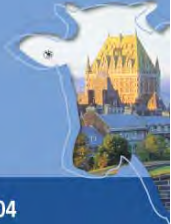


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Bovine Practice: Successes of the Past and Challenges and Opportunities in the Future

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INTRODUCTION

In the last 50 years, remarkable and interesting changes have occurred in bovine practice which have benefited the cattle producer, bovine practitioner and the consumer. The foreseeable future will be an even more interesting and exciting challenge for the cattle industry, bovine practitioners, veterinary educators and governmental veterinary medicine. This paper is based on my experiences in teaching and studying bovine medicine and health management for 43 years, and interacting with bovine practitioners during that same length of time.

Describing the present status and predicting the future of bovine practice is a very complex task because there are so many interacting factors. This paper will deal primarily with private bovine practice. Public bovine practice includes very important veterinary activities in governmental regulatory services, diagnostic veterinary laboratories, teaching and research, and industry veterinarians. Of even greater importance are the efforts of veterinarians in developing countries who are attempting to assist in the alleviation of poverty through the control of livestock diseases, the control of which are taken for granted in developed countries¹⁵.

SUCCESSSES, DEVELOPMENTS AND CHANGES OF THE PAST 50 YEARS

Modern bovine practice began in the 1950s when consumer demand for meat and milk increased following the Second World War. The emphasis was on individual animal emergency medicine. Pneumonia, calf diarrhea, foot rot, milk fever, acute mastitis, retained placentas, acute hardware disease, dystocias, and prolapses of the vagina and uterus were among the common problems handled by the veterinarian.

Between 1950 and 1980 many new diseases of cattle were newly recognized and our understanding of many existing diseases improved as a result of research. Progressive advances were made in bovine reproduction, surgery, nutrition, mastitis control, infectious disease control, vaccines and vaccinology, and clinical diagnosis and treatment of individual animals. The introduction of antibiotics gave practitioners a highly successful therapeutic. Bovine practitioners provided excellent service and became pillars of their rural communities. Clinical diagnostic technologies such as ultrasonography were adopted, and laboratory diagnostic tests improved.

Many vaccines for the control of infectious diseases of cattle were developed in the last 50 years. Even though many vaccines were approved for use based on experimental challenge studies, not all have been effective under naturally-occurring field conditions. Notable examples include those for the control of the bovine respiratory disease complex which is caused by several different infectious agents predisposed by risk factors. Vaccines which have been successful as aids in the control of infectious diseases include those for foot and mouth disease, E. coli K99+, brucellosis, anthrax, bovine virus diarrhea, infectious bovine rhinotracheitis and the clostridial bacterins. These are diseases whose etiology is clearly defined.

Veterinary medicine can be proud of some remarkable advances in vaccinology for the control of rinderpest or cattle plague which has devastated countless herds of cattle in developing countries, particularly Africa. In 1999, Walter Plowright, a British veterinarian received the World Food Prize of \$250,000.00 (US) for his research on rinderpest between 1950 and 1964 in Kenya which resulted in the development of the Plowright vaccine which is safe, effective and inexpensive. The vaccine can be used on both wildlife and livestock. It protects cattle for 10 years and for many for a lifetime. Widespread use of the vaccine has led to the virtual elimination of the cattle plague in all but a few isolated pockets in Africa, Asia and the Middle East. A target date of eradication has been set at 2010; comparable to the eradication of smallpox in humans.

In the 1970s, the principles of herd health evolved and gradually expanded over a period 25 years. Computer software programs for dairy herd health and beef cow-calf herd health and beef feedlots were developed. The principles of disease investigation of the herd were described and applied successfully, and modern veterinary epidemiology emerged as a huge success story in veterinary medicine. The concept of production medicine evolved and the necessity to teach it in the undergraduate veterinary program was encouraged⁷.

Revolutionary changes occurred in food animal agriculture in the 20th Century, and continues. The number of livestock farms continues to decline while individual farms have become larger and more intensified. The economical and efficient production of inexpensive, wholesome and safe meat and milk by cattle in the 20th Century is a fascinating success story of agriculture. Cattle producers, government agencies, agrologists, and veterinarians can be proud of their contributions to this success.

Four forces have strongly influenced changes in the structure of animal agriculture: *industrialization*, *globalization*, *food safety linkages*, and *consumerism*. These are all areas in which veterinarians' training and knowledge can be applied specifically. The need for veterinarians'

knowledge and skills in these areas is demonstrated by the AVMA's adoption of research priorities. Food safety for all Americans; food animal well-being; new and reemerging diseases of livestock; quality food from animals for a global market; and environmental quality and agriculture, among others, were adopted as 1995-1996 research priorities³⁴.

Consumers demand wholesome and safe food and they now influence how beef and milk are being produced. On-farm food safety programs were introduced in 1990s as a direct consequence of consumer concerns. Quality milk assurance programs in dairy herds and beef quality assurance programs in beef cattle herds and feedlots are gradually being developed.

Most veterinary curricula remained as generalist programs with increasingly more core-elective programs (undergraduate career path streaming and tracking) on a species or discipline basis being offered. However, it is generally agreed that veterinary curricula are overloaded and changes must occur so that students can begin to pursue a career path at the undergraduate level rather than attempting to learn everything¹⁷. The generalist undergraduate program does not prepare veterinarians to be competent for bovine practice at graduation. A undergraduate core-elective streaming program with an emphasis on dairy cattle practice, for example, is necessary if students are to become more competent in bovine practice on the day of graduation.

Most veterinary students are now female and from urban backgrounds with a very small percentage from meaningful food animal farm backgrounds. There has been a major shift of student interest to small animal practice and a concurrent decreasing interest in food animal veterinary medicine, and equine practice. A conference held in Kansas in 2002 addressed the question: Food Animal Veterinarians: An Endangered Species? Are Too Few Veterinary Graduates Choosing Food Animal Practice? What is the Problem?²². Surveys of veterinary students in veterinary colleges reveal that less than 15% desire a career in food animal practice. Surveys in Australia reveal that new veterinary graduates leave rural veterinary practice after about two years⁸. Also, there has been a decreasing interest in regulatory veterinary medicine, and teaching and research careers. In 2002, the Task Force of the CVMA on AEducation, Licensing, and The Expanding Scope of Veterinary Practice. in its opening statement said **Concern has been expressed that the relatively narrow and inflexible education and licensing system limits the development of the veterinary profession**¹⁷.

Clinical caseloads in veterinary teaching hospitals have become highly specialized tertiary care cases which are not desirable for undergraduate clinical training². Some ambulatory clinics, once a common activity of veterinary colleges in North America, are now closed or relatively inactive for various reasons, making student externships in private practice necessary.

Bovine practitioners have participated in a wide variety of continuing education programs such as preconvention seminars at meetings such as American Association of Bovine Practitioners. An increasing number of courses emphasize bovine health and production management. The American Association of Bovine Practitioners List Serve (AABP-L) has been an excellent electronic networking medium for practitioners to consult with each other about bovine health and production problems. The vast array of problems posted on a daily basis indicates the complexity of problems facing practitioners. Certificate programs in health and production management in dairy cattle were

developed and high successful ¹² .

Amazing advances in communications technology contributed to the successes of the past and will be an important basis for major progressive advances in the future. These include computer software programs for health and production management in dairy herds, beef herds and feedlots. The amount of information available on the internet developed only within the last decade is staggering and overwhelming. Video and digital imaging communications allow the transfer of video images of field necropsies in a feedlot to a veterinary practice where they can be viewed and evaluated and downloaded and stored for future reference ³⁵ .

Information technology and access to the veterinary literature and use of the modern desktop computer launched a fascinating never ending world of activity. Scientific articles can now be accessed through electronic journals. Individual animal identification systems for cattle have been and are being developed in worldwide are necessary for the control of infectious diseases and for biosecurity measures.

From the 1950s to the 1980s bovine practices flourished and many become multiple-person practices. Some remained as solo person practices which resulted in overwork, especially during the busy seasons of the year. But these practitioners enjoyed their work and were respected in their communities. In some geographical areas, large animal clinics were established for the treatment of individual animals such as dehydrated diarrhetic calves, dystocias, caesareans, surgery for displaced abomasa, and to serve as veterinary consultation centers. The sales of animal health products became on important source of revenue.

In 2004, bovine practice is much more advanced than 50 years ago. So much more is known about various aspects of all known diseases of cattle. Major advances have occurred in internal medicine, theriogenology, herd medicine, surgery, epidemiology, microbiology, immunology, serology, bacteriology, virology, parasitology, clinical pathology, anaesthesiology, ethology, pharmacology, toxicology, pathology, ruminant physiology, and medical imaging all applicable to bovine practice. The incidence of many diseases has decreased because of effective control by the producers.

