PEER REVIEWED

Dairy Production Medicine in the United States

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Abstract

Consolidation of the dairy industry in the United States over the next decade will secure the transition of dairy farms to a new model of larger, "scale-adapted" dairies. With that change, the demand for dairy veterinarians in a traditional practice role will decline and the roles played by those that remain will change. Dairy veterinary medicine will largely shift from a "hands-on" technical role to a role in consultation, dairy management, and at higher levels in the food and production chain. Veterinary education will need to change as well to respond to these trends.

Résumé

La consolidation de l'industrie laitière américaine au cours de la prochaine décennie va achever la transition des fermes laitières en un nouveau modèle de grandes fermes. Lors de cette transformation, la demande de vétérinaires en production laitière va diminuer et le rôle de ceux qui resteront va changer. La médecine vétérinaire en production laitière va en grande partie perdre son aspect technique au profit d'un travail de consultation, de régie du troupeau , d'implication à un niveau plus élevé dans la chaîne agro-alimentaire. L'enseignement vétérinaire aura aussi besoin de changer pour répondre à ces tendances.

Introduction

We believe dairy veterinary medicine in the United States (US) is at a major crossroad, and the next decade will determine whether this sector of the veterinary profession will flourish or wither. What follows are some observations about the status and trends in the dairy industry and veterinary profession, and some of our opinions about these circumstances and how they may change our profession. Whether our specific projections prove true will be tested by time. In our view, there is an urgent need for the profession to address these issues and seek a sustainable future for dairy veterinary medicine.

Four major influences are shaping agriculture in the United States, and these forces shape the dairy industry and, by extension, the dairy veterinary profession.

1. Dairy production is increasingly consolidated and individual operations are larger. Small farms have been exiting the industry at a rapid rate over several decades, and large, "scale-adapted" dairy farms now dominate the industry in terms of production. By scale-adapted, we mean larger dairies that focus on throughput, efficiency, specialization of tasks, use of capital to reduce labor, outsourcing of some functions, economies of scale, information management and economically based decision making. Ownership remains largely in the hands of individual families, but the operating model is more business-oriented. This change is a result of geographic shifts, economies of scale and technology application, and development of newer, more efficient production technologies (e.g., total mixed rations [TMR], information technology, manure storage systems, large throughput milking parlors, etc.).
2. Markets for food, including dairy products, are increasingly global, creating pressures for efficiency, food quality standards, production practice standards and trade and marketing strategy changes. "Cheap food" policies and other employment choices available to rural populations further drive the need for increased efficiency in food production systems.
3. Food safety issues (highlighted by the recent response to a single cow with bovine spongiform encephalopathy in the US) are reshaping production practices that were once industry standards. Governmental policy in affluent countries

is shifting away from production enhancement toward polices that address public perceptions and trade issues.

4. Consumerism has altered the public's influence on the array of dairy products marketed as well as demands placed on the producer for both food content and production and processing practices. Traditional consumer expectations of food wholesomeness, variety and selection are still important, but now some consumers are demanding to know *how* their food was produced as well. Public concern about environmental protection and animal welfare issues abound as well.

Consolidation in the US Dairy Industry

The trend towards consolidation in the dairy industry (fewer but larger farms) is decades old (Figures 1 and 2).[10,14] Only in the last decade, however, has the dominant sector of the industry shifted from single-family production units, where most labor was provided by family members, to larger dairies (more than 200 cows) that rely principally on employed labor (Figure 3), despite remaining predominantly a family-owned business (Figure 4).[3] The transfer of labor tasks to non-family employees has fundamentally shifted the role and focus of dairy owners to people management, and has shifted the expectations for veterinary medicine. Along with this shift in size, scale and management specialization, markets have placed heavy constraints on profit margins of milk sold in the face of increasing input costs (Figure 5),[10] and have forced a more attentive business attitude on producers. This consolidation will very likely

