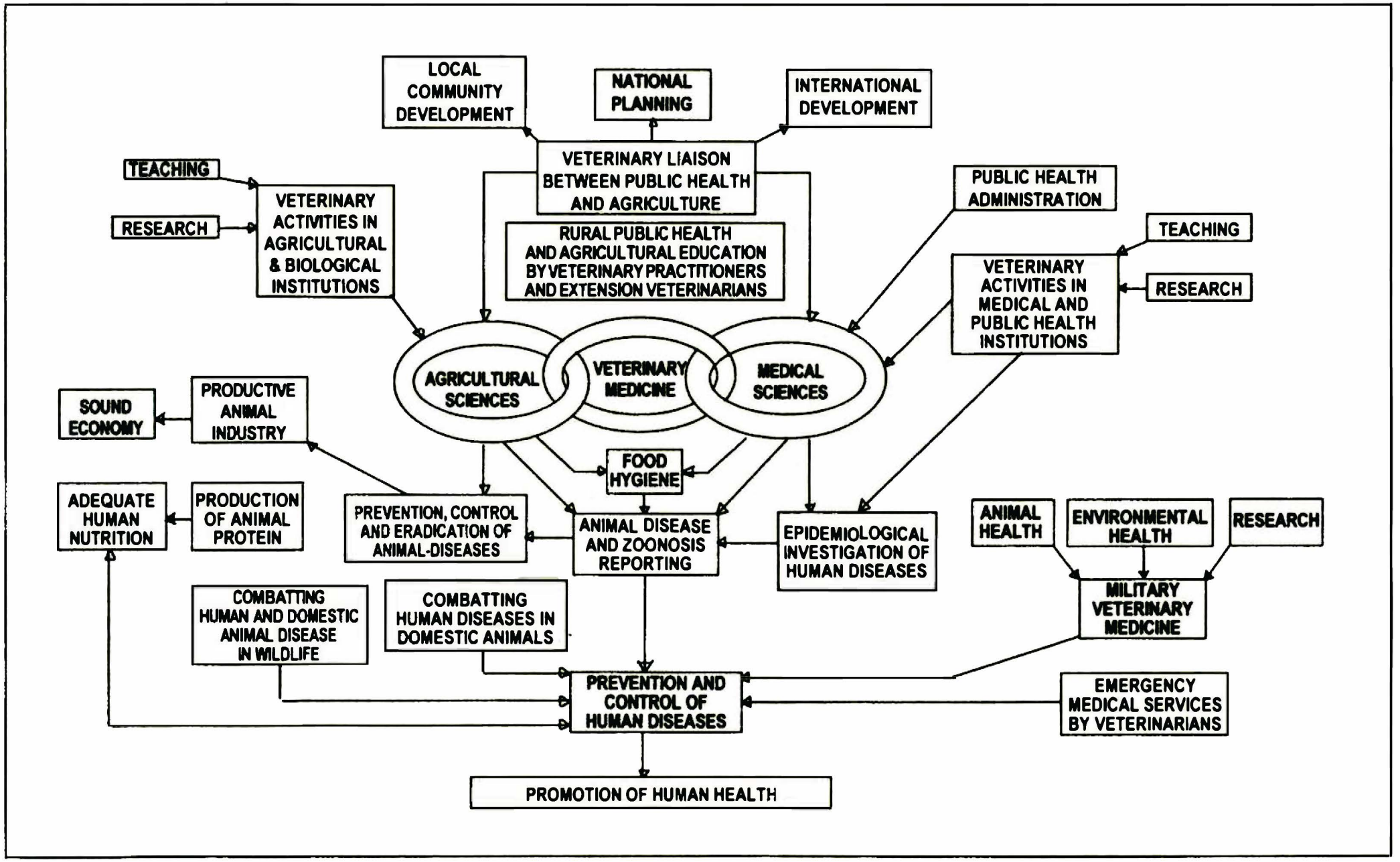

Figure 7. The multiple links of veterinary medicine with medical, agricultural and related sciences. (Schwabe 1984).

will be towards agriculture and which will fit into a new field of medical practice called agro-medicine. The graduates, both medical and veterinary, will be trained in rural medical practice since 70% of our population are in this area.

The establishment of a medical school together with an agriculture and veterinary academic institution is not new. There is such in a university in Sweden at Upsalla where the three institutions are in one campus. The arrangement has worked satisfactorily. In fact, the University of Upsalla has established an international reputation. Scientists who have won the Nobel prize in medicine and related sciences, deliver their award-winning research at Upsalla. If UPLB will pursue this concept, the administration can use Upsalla University as their model.

If this plan of establishing a Graduate Institute of Veterinary Public Health and Comparative Medicine pushes through, the vision of putting up an agro-medical school at UPLB can be realized and perhaps the dream of combining the disciplines of human, veterinary and comparative medicine including the agricultural sciences, can be realized in the distant future.

One last statement about Veterinary Public Health. Tjalma, cited by Schwabe (1984) stated that: "The future of Veterinary Public Health is limited by the ability of the profession to recognize its opportunities and accept its responsibilities." This statement is a very appropriate ending for the implementation of the concept of ONE MEDICINE.

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