Many bovine practitioners now provide various levels of animal health and production management services to large dairy herds, beef cow-calf herds, and beef feedlots. Health management and production are being collected, analyzed and decisions made based on good information.

FACTORS WHICH INFLUENCE SUCCESS AND PROSPERITY OF BOVINE PRACTICE

Many interrelated factors have influenced the success and prosperity of bovine practice and will continue in the future. Many of these factors are beyond the control of the cattle producer and the bovine practitioner.

Economics of Animal Production and Consumers

The prices cattle producers receive for their live animals and beef and milk have a profound influence on the success and economic prosperity of bovine practice. When commodity prices are depressed, producers restrict their use of veterinarians to the bare essentials or do not use them at all.

The continued industrialization of animal agriculture in developed countries, has resulted in an abundance of meat and milk which depresses prices because of the law of supply and demand. The relatively static per capita consumer consumption of beef and milk contributes to the abundance and failure of prices to increase to meet increasing input costs to the producer who in turn produces more product in an attempt to maintain economic viability.

In the document, *Livestock to 2020. The Next Food Revolution* the authors describe the revolution which is occurring in global agriculture which will have profound implications for human health, livelihoods, and the environment⁵. Population growth, urbanization, and income growth in developing countries are fueling a massive global increase in demand for food of animal origin.

In the consumer societies of the western world, per capita consumption of meat and many other livestock products is predicted to decline, where high income levels, widespread availability of an enormous variety of food products, low levels of malnutrition and increasing levels of cardiovascular disease, diabetes, and other complications of overindulgence have led to a negative view of animal protein⁵. This has been coupled with concerns over the environmental threats posed by the need to dispose of large amounts of animal effluent from large-scale and intensive food-animal production units.

Ironically, these factors are reversed in much of the developing countries. Malnutrition is rife in many regions, and livestock products particularly meat and milk, provide an important opportunity to overcome this by providing protein, micronutrients, and vitamins. The annual demand for meat is predicted to grow by 3.3%, dwarfing the growth rates of 0.6% for meat and 0.5% for milk predicted for the developed world⁵.

Effects of Certain Cattle Diseases On International Trade

The discovery of bovine spongiform encephalopathy (BSE) in the U. K. in 1986, and the outbreak of foot and mouth disease (FMD) in 2001, has had a profound depressing effect on cattle practice in the U.K.

The banning of imports of live cattle, beef, semen, embryos, and other by-products from countries

which have BSE and FMD has a devastating effect on the economy of the exporting country, and consequently the cattle industry, and ultimately bovine practice.

Environmental Factors

Marked environmental changes resulting in prolonged drought or flooding can have serious effects on feed and water supplies resulting in the deaths of animals because of starvation or dehydration.

Bovine Practitioner

The enthusiasm which bovine practitioners have for their careers can have a positive or negative influence on prospective veterinary students. Practitioners who enjoy their careers and promote the many rewards of meeting the veterinary needs of cattle producers can motivate students to pursue similar careers. Practitioners who are disillusioned with bovine practice may have deleterious effects on any aspirations students may have for bovine practice. The working conditions and the rural lifestyle must be made attractive to prospective veterinary students who have many other career alternatives.

Veterinary Education

The generalist veterinary curriculum does not prepare the new graduate to be competent and confident in any more than the simple veterinary needs of the modern cattle producer. Learning to become competent and confident to meet the health and production management needs of the modern dairy cattle producer, with a huge capital investment, is extremely difficult and prolonged, and unreliable, without a structured supervised postgraduate professional training program. Consequently, the new graduate is most comfortable in a general mixed animal practice. There is a need for in-depth undergraduate career path programs in a species or discipline which prepares the new graduate to meet the broad needs of the producer.

Management Expertise of the Producer

The level of management expertise of the cattle producer has a profound effect on the enthusiasm and success of the practitioner. Producers who are progressive, have good records, and who give high priority to improving health and production management will motivate the veterinarian to be progressive and enthusiastic.

OPPORTUNITIES IN BOVINE PRACTICE OF THE FUTURE

The next phase in bovine practice will be continued expansion of totally integrated animal health and production management to meet the goals of the cattle producer who must in turn meet the needs of society for wholesome and safe meat and milk, and for sustainability of the environment. This service will be provided by specialist bovine practitioners

A golden opportunity exists for cattle producers and bovine practitioners to become proactive in a total animal health and production management veterinary service. Bovine practitioners should be leaders in shaping the future of the cattle industry rather than simply reacting to events or production practices.

The knowledge and the technology are available to provide a cost-effective comprehensive health

management veterinary service to production-oriented livestock producers. The delivery of the service by veterinarians is the greatest challenge facing food animal practitioners. The emphasis is changing from the treatment of disease to health and production management.

The basis for the future in bovine practice will be: the continued growth of world population; the continued increasing demand for wholesome and safe meat and milk; the continuous industrialization of animal agriculture; *the increasing importance of the herd as the unit of concern, and its health and production, rather than the individual animal*, the importance of animal welfare; the economic viability and financial success of cattle producers; modern information and communication technology, and the education of bovine practitioners.

Towards A Philosophy of Bovine Practice

Bovine practice evolved through emphasis on individual animal medicine. The future of bovine practice will be influenced by our philosophy as bovine practitioners. We need to articulate our purposes and goals, our education and skills. The defining characteristics of bovine practice would be as follows:

- X The purpose of cattle is for the production of wholesome and safe meat and milk and other by-products for consumers.
- X Our role is the diagnosis, treatment and control of diseases of cattle which affect their health and production.
- X Assist the producer in the integration of health and production management of the herd both economically and humanely.
- X Emphasis on the food safety and the control and prevention of the zoonoses.
- X Protect the national herd against diseases such as foot and mouth disease and bovine spongiform encephalopathy which threaten international trade of cattle and their by-products.

The **Aims of the World Association of Buiatrics** are as follows:

To propagate scientific and practical knowledge of the management and production of cattle, and the control of cattle diseases.

The objective of the association is to improve the competitiveness of the bovine practitioner in the field by contributing to a high standard level of basic veterinary education provided by competent scientists; specializing not only in bovine medicine but also in all aspects related to bovine production, i.e., nutrition, genetic, reproduction, biotechnology, etc...

- X anticipation of changes occurring in the consumer
- X demand and in the availability of new production
- X techniques;
- X rapid adaptation to these changes;
- X continuous retraining with highly specialized teachers;
- X aggressive competition;
- X professional promotion of the bovine practitioner as an essential partner in animal health, optimal and profitable productions, consumer safety, animal welfare.

Consideration of these aims reveals an enormous responsibility for the veterinary profession including veterinary education and all sectors of bovine practice to meet the needs of the cattle industry.

THE ANIMAL HEALTH AND PRODUCTION MANAGEMENT NEEDS OF THE CATTLE INDUSTRY

The most important objective in bovine practice is the continuous improvement of the efficiency and economic viability of the production of cattle herds by the management of animal health and production. This involves several different but related activities and responsibilities including the following:

Education of the Cattle Producer. The expectations which cattle producers have from their veterinarian varies widely depending on the value of the herd. Producers expect to be provided with the practical knowledge and skills required for economical, efficient and profitable health management of the herd. Bovine practitioners must give high priority to educating the producer about the relationship between all aspects of animal health and production management at the individual herd level and beyond the farm regionally and nationally. Producers must understand the causes of disease, how diseases affect production, the various risk factors which are important to manage, and the principles of disease control. There is a constant need to raise the level of awareness of producers about the important aspects of infectious diseases, and the reasons for quality assurance programs for meat and milk production. Producers must be aware of the zoonoses possible from cattle, the risks and how they are controlled.

Animal Identification, Records and Records Analysis. Individual animal identification at birth, and the recording, collection, analysis and use of animal health and production data are essential for the monitoring of progress, disease surveillance and investigation, and for making rational decisions. Witness the importance of individual animal identification in the investigation of the BSE cases.

Clinical Diagnosis, Treatment and Control of Disease. The clinical diagnosis of individual animals or groups of cattle with clinically obvious illness will continue to be a major responsibility requiring diagnostic skills to make a diagnosis rapidly and economically on the farm with the aid of laboratory services as necessary. As herds become larger, veterinary technicians and animal attendants will do more of the routine individual animal medicine in consultation with the veterinarian.

Herd Investigation of Disease and Suboptimal Performance. The diagnosis of suboptimal performance and subclinical disease in the herd will be of even greater importance and will require investigative skills and knowledge integrating health and production. Being able to examine a herd of dairy cattle, beef cattle, or a pen of feedlot cattle for clinical or subclinical disease or suboptimal performance, and, collect the relevant history, epidemiological and clinical findings and make a diagnosis which result in correction of the problem is a major challenge. It requires that the practitioner spend time investigating the problem on the farm, make repeated visits and follow-up

examinations, and have access to excellent diagnostic laboratory services as necessary. The steps recommended for examination of the herd have been outlined and described²⁴.

Control and Prevention of Infectious Diseases. The control of infectious diseases, including parasitic diseases will be a major activity for producers, private practitioners and regulatory veterinary medicine. Important aspects include risk management, vaccines and vaccinology, control of zoonoses on the farm and in abattoirs, and antibiotic resistance and drug residues in meat and milk. **Biosecurity and prepurchase testing** must be given high priority to prevent introduction of infected carrier animals into herds and feedlots.

Preparedness for foreign animal diseases. Veterinarians have a major responsibility to be prepared to diagnose, prevent, control and eradicate foreign animal diseases³⁰. This means that veterinary education in foreign animal diseases will continue to be critically important if veterinarians are expected to fulfill the profession's primary obligations to society: those of protecting our animal's health, conserving our animal resources, and promoting public health. Consideration of the impact which BSE and foot-and-mouth disease have had in some countries provides ample evidence of the importance of infectious diseases.

Management of Common Disease Complexes. Several disease complexes of cattle continue to challenge the bovine practitioner. Examples include: bovine respiratory disease complex, neonatal morbidity and mortality weaning calf morbidity and mortality, diseases of the ruminant stomach and abomasum, diseases of the postparturient dairy cow, lameness in dairy cattle, and diagnosis and disposition of the downer cow syndrome.

Nutrition, Feeds and Feeding Systems. Monitoring the nutritional status of the herd is a large part of production-oriented health management especially in dairy herds. In large herds, professional nutritionists will be employed as consultants.

Housing and Ventilation. Providing advice on housing and ventilation, especially for dairy herds, in areas with cold winters and those with hot summers, is an increasingly important responsibility of the veterinarian in consultation with agricultural engineers.

Reproductive Performance. Efforts to achieve and maintain a high level of reproductive performance in both dairy and beef herds will be a high priority for producers and practitioners.

Animal welfare advocate. Encouraging livestock producers to maintain standards of animal welfare which comply with the views of the community is emerging as a major responsibility of the veterinarian. The production of food-producing animals under intensified conditions has now become an animal welfare concern which practitioners must face and become proactive.

Zoonoses and food Safety. Promoting management practices which ensure that the meat and milk are free of biological and chemical agents which are capable of causing disease in man must also become a preoccupation for food-producing animal veterinarians. The general public is concerned about the safety of meat and milk products it consumes and the most effective way to minimize

hazards presented by certain infectious agents and chemical residues in meat and milk is to control these agents at their point of entry into the food-chains, namely, during the production phase on the farm.

On-Farm-Food Safety Programs. Canadian On-Farm Food Safety (COFFS) Program is an example of a producer-led, industry/government partnership that provides national commodity groups with the opportunity to develop the strategies and the necessary tools to educate producers and to implement national on-farm food safety initiatives consistent with the Codex Alimentarius' Hazard Analysis Critical Control Points (HACCP) definitions and principles and with the Canadian Food Inspection Agency's Food Safety Enhancement Program.

The **Canadian Dairy Industry** has adopted a **Milk Quality Assurance Program** consisting of Best Management Practices, Hazard Analysis Critical Control Points Approach, Critical Control Points, and Standard Operating Procedures. To be validated a Canadian Quality Milk (CQM) farm, a number of criteria must be met.

Factory Farming As A Societal Issue. The industrialization of food animal agriculture, or often called '>factory farming' is a major issue which must be addressed by veterinary educators and food animal practitioners. The American Society of Animal Science has recently focused its attention of a variety of contentious issues in animal agriculture²⁷.

The Need for More Science in Bovine Health Management

Research is the continuing questioning and refinement of what we perceive as truth. The purpose of veterinary research is to improve our knowledge of the diseases and health management of the species of primary veterinary concern¹¹. Clinical research is necessary to improve our understanding of the etiology, epidemiology, diagnosis, treatment and control of the common diseases of the species of primary concern. Clinical research allows us to test the hypotheses underlying our clinical decisions and allows us to practice evidence-based medicine rather than depend on empirical medicine. The last decade has seen an increase in the publication of well-designed prospective and retrospective case studies and these need to be encouraged and improved. The importance of case studies reinforces the value of a critical clinical caseload in the veterinary teaching hospital. If the caseload is not available at the college, the case material in private practices will have to be used. Every up-to-date clinician prefers to practice the best evidence-based veterinary medicine possible within certain economic limits. The results of randomized clinical field trials to evaluate drugs and vaccines are being published and more are needed.

There is a major need for animal health research to alleviate poverty in developing countries¹⁵. It has been estimated that livestock form a component of the livelihoods of 70% of the world's poor¹⁵. Livestock are important in supporting the livelihoods not only of farmers but also of consumers, traders and labourers throughout the developing world. Animal diseases are an everyday occurrence to these people, as the animals of the poor are particularly vulnerable to disease (due to many reasons, including lack of knowledge about their management and control, and lack of access to Band resources for Banimal health and production inputs and services¹⁶.

THE DELIVERY OF VETERINARY SERVICES IN BOVINE PRACTICE OF THE FUTURE

Changing the Paradigm of Private Bovine Practice to Integrated Animal Health and Production Management.

It is the responsibility of the members of the practicing veterinary profession to take the lead in developing and implementing a best practice model for mixed animal practice and specialty food animal practice. Bovine practitioners are expanding their services in health and production management, and doing relatively less individual animal medicine more of which will be done by owners, animal attendants, and veterinary technicians. Herd health and all its related activities such as food supply, food safety and food quality, (veterinary public health) and protection of the environment from intensified animal agriculture is the way of the future and abounds with many different opportunities for veterinary graduates. To be successful, veterinarians must educate producers and their staff about the economic benefits of integrated animal health and productionBtotal animal health care.

The fundamental task for food animal veterinarians is to shift from a fee-for-service or task oriented business relationship to a fee-for-advice or information oriented business relationship that is focused on the financial performance of the livestock enterprise³⁴. *The costs of veterinary services will have to be spread over the entire herd rather than the individual animal.*

Food animal veterinary medicine serves producers and must respond to the forces that influence the clientele it serves. The ultimate business of the livestock industries is to produce food for human consumption. Practitioners who deal exclusively with dairy cattle, beef cow-calf herds, beef feedlots, are health and production management oriented which is very complex. **"The knowledge and the technology are available to provide a cost- effective comprehensive health management veterinary service to production- oriented livestock producers. The delivery of the service by veterinarians is the greatest challenge facing large animal practitioners"**²⁰

At the undergraduate level our greatest challenge is to teach, motivate and excite those students who are interested, how to deliver a comprehensive health management and production veterinary service to the modern livestock producer.

Health and Production Management of Cattle Herds

A planned animal health and production management program, commonly known as herd health, or production-oriented medicine, is a combination of regularly scheduled veterinary activities and good herd management designed to achieve and maintain optimum animal health and production. These programs vary from simple ones, in which the veterinarian visits the herd on a regular basis to examine animals and their performance and to make recommendations for the control of disease and improvement of production, to intensive programs, in which the veterinarianCwith the assistance of other agricultural science specialistsCmakes detailed recommendations about the daily management of the animal health production program. This may include recommendations on nutrition, housing, genetic improvement, purchase of breeding stock, selling of animals ready for market, and cash flow. Some veterinarians are now employed as resident herd managers and are responsible for

ensuring maximum use of all available resources by coordinating the services and advice provided by all the agricultural advisors who are involved with the herd. An understanding of production medicine is essential if veterinarians are to have a role in the livestock production industries of the future ⁷.

Objectives of Health and Production Management. *The primary objective of a health and production management program for herds of cattle is the maintenance of animal health and production at the most efficient level that provides competitive economic returns to the animal owner* ²³. The goal is to control and manage animal health and production at a high level of efficiency while seeking and introducing new techniques that can continue to improve efficiency. An equally important secondary objective is the provision of comfortable animal facilities, and handling, and housing commensurate with reasonable animal welfare.

Targets of Animal Health and Production Performance. The objectives of herd health are achieved by the application of the concept of target of performance. *A target of performance is the level of animal health and production considered to be optimum and to yield the best economic returns on investments.*

In a herd health program, the actual levels of animal health and production are determined on a continual basis and compared with the targets of performance. The differences between the targets of performance and actual performance are the shortfalls in performance. The reasons for failure to achieve the targets of performance are then identified. Recommendations for improvement are made and performance is monitored continuously to assess the effectiveness of the action taken. These measures are then repeated on a continuous basis

Types of Bovine Practices

Mixed Animal Practice

Mixed animal practice in rural communities is becoming limited to cattle and small animals, and horses. In many of these practices, most of the large animal work is cattle practice.

The emphasis in mixed animal practice has been and will continue to be on individual animal medicine, emergency service, some herd investigations, and task-oriented herd health work such as pregnancy diagnosis, breeding soundness examination of bulls, and recommendations on health management such as vaccination schedules.

Sales of drugs and vaccines constitute a significant portion of income. The number of veterinarians in mixed animal practices varies from one to several with and several and there is a tendency for each veterinarian to develop a special interest in certain aspects of a species or a discipline.

Historically, food animal practitioners entered mixed animal practice in rural communities, were motivated and dedicated, and became pillars of the community. They raised families successfully. Inevitably many such practitioners shifted to do more small animal practice as it became available. But now these practitioners are finding it difficult to recruit new graduates into these rural areas and

cannot sell their practices.

The percentage of veterinary practitioners engaged in a single-species such as small animals and horses, has increased and continues to increase while the percentage in mixed animal practice continues to decline¹⁸. The number of small animal practices continues to increase while the number of large animal practices remains about the same and perhaps is declining.

Dairy Cattle Practice

There are many opportunities in general or specialty dairy cattle practice. The spectrum of the dairy cattle practitioner in North America varies from the generalist who provides routine emergency individual animal medicine and some basic herd health activities for herds from 50 to 200 cows, to the specialist who provides a broader in-depth service for dairy herds ranging in size from 200 to several thousand lactating cows. In some large herds, resident veterinarians are employed full time by the producer.

A dairy cattle veterinary specialist provides comprehensive health and production management veterinary service including evaluation of reproductive performance, mastitis control and milk quality including milking machine evaluation, calf health management, embryo transplant services, nutritional status of the herd and feeds and feeding consultation, infectious disease control and vaccination recommendations, advice on culling and breeding programs, biosecurity strategies and herd accreditation schemes for purchasing and selling breeding stock, evaluation of animal health and production records, and the economics of milk production. Such bovine practitioners now make regularly scheduled visits to the farms and may spend several hours to a full day on health and production management **of the herd**.

Beef Cow-Calf Herd Practice

There are many opportunities in beef cattle practice, either in a mixed multiple-person practice, or as a beef cow-calf specialist. Beef herds in North America vary considerably in size. In the US in 1998, 80% of the beef herds had 1-49 cows, 12% 50-99 cows, 7.7% 100-499 cows and 0.6% had more than 500 cows. The needs of beef cattle producers vary from individual animal medicine, to basic herd health procedures such as pregnancy diagnosis, breeding soundness examinations, and providing advice on disease control and vaccination recommendations. The caseload is typically seasonal. Common practices include breeding soundness examination of bulls prebreeding, pregnancy diagnosis and selection of cows for culling in the fall, and management of weaned calf diseases. During calving season, emergency services consist primarily of obstetrical assistance including caesareans as necessary, and the treatment of calves with neonatal disease. As herds become larger, owners become more knowledgeable and expect more from veterinarians such as evaluation of the feeds and feeding program for the winter months, evaluation of production records, prebreeding evaluation of the female part of the herd, biosecurity strategies, vaccination protocols, and provision of advice on calving management, weaning procedures, heifer replacements selection, and consultation on the economics of production. The veterinarian may make several scheduled herd visits annually to make observations, collect animal health and production data, do pregnancy diagnosis and breeding soundness examinations and evaluate the nutritional program. Producers of purebred beef herds increasingly expect their veterinarian to be very knowledgeable and skilled in

all aspects of health and production management of the herd.

Beef Feedlot Practice

Feedlot veterinary medicine has now become very advanced as a result of leaders in the field who developed excellent programs.

The feedlot veterinarian is responsible for maintaining optimum animal health through the following activities:

- X Makes regularly scheduled visits to the feedlot, is punctual, and stays as long as necessary for adequate consultation. The frequency of visits depends on the size of the feedlot, the time of year, the expertise of the feedlot personnel, whether animals have recently arrived, and the degree to which the veterinarian is contractually responsible for the total animal health program.
- X Is available for emergency visits to the feedlot when disease epidemics occur unexpectedly.
- X Performs necropsies during the visit and trains feedlot personnel to do necropsies at other times.
- X Examines sick animals with the treatment crew to ensure that reasonably accurate diagnoses are being made and rational therapy is being given according to the previously provided treatment protocol.
- X Regularly examines, analyses, and interprets animal health and production data and periodically makes recommendations in a written report. The effectiveness of detection of sick animals, based on response and relapse rates and case fatality rates, should be determined, and the effectiveness of the processing program for new arrivals, which includes the vaccines used and the medications given, should be examined and analysed regularly. The veterinarian is responsible for selecting and prescribing all drugs used in the lot, giving specific advice about the use of drugs, and establishing a drug residue avoidance program in the lot.
- X Discusses overall animal health and production performance with the feedlot manager and other consultants. He or she coordinates the advice of other specialists, sets animal health and production goals, and monitors achievement.
- X Performs bench marking with other operations. Produces a monthly report that compares processing costs, treatment costs, and death loss by arrival weight and days on feed for clients in the consultants practice.
- X Takes an interest in all aspects of the feedlot operation and makes an effort to be aware of new developments in the feedlot industry.

Feedlot Health Management Services (HMS) is a consulting company providing comprehensive herd health programs, veterinary consulting services, and computerized health recording systems to feedlots throughout western Canada and the United States.

The company is based in Okotoks, Alberta, Canada and currently employs 9 veterinary consultants and 18 administrative personnel. The practice has expanded over 18 years and presently provides production consulting services to beef feedlots with an annual throughput of greater than one million

animals.

STRUCTURE AND OPERATION OF BOVINE PRACTICE IN THE FUTURE

Multiple-Person Practice

Multiple-person practices with bovine specialists are becoming more common. Several veterinarians in a group can consult with each other, regularly review cases and herd problems, roster night and weekend emergency service equitably, and, very importantly, provide the opportunity for each veterinarian to pursue certain areas of interest and become experienced and highly competent in a particular aspect of the practice. Practices will then become centres of excellence. A group practice provides the time and the opportunity to develop more health and production-oriented services if the routine individual animal medicine is shared among the members of the practice, or as is commonly done, the most recent graduate will do most of the individual animal medicine and gradually develop the knowledge and skills necessary for herd health work.

Time can be made for individual veterinarians to pursue certain specialized continuing education programs such as Certificate Programs which may lead ultimately to Board Certification. Effective supervision and mentorship can be provided in a multiple-person practice. With an adequate number of veterinarians in a practice, qualified support staff like veterinary technicians can be effectively employed. The experiences of veterinary students doing externships in these practices will be enhanced because there will more likely be sufficient work to be done compared to the single person practice which may have very busy times or very little to do depending on the season.

Corporate food animal practice may be the way of the future. This would involve as many as 10 to 15 veterinarians in a practice. A business manager would be a major asset, and one or more veterinarians could gradually develop expertise in epidemiology and animal health and production data analysis, field pathology, housing and ventilation, applied nutrition and feeding programs, reproduction, calf health management, and mastitis control and milk quality. Technicians would be employed to provide assistance on the farm and in the clinic centre.

Supervision, Mentorship and Career Guidance of New Graduate

Many new graduates feel that there has been insufficient supervision, mentorship and career guidance in practice. Supervision means overseeing and assisting as necessary of all or most of the veterinary activities, including client interactions, and business transactions, for the initial stages of employment of the new graduate. The amount of direct supervision required must be determined by the employer who evaluates the level of competence and performance of the graduate initially. Regular feedback, including praise for work well done, and constructive criticism as necessary about competency and performance are necessary for development.

A major problem of supervision in bovine practice is the difficulty and practicality of providing direct supervision of clinical work on the farm. Where much of the service is provided on the farm, it is impractical and uneconomic to provide direct supervision.

A mentor is a wise and trusted teacher or guide who takes a sincere interest in the development of

the new graduate. Mentorship in veterinary practice is developing a friendly and professional relationship with the new graduate by providing guidance and advice about both professional and citizenship development. Careful and considerate listening is a major asset of an effective mentor. Taking a regular interest in the activities of the new graduate is vital. Recognizing and enhancing the strengths, and understanding the weaknesses of the new graduate and being patient and tolerant of inexperience are necessary mentoring skills. Sincerely praising work well done is an integral part of mentoring, and being helpful and considerate about errors in diagnosis or difficult cases or clients are important. The relationship must be trusting, honest, respectful, confidential, accountable, and mutually beneficial. The new graduate should not ever feel reluctant to seek advice from the mentor about daily practice activities or professional aspirations. An effective mentor is able to make the new graduate practice critical self-appraisal of performance. Another important objective of mentorship is effective development of the person as a citizen, family member, team member, and veterinarian to meet the needs of society. Ideally, an effective mentor is an inspirational role model for the new graduate to become personally self-motivated and self-disciplined which will enhance the unique skills of the graduate which invariably are different and perhaps superior to the mentor.

Practitioners also have a critical role to play in career development of new graduates. New graduates need guidance about how to develop a career path in veterinary practice which will be satisfying, rewarding, and meets the needs of the clients. This includes advice on the business aspects of investing in a practice. New graduates need to develop a sense of pride in the practice and made to feel that they are contributing to its success.

Keeping Up To Date in Bovine Practice

Keeping up to date with the relevant literature in bovine practice, as in any other sector of veterinary medicine, is a challenging task. The large number of sources of information is overwhelming. New information is being published daily in scientific journals, textbooks, government documents, and extension bulletins. The Internet now provides large amounts of information on almost every aspect of bovine health and production management. However, it must be considered carefully for validity and reliability. Continuing education courses on a wide variety of topics in bovine practice are offered on a regular basis worldwide. The American Association of Bovine Practitioners List Serve provides a forum in which AABP members worldwide may discuss techniques, materials, and issues related to veterinary medicine in cattle, and to maintain a library of related materials for electronic distribution. Specialists in disciplines of bovine practice, such as theriogenology, internal medicine, surgery, and epidemiology at veterinary colleges, diagnostic laboratories, and industry veterinarians are also an excellent source of specific information when consultation concerning clinical cases or herd problems are encountered. Animal scientists, nutritionists, agricultural engineers, agronomists, and others are also available at universities and research institutes for consultation.

How does the bovine practitioner remain current with important new information which may be applicable in practice?

Practitioners must develop the discipline of regularly scanning selected journals and reading articles which are relevant to their practice needs. Articles of importance must be filed using a simple system so that retrieval is easy and quick. Most bovine practitioners claim they do not have sufficient time

to critically read veterinary journals, and very few practitioners subscribe to more than a few journals. However, in a multiple person practice a good cross-section of relevant journals can be received and available in the practice library which should be a high priority for keeping up to date. Each practitioner must develop a disciplined routine of critically reading journals and, most importantly, make the changes necessary in health management which are progressive and beneficial. Continuing education must be given high priority by the practice.

Keeping up to date can be will require continuing education cooperation between practitioners in a multiple-person practice and networking between practices using electronic communications. Dairy cattle health management certificate programs in which a number of practitioners participate in regular continuing education program provides an excellent opportunity for 30 to 40 veterinarians to share their experiences and the new information they find in journals. The Dairy Health Management Certificate Program offered by the Ontario Veterinary College, Guelph, Ontario, has been highly successful in providing advanced dairy cattle health and production management to dairy cattle practitioners.

The American Association of Bovine Practitioners provides Preconvention Seminars annually. A wide range of specialized topics are offered by specialists which provides excellent opportunity to become aware of new information and skills which can be used to make changes in the veterinary services provided to the producer.

Veterinary colleges have traditionally not taught students how to develop a personal library and how to find information to answer important questions and problems encountered in practice. It has been assumed that students, and then graduates, will develop their own system of keeping up to date and finding information to solve problems. Exercises to learn how to use the veterinary literature in clinical situations could be incorporated into the experiences of students in clinical rotations of veterinary teaching hospitals or in practice externships.

Emergency Veterinary Service Out of Regular Practice Hours

The provision of emergency veterinary service in bovine practice after regular day hours and during the weekends and holidays is an issue, particularly for recent graduates. Possible solutions to mitigate the onus of such service work include the following:

- X Educate producers to request service during regular hours. This requires close surveillance of animals and the early detection of those which require veterinary assistance. An after hours call charge may motivate producers to minimize the number of unnecessary out of hours calls
- X Gradually educate and instruct producers how to do routine procedures on their own. Provide a manual for standard operating procedures for the detection, diagnosis, treatment and recording of the common diseases. This includes a supply of the animal health products which should be kept on hand and provided by the veterinary practice.
- X Employ veterinary technicians to assist with many of the common technical procedures encountered in routine and emergency service. The incorporation of veterinary technicians into food animal practice has the potential to improve the working conditions.
- X Develop and maintain a multiple person practice which allows for equitable distribution of

- the entire workload. Provide time off to the veterinarian who has been busy providing veterinary service throughout the night and weekend.
- X Where possible, establish cooperative networking between adjacent practices to share the emergency veterinary service.
 - X Encourage telephone consultation with producers and provide advice.
 - X Do not schedule herd health visits if on duty night before.
 - X Provide veterinarians a portion of the professional fees earned while doing after hours emergency work.

Notwithstanding the above comments about after hours emergency service, the new graduate must accept that a bovine practitioner provides a service to the livestock industry and that a certain amount of after hours emergency work is inevitable as it is many other professions and occupations. As food animal practitioners we are not unique in our obligation to provide emergency service after regular hours. .

Professional and Business Development of Veterinary Practice

Private veterinary practice must become much more professional and business oriented. The KPMG Mega Study, indicated that many veterinarians although clinically competent, may lack the crucial skills, knowledge, aptitudes, and attitudes that typically are correlated with , and may be essential for, their economic success ¹ . The detailed outline of the topics for a curriculum in Veterinary Professional Development and Career Success is provided in a paper ¹⁰ . One outstanding section deals with, The Art and knowledge for a successful veterinary practice. A survey of veterinary technical and professional skills in students and recent graduates of a veterinary college found that most participants felt that they had not received instruction about professional skills, but those who had felt more competent about them ³¹ .

Veterinary Technicians in Bovine Practice

Veterinary technicians can be employed as assistants in many different common tasks both in traditional veterinary practice and in herd health programs. Up until very recently veterinary technicians have not been employed in large animal practices to the same extent as they are in small animal practice where they are deemed to be indispensable ⁴ .

As food animal veterinary practices change from primarily an emergency based practice to more production-oriented health management services, the veterinarian will be relied on for more and more information and problem-solving. Veterinarians are becoming involved in nutrition and feeding systems, breeding and culling programs, records and records analysis, and infectious disease control.

Technicians can be an invaluable asset to a food animal practice ²⁹ . Working with the practitioner on the farm they can increase the quantity and quality of services provided by the practice by developing standard operating procedures and treatment protocols, implementing and monitoring programs such as mastitis control, conducting field trials, planning the details of herd health visits in advance, identifying cows for examination, assisting with breeding soundness examination of bulls, body condition scoring of cows, trimming feet, collecting samples (blood, milk, feed and water),

assisting with vaccination procedures, collecting animal health and production records and entering the data into the computer, preparation of the data for the veterinarian, preparing herd health visit reports and regular newsletters, and helping to instruct herdsmen and owners about injection sites. The veterinarian-technician team working on the farm will increase output and efficiency of service and it will be cost-effective. Technicians can help to improve the working conditions of food animal practice on the farm and in large animal clinics and it will be a pleasure to provide the service.

VETERINARY EDUCATION OF THE FUTURE BOVINE PRACTITIONER

Food Animal Veterinary Education

Compared with small animal and equine veterinary education, there has been a steady erosion of food animal veterinary education in veterinary colleges in concert with a decreasing rural constituency and an increasing veterinary commitment to companion animals³. The relevance of veterinary medicine to the food and fibre animal industries is under threat, paradoxically, at a time when improvements in transport and communications and reductions in international trade barriers mandate greater veterinary involvement in the reduction of livestock disease, stress, and production constraints in livestock. At this time in history, when animal agriculture needs veterinary medicine the most, when the industries have become complex and economics is so important, when consumers are concerned about food safety and quality, and animal welfare issues, we seem to be turning away from the responsibility³. The profession needs to show, balanced leadership if it is to retain a significant agricultural presence into the 21st century.

Demographic, economic and sociological changes are collectively diluting the traditional role of veterinary colleges of adequately training sufficient numbers of veterinarians to serve the production animal industries. This is despite increasing needs by the livestock industries for effective veterinary inputs, and strong political imperatives for veterinary colleges to maintain viable educational programs with production animals. Real challenges exist to maintain such programs and to recruit and educate students to fulfill future requirements. This challenge must be met early in the educational process, especially as a growing proportion of production animal veterinarians will be drawn from nonfarm backgrounds. To accomplish this, it is necessary to achieve closer cooperation with, and stronger support from, industry and related educational programs.

The educational process itself needs to become more flexible to allow students greater choice both within the veterinary degree programs and from production animal expertise in other programs and institutions. The training of species/industry specialists appropriate for the food animal industries will require post-DVM training in a number of less than traditional areas such as nutrition, epidemiology, economics, data handling, food safety, facility design, and animal welfare. Advances in modern technologies should allow students an eclectic selection from a global smorgasbord of resources provided by the best authorities in their respective fields.

To meet the teaching and learning needs of a centre of excellence in food animal veterinary education at veterinary colleges requires a first-class teaching practice. Why not? We have sophisticated facilities, expensive diagnostic equipment like medical resonance imaging, scintigraphy, echocardiography, endoscopy, and many different board certified clinical specialists

for companion animal medicine. Why do veterinary colleges not have leading edge food animal field practices in dairy cattle, swine production, beef cow-calf herds, beef feedlots, and cooperative programs in regulatory veterinary medicine and public health? Such practices would require considerable on-farm teaching and learning, and require animal health data laboratories.

If veterinarians are the most qualified individuals to diagnose and treat disease in individual animals, then veterinary colleges should ensure that opportunities are available for students to acquire adequacy in the skills. This may require subsidization of certain aspects of the caseload, the development of unique off-campus experiences in private veterinary practices, or on farms, or restructuring of large animal clinical teaching programs from being discipline-based to species based, especially in colleges with a small food animal caseload ³².

Recruitment of Veterinary Students into Bovine Practice

How will the veterinary profession recruit a sufficient number of students to pursue a career in bovine practice?

In order to attract new veterinary graduates into bovine practice, it must be appealing, attractive, interesting, exciting, motivating, financially rewarding and progressive. The new graduate must become empowered to excel in his or her work and be given opportunity to be innovative. This requires a critical mass of veterinarians, technicians, and excellent receptionists and secretarial assistance. If the practice will not sustain such a critical mass, it is questionable that it should be maintained.

Bovine practitioners must encourage prospective veterinary students who express an interest in bovine practice to pursue it as a career and then provide mentorship, enthusiasm and guidance while the student attends veterinary college.

Veterinary students will become interested in bovine practice by being associated with veterinary clinicians who teach and practice bovine health and production management. Veterinary colleges must have an adequate number of highly qualified clinicians who are active in food animal practice and provide regular health and production management services to livestock producers. These clinicians must be able to demonstrate leadership to students interested in bovine practice. Students must become intimately involved in the herd health programs, on-farm visits, examination of animals and the herd, collection of data, and the use of computer programs to monitor and analyse data, the preparation of reports to the producer, and be aware of the nature of the fees charged for the services. Importantly, students must be given the time and the instruction necessary to assimilate all of these aspects of an integrated veterinary service. If the student is not engaged in such a teaching and learning exercise in a structured fashion while at college, it is unlikely to ever occur in private practice.

The recently formed Academy of Rural Veterinarians is a group of concerned rural practitioners in North America who want to inform veterinary students that rural veterinary practice is a viable career alternative which offers personal, professional, and financial rewards comparative to other disciplines in veterinary medicine. They encourage all rural veterinarians to become positive role

models in their communities and become engaged at the high-school level and earlier and participate in career days, 4-H events, and other youth organizations. Mentoring students interested in rural practice will be an important activity. The website: ruralvets.com provides a communication medium.

The Generalist Curriculum and Veterinary Graduate

Traditionally, veterinary colleges attempted to educate the generalist veterinarian, who could provide service primarily to all domestic animal species-the omnicompetent veterinarian. The profession has had a long held belief that its strength was in being generalists.. Traditionally, in their clinical years, students were rotated through all the species and discipline rotations and graduated with varying degrees of clinical expertise. That 'omnicompetence' was feasible and possible 25 years ago when the knowledge base was smaller and, more importantly, clinical skills were less advanced, and when clients then did not have the high expectations they now have.

The PEW Report ¹⁹ said, *It no longer makes sense for the profession to cling to an inaccurate and outdated view of the capacity of a veterinarian. The time when an individual could reasonably be expected to possess the needed skills and knowledge to minister to the health and needs of kinds of animals at a level acceptable to the public is long gone. It is an important part of the profession's history; but it has no validity now, and will certainly not be valid in the 21st century. It is important to recognize this reality for it affects many things that the profession does. The concept of a universal veterinarian is an anachronism, and it should be buried with honour. The impossible dream-the DVM who can provide the health care of all creatures great and small is inhibiting the progress of the profession. It is at the very root of the very serious problems facing veterinary education issues today.*

Omnicompetence is unnecessary, undesirable, not possible, frustrating for clinical instructors, and students, and wasteful of resources. It also could be argued that omnicompetence has held back progress in veterinary medicine and veterinary science. Spending all of our efforts on being a generalist has not allowed us to become advanced in specific fields. No longer can every veterinarian know something useful about everything. In fact, continued omnicompetence could result in omni-incompetence. Many veterinarians may be overtrained to do the things they are doing and undertrained for the opportunities available.

In preparing veterinarians for the 21st Century, veterinary education must change; two objectives are necessary.

First, there must be adequate coverage of the core biomedical science subjects in the first two years, and possibly in part of the third year. Second, the remaining clinical semesters must be focused on the student' career choice; that is **species or discipline specific**. Such a system has been in place at the School of Veterinary Medicine, University of California for 30 years.

Veterinary students should experience the richness of the basic sciences (the core curriculum) and then be given the opportunity to concentrate their education (species or discipline specialization) on the basis of their professional goals and the needs of society.. The core

*curriculum prepares students for the specialized curriculum of their choice*²⁵.

If 75-90% of our veterinary students in North America are interested in a small animal practice career, does it make any educational sense to require them to learn the specific food animal courses, including the clinical rotations, merely because they must pass the North American Veterinary Licensing Examination (NAVLE)? Why not concentrate the faculty and college resources, on the students who **desire** a career in food animal veterinary medicine? One can easily imagine the excitement in teaching and learning which would occur if the relevant faculty concentrated their efforts on the food animal students in an undergraduate program beginning in first year with ever increasing emphasis throughout the four year DVM course? Graduates from such a program would be much more competent and confident than the traditional graduate, and further, would likely pursue their careers as lifelong learners with a much greater understanding. Still further, it is likely that a higher percentage would remain in food animal practice if they feel competent and confident, and empowered about by what they are doing. An interest in teaching and research careers would also be expected.

However, many mixed animal practice owners today still prefer the veterinary graduate be competent in all species.

Undergraduate Career Tracking Programs

Veterinary medicine has evolved into a vast array of specialties. The body of veterinary medical knowledge has expanded to such an extent that it becomes less feasible each year to expect that a student can be taught all essential information within four years. The logical step to take is to allow students to concentrate their education on the basis of their desired career path. Veterinary colleges have various tracking programs and electives, but the student is still bound by the North American Veterinary Licensing Examination (NAVLE) to acquire knowledge in all aspects. If there is a reformation, to allow for speciation of the degree, the student and the colleges can be liberated to make more choices.

With an undergraduate tracking program, it would be possible for a student to spend from 75 to 90% of the clinical year in an elective program such as dairy cattle health management. The program would include well structured and supervised clinical experiences in all aspects of dairy cattle health and production management. On the day of graduation, the new graduate would feel confident and comfortable beginning to serve the needs of the dairy cattle producer.

There are several logical reasons for undergraduate tracking, and ultimately, designated licensure. The body of knowledge in each area of veterinary has expanded to the point where it is a challenge to master. It is often said that veterinary colleges attempt to teach everything to every student. In reality, veterinary colleges have continued to emulate human medicine with an emphasis on individual animal medicine. As a result there is a dichotomy between how companion animal medicine and food animal health and production management are taught, and learned. Companion animal medicine is individual animal oriented, and students are exposed to highly sophisticated diagnostic equipment and extensive use of the laboratory. Most new graduates feel reasonably competent and comfortable to begin providing service in small animal practice after graduation.

Food animal health and production management on the other hand, is constrained by economics, is much more herd oriented, and it is **much more difficult** to teach students, and for them to learn to be competent and confident provide veterinary service to the modern livestock industry in a generalist curriculum.

With undergraduate tracking, a more constructive educational environment would involve those students who desire an education in a particular area, rather than a mix of these focused students and those merely in attendance by requirement. Only when students are encouraged to become actively involved in the process of education, in the design of courses and methods of assessment, as sources of knowledge and experience, and as active participants in the teaching, will veterinary education start to improve. Students can change from being passive recipients and regurgitators of information to active seekers of knowledge and understanding. As veterinary educators we have underestimated the self-teaching and learning abilities of veterinary students. Why not let them plan their careers?

In a clinical tracking program, because of a smaller number of students in each program, it would be possible to have an clinical competencies outcomes assessment of every student before graduation. In a general program, it is not logistically possible to examine every student to determine if they have achieved a certain level of clinical expertise in the common clinical skills of all species. There is increasing recognition that colleges of veterinary medicine need to more explicitly define the attributes expected of their veterinary graduates³³. The need was emphasized in the PEW Report and in the KPMG-LLP study on the current and future market for veterinarians and veterinary medical services in the United States. Those studies concluded that major changes in the profession are needed to meet expectations of the profession and society. Colleges of veterinary medicine must define the complement of professional characteristics, as well as the knowledge and skills, required of their graduates on graduation. *To do so is of vital importance, not only so that graduates will be fully competent providers of veterinary care, but also so that they will be able to meet the breadth of responsibilities implicitly and explicitly placed on members of the veterinary profession and be able to successfully compete in the existing and expected marketplace .*³³

Undergraduate tracking should result in improved clinical competency in a species or discipline. More graduates might become board certified in a clinical specialty, lifelong learning skills would be enhanced, more clinical research would be stimulated, referral centres of excellence would emerge, professional development programs would be more specific and effective, veterinarians would develop effective personal libraries, and overall, most importantly, society would receive highly competent veterinary service.

As food animal production continues to intensify, the expertise of the veterinarian will have to be at the **leading edge** of health and production management to provide economically useful herd health service. In addition, to their problem solving skills, their use of epidemiological techniques to detect and manage the determinants of production has given veterinarians a competitive advantage to deliver health and production management veterinary services.

Several arguments have been posed against undergraduate career path tracking. They include:

students don't know what they want to do and would like to try everything; it narrows career options; retraining would be necessary for students who decide they don't like a chosen program; it would cause disruption of the educational system; if only a few students select a particular program, then not enough students will be available to operate certain clinic rotations; and the need for mixed animal practitioners in rural veterinary practice. All of these arguments severely constrain the progress of veterinary medicine, and science. Quota undergraduate programs also would allow an increase in total student enrollment to offset the shortage of veterinarians in all sectors of the profession.

Quota Undergraduate Tracking Programs in Veterinary Education

An undergraduate tracking program in which the students are allowed to preferentially select the clinical rotations of their choice in third and fourth years **will not** ensure that a sufficient number of students participate in the scope and diversity of veterinary medicine necessary to meet the needs of society. In order to ensure a reasonable balance of veterinarians in the various categories of veterinary medicine, quota undergraduate tracking would be necessary²¹. Students would have a common first year, and then apply for one of the undergraduate programs offered by the veterinary college. Quotas would be established for each program and students would be expected to know when they enter first year the program they intend to select. For example, for a class of 100 students, 40 positions would be reserved for small animals, 30 for food animals, 10 for mixed animal practice, 5 for equine practice, 5 for veterinary public health, 5 for biomedical sciences, and 5 for ecosystem health. Students would apply for one of the undergraduate programs and would be limited to that program. This would be a major reformation, not a revolution, of veterinary education and is deemed necessary to meet the veterinary needs of society. **Colleges have control of the admissions procedures and could set quotas for undergraduate programs.**

A quota tracking would attract preveterinary students who desire a career in food animal practice, and, a significant number would be from farm backgrounds who desire to work in agricultural veterinary medicine. Widespread promotion of the availability of the program to potential students would be necessary and desirable. It also seems very reasonable to expect that state and federal governments would look favourably on a program which is directed to meet the needs of the livestock industry. Also, importantly, undergraduate programs would increase the participation of students in the diverse sectors of the profession to meet the needs of society.

Several arguments have been posed against radical tracking. They include: students don't know what they want to do and would like to try everything; it narrows career options; retraining would be necessary for students who decide they don't like a chosen program; it would cause disruption of the educational system; if only a few students select a particular program, then not enough students will be available to operate certain clinic rotations; and the need for mixed animal practitioners in rural veterinary practice. All of these arguments severely constrain the progress of veterinary medicine, and science. Quota undergraduate programs also would allow an increase in total student enrollment to offset the shortage of veterinarians in all sectors of the profession.

Importance of Adequate Clinical Caseload at Veterinary College

The caseload has been (or should be) the lifeblood of a modern accredited veterinary college. The

caseload exists for the education of the students and faculty including preclinical, paraclinical and clinical faculty.

The size and nature of the food animal clinical caseload in some veterinary colleges has become an issue in veterinary education². With an inadequate clinical caseload, students do not have the opportunity to acquire practice entry-level clinical skills, it's difficult to teach problem-solving skills, faculty cannot maintain credibility, and research ideas do not emerge. In addition, colleges need teaching animals and resources to teach basic clinical exercises such as animal handling, clinical examination and diagnostic techniques.

Historically, colleges have operated *in-clinics*, and *ambulatory clinics* which provide on-farm teaching. The clinical education received by a student in an in-clinic with an adequate and varied caseload is unique and difficult to duplicate in a private veterinary practice²⁸. The student has the time to interview the client, examine the animal, discuss the clinical and laboratory findings with the clinician and fellow students, hospitalize the patient if necessary, and follow the case from presentation to its final disposition, whether discharged with written discharge notes, sent to necropsy, or sent to slaughter for salvage, all under the supervision of a clinician. The student is expected to read the literature about the cases and then present some of the cases in clinical rounds for detailed discussion with clinicians and fellow students. It is the responsibility of the clinician to intellectually stimulate the student and expect high standards of performance. The clinician should expect critical thinking and coherent arguments.

However, in-clinic food animal caseloads in many veterinary colleges have declined to below the numbers and kinds of cases deemed necessary to teach students the basic clinical skills. In addition, with an increasing emphasis on biosecurity, and the economics of transporting food animals to a teaching clinic, it is very likely that in-clinics for food animals will not grow in the future. The caseload of large animal teaching clinics of the future will consist primarily of horses, some cattle, small numbers of sheep and goats, and no pigs. Cattle caseloads will be dependent on economics, ease of transportation of the animals, and the levels of biosecurity which can be assured.

For modern food animal veterinary medicine, the *ambulatory clinic* for on-farm teaching is of paramount importance. In an editorial on In-House Caseloads and Educational of Veterinary Students in Production Animal Medicine Gilbert writes: *A Society expects service and leaderships from the veterinary profession in a range of traditional and newly recognized roles. In the field of production animal agriculture, these include diagnosis and treatment of disease; prevention of animal disease and suffering; promotion of animal health and welfare; economic and efficient production of food, fibre and hides; protection of public health; and preservation of the environment. Of these, only the first is arguably best taught within the walls of a teaching hospital. Experience of the animals in their production environments is essential for optimally learning the other skills and knowledge required*⁶.

He goes on to say: *If veterinary colleges are failing in regard to education in production animal medicine, it is not in failing to develop in-hospital caseloads, but in failing to recognize the expanded role required of modern veterinarians in the animal production industries and to make the*

necessary curricular changes necessary to accommodate newer demands. Societal demands in respect to animal welfare, public health and the environment are real, urgent, and likely to be persistent. If we do not meet these demands, others will. Failure of the veterinary profession and veterinary educators to respond adequately will erode the prestige of veterinary medicine and the professional domain of veterinarians.

Because the demands of modern agricultural animal medicine are superimposed on increasing demands for service and education in an ever-widening array of clinical specialties, species of importance, and nonpractice career options, innovative strategies will have to be developed to meet the challenges. These are likely to include effective and mutually beneficial cooperative arrangements and partnerships at regional and national level, including veterinary colleges, other educational institutions, and stakeholders such as commodity groups, government, and other professions.

Postgraduate Mandatory Internship (Professional Training Phase)

There are few professions where an initial degree confers on the holder an unlimited, life-long licence to practise, and the veterinary profession does need to consider how long it can or should maintain its present position in this respect .

An alternative or a complement to undergraduate tracking is mandatory postgraduate internship. A supervised internship in a veterinary college teaching hospital or a private veterinary practice with an adequate caseload is an excellent experience. It provides the opportunity for new graduates to apply their knowledge to clinical problems, under supervision. Under ideal conditions, interns have the time and resources to follow cases, including necropsy if applicable. The learning curve in a one-year internship is very steep. Adequate supervision and mentorship must be provided and the intern must be encouraged to do most of the common procedures independently. Internships also provide experience with clients, business management, personnel relationships, continuing education and development of a personal library, interactions with colleagues and the opportunity to develop one's area of professional interest. A good year of serious clinical training would be very beneficial to all veterinary graduates.

The colleges should provide the basic clinical diagnostic and therapeutic exercises necessary for the new graduate to enter practice. Practitioners should not have to teach new graduates the basic skills such as clinical examination of the individual animal or a herd investigation, handling animals, venipunctures, passage of stomach tubes, rectal examination, and common surgical procedures.

Postgraduate Professional Training Phase. The Royal College of Veterinary Surgeons in the U. K. proposed a professional training phase of at least one year in practice after graduation before a license to practice is granted ²⁶. Training programs would be in named areas such as *companion animal practice, equine practice, production animals, mixed practice, food safety and public health, research*, and a *specific discipline*. Day 1(at graduation) and Year 1(at end of professional training phase) competencies form the cornerstone for consideration of the primary degree and the professional training phase. The professional training in the specified area is done in a registered

practice or institution. The employer of the registered practice is responsible for assuring that competence of the new graduate is achieved.

Later career moves into other areas of practice would require veterinarians to repeat the professional training phase in a registered practice. There would be periodic renewal of licensing to practice.

The RCVS also envisages fully licensed veterinarians working over two to ten years in practice obtaining modular Certificates leading to full qualification in a broadly named area (Companion Animals, Equine, Production Animals, Mixed Practice).

Continuing Professional Development and Postgraduate Specialization

Continuous professional development is closely related to the undergraduate program. Much has been said about the importance of students being self-directed life-long learners. However, at the undergraduate level, in general, students are not formally taught how to be life-long learners, how to develop an effective personal library, how to read the literature critically and how to develop a personal professional development program during one's career. It has been assumed that veterinary students will learn those tasks on their own. Veterinary curricula need to consider how students should be taught life-long learning. Undergraduate tracking would allow the initiation and student awareness of life-long learning skills. Continuing education is much more than merely saying that it is important. It must become part of the mind set of the students before they graduate.

Having achieved a licence to practice, veterinarians should be encouraged to work towards higher qualifications as confirmation of their developing expertise. Historically, continuing education courses and workshops were offered by colleges and veterinary associations. Attendance and participation by practitioners was voluntary. Increasingly, veterinary licensing authorities require veterinarians declare evidence of attendance at continuing education courses for a certain number of hours per year as a requisite for continued licensure. Such mandatory continuing education will continue and probably expand.

Continuing veterinary medical education can motivate practitioners to change the way they practice. If the purpose of continuing education is to improve practice and patient care, it should be integrated into a practice's strategic planning and considered a legitimate business expense. Decisions about continuing education are made easier if program objectives are clearly outlined.

Certificate programs are becoming popular as a means of ensuring continued or improved competency for practitioners. They are structured, intensive programs designed to meet specific needs for a particular audience. They attract veterinarians who are not necessarily interested in postgraduate degree programs, yet desire more intense training than usually provided through conventional continuing education programs. Certificate programs focus on a specific area or need and are designed for individuals with at least 2 years of experience in clinical practice.

American Board of Veterinary Practitioners. The ABVP is accredited by the AVMA and is one of 19 specialty boards to recognize clinical practitioners. Its purpose is to promote the highest standards in the art and science of veterinary practice. It seeks to recognize veterinarians, qualified through examinations, who deliver superior comprehensive veterinary care. To become certified by

the ABVP is to be recognized for outstanding performance in veterinary practice. It demonstrates a practitioner's dedication and commitment toward advanced studies over and above the attainment of a veterinary degree. The ABVP is also the only specialty board to require recertification by examination every 10 years.

The Board does not require post-graduate training such as an internship or residency but does require a series of tests to become certified in any one of the following: Food animal practice; dairy cattle practice; beef cattle practice; swine health management; equine practice; canine and feline practice; feline practice; and, avian medicine

Practitioners who have become Board Certified, say that it has increased new opportunities, improved their performance and professional development, and increased the value of their veterinary services and income. In summary, they highly recommend certification by the ABVP.

Certification by the AVBP needs to be promoted to all new veterinary graduates who plan to pursue a bovine practice career.

Designated or Limited Licensure. If a generalist undergraduate veterinary education is undesirable, unnecessary, and not possible, then undergraduate clinical tracking and as a consequence, designated or limited licensure, is a rational alternative for consideration.

For many years, it was assumed that the basic veterinary degree provided the new graduate with the knowledge and skills to work in any and every facet of veterinary medicine for a lifetime. In North America, veterinary students have been required to write the NAVLE in order to obtain a state or provincial license to practice. It is a general examination consisting of questions from all sectors of veterinary medicine but 60% are small animal oriented.

The fact that all veterinary graduates must pass a standard licensing examination constrains the flexibility of the educational establishment to develop new areas of competence that respond to societal needs and perpetuates the human and medical model and culture within our profession. If the profession cannot realistically use formal postgraduate education to enhance the competence of a significant portion of its members, as seems to be the case, it simply must look more seriously at substantial undergraduate tracking and, perhaps, a period of internship or residency before licensure to practice¹⁴.

Karg has written that it is time for the veterinary profession to seriously consider designated licensure within the veterinary degree⁹. Designated licensure means being licensed to practice only in a specific area of veterinary medicine such as a particular species or class of animal or discipline. Potential categories, each with its own full-length examination, could be: canine, feline, avian production, ruminants, swine, companion exotics(including birds, rodents, rabbits, reptiles, and ferrets), and zoo and wildlife medicine and surgery. Under designated licensure, undergraduate veterinary students would select a professional career path of study after their second or third year (of a four-year course) and spend their clinical years studying in that specialty. Thus designated licensure implies undergraduate clinical tracking.

Karg writes, *Most veterinarians practice on a limited number of species. The increasingly rare mixed practitioner is a person of considerable prestige, experience, and knowledge and is indispensable to the fabric of society. More is demanded of this Herriot-esque veterinarians in terms of potential problems to be encountered than of any other private practitioner. Yet, the attempt is made to graduate such an individual in the face of a burgeoning knowledge base. **It would be a daunting task, but not an unreasonable one, to ask this unique graduate to pass each full-length examination if he or she wants to be this complete practitioner*** ⁹.

The organized veterinary profession, not the universities, has the instruments necessary for leadership in making sure that society's needs are being met; namely, veterinary licensure, regulation of internships, setting practice standards, and college accreditation ¹². *These tools (all having to do with standards) can be a powerful force for either changing or maintaining the status quo. They can allow the introduction of the engineering model in veterinary education and licensure, in which veterinary students would have to choose one of several major career paths, such as mixed animal practice, small animal practice, equine practice, food animal practice, public health, food hygiene, comparative medicine, zoo medicine, aquaculture, or ecosystem health, at the end of the second year of the North American four year professional degree course. Examination for licensure would be tailored to the career path chosen.*

However, undergraduate tracking without quotas would not solve the problems described by Nielsen. Designated licensure would allow colleges to allocate quotas for each major area so that a certain number of students would be able to select and focus their efforts in areas like food animals (dairy cattle, beef cattle, swine), food safety and veterinary public health.

ABSTRACT

In the past 50 years, remarkable changes have occurred in bovine veterinary practice which have benefited the cattle producer, bovine practitioner and the consumer. The foreseeable future of bovine practice will be an even more interesting and exciting challenge for the cattle industry, bovine practitioners, veterinary educators and governmental veterinary medicine. The basis for the future in bovine practice will be: the continued growth of world population; the continued demand for meat and milk; consumer demand for wholesome and safe meat and milk; the continuous industrialization of animal agriculture; the importance of animal welfare; the financial success of cattle producers; modern information and communication technology, and the education of bovine practitioners.

The next phase in bovine practice will be an increasing level of totally integrated animal health and production management to meet the goals of the cattle producer who must be economically successful and meet the needs of society for wholesome and safe meat and milk, and for sustainability of the environment. This service will be provided by specialist bovine practitioners. The profession must adapt by a combination of introducing undergraduate career paths in a species or discipline, mandatory internship, and encouraging more formal postgraduate specialization and certification by peer groups. Designated licensure is inevitable.

The knowledge and the technology are available to provide a cost-effective comprehensive health management veterinary service to production-oriented cattle producers. The delivery of the service by veterinarians is the greatest challenge facing bovine practitioners. The emphasis is changing from the treatment of disease to health and production management.

**La pratique bovine:
Les succès du passé, les défis et les possibilités de l'avenir**

Pendant les derniers 50 ans, des changements remarquables ont eu lieu dans la pratique bovine vétérinaire, qui ont eu un impact très positif pour les producteurs, les consommateurs et les praticiens dans le secteur bovin. A l'avenir, la pratique bovine deviendra même plus intéressante et sera un défi de taille pour l'industrie bovine, les vétérinaires, les éducateurs et le secteur gouvernemental.

La base pour l'avenir de la pratique bovine sera la croissance continue de la population mondiale, une plus grande demande de viande et de lait, la demande des consommateurs pour des produits sains et sécuritaires, l'industrialisation du secteur agricole, l'importance du bien-être des animaux, le succès financier des producteurs, l'information moderne et la technologie des communications et la formation ainsi que l'éducation des vétérinaires.

La prochaine phase de la pratique bovine sera d'intégrer totalement la santé des animaux et la gestion de production afin de répondre aux besoins des producteurs qui doivent réussir financièrement et fournir à la société un produit sain et nutritif et assurer la protection de l'environnement. Ce service sera fourni par les vétérinaires. La profession doit s'adapter en combinant l'introduction un plan de carrière au niveau de la licence dans un domaine spécialisé, l'internat obligatoire et encourager une spécialisation au troisième cycle et la certification par ses pairs.

La connaissance et la technologie est disponible afin de fournir efficacement un service vétérinaire compréhensif de gestion de santé aux producteurs bovins. La livraison du service par les vétérinaires est le plus grand défi pour ces praticiens. L'emphase se déplace du traitement de maladies à la gestion du secteur de santé et de production.

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