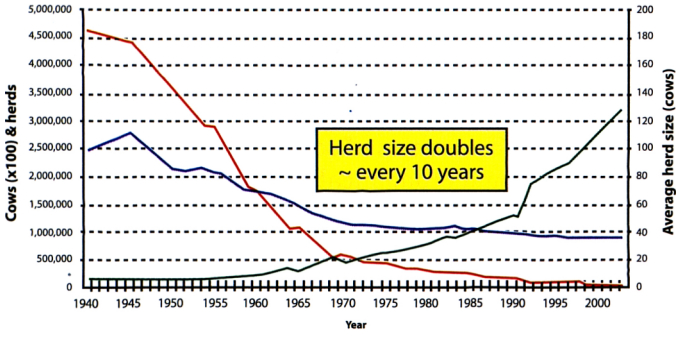

Figure 1. US dairy farms and cows (1940-2003). Source: USDA-NASS, AFBF, FASS

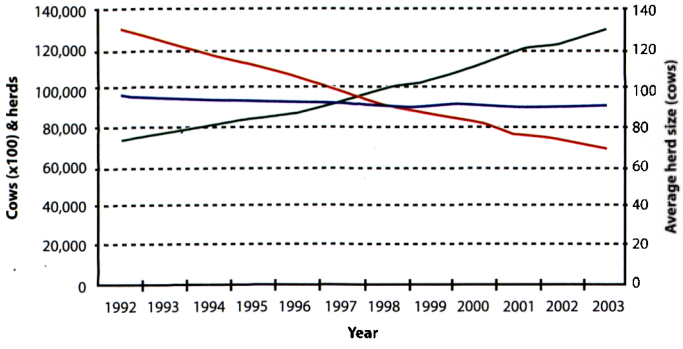

Figure 2. US dairy farms and cows (1992-2003). Source: USDA-NASS, AFBF, FASS

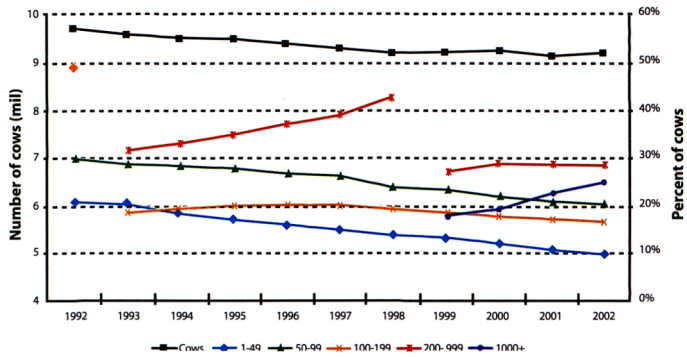

Figure 3. Percent of US dairy cows by herd (1992-2002). Source: Adapted from USDA-NASS

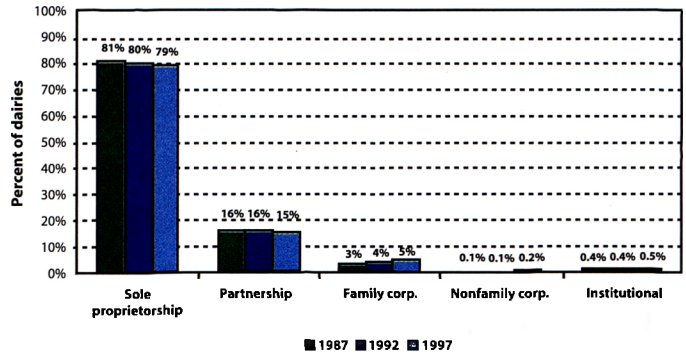

Figure 4. Change is operational model does not imply ownership model has changed. Source: Blayney *et al*, 2000 data

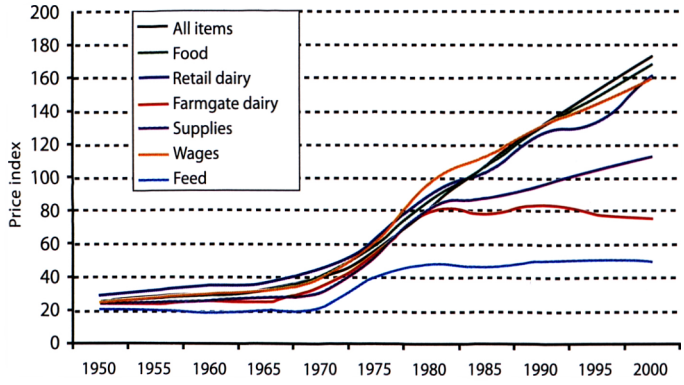

Figure 5. Milk price has not kept pace with inflation. Disconnect between in costs of goods and services (inflation) and specific sectors. Source: 2003 NMPF Dairy Producer Highlights

continue, with a dramatic decline in number of herds and a drift in geographic distribution of herds across the US toward the western states. Yet, some dairy production will remain distributed throughout the US, though it will continue to concentrate into more clearly discernable pockets. These changes will continue to fuel a shift in types and styles of services offered to producers by suppliers of all sorts.

We propose that the US dairy industry can be conveniently segmented into four sectors:

1. **Sunset dairies**: These are the traditional small, family owned and operated dairies, typically with 100 or fewer cows, producing their own forage and depending principally on family labor. In a majority of cases, when the current owner leaves dairying for age, economic or lifestyle reasons, the farm will cease to exist as a single entity. The cows and land may remain in production, but only as part of a larger operation. Sunset dairies are still a significant sector in the overall industry, particularly in the upper midwest and to a lesser extent in the northeast, but can be expected to continue to decline in numbers.
2. **Niche dairies**: These dairies have found a specialized niche that allows them to compete successfully, e.g., organic milk producers, bed and breakfast experiences, grazers, Amish, custom cheese makers and ancillary sales such as manure-enriched soil to developers. These dairies will survive because they are the absolute best at their particular specialty. By definition of niche, only a few can maintain a sustainable business because of constraints in the business environment.
3. **Lifestyle dairies**: These dairies fall into two subcategories. The first is small dairies that continue to operate because the family has a significant source of non-dairy income. The other category is the "legacy" farm where ownership of the land has remained continuously in a single family for generations (e.g., bi- and tri-centennial farms of the northeast), and where there is collateral family pressure, sufficient community support and available equity to remain in business. Together with the niche dairies, this sector will likely remain, but only as a very small part of total US milk production. Instead of the rule, they will be the exception.
4. **Large dairies**: Variously defined in terms of size (>200 or >500 or more cows), these dairies already produce more than one-half of all US milk supply and will make up two-thirds of total milk supply by the end of the decade (Table 1).[9]

Table 1. Dairy herds in the US (1,000s).

herd size /year	1-49	50-99	100-199	200-499	>=500	All
1982	204.7	53.3	14.6	approx.	5,000>200	277.8
1992	93.1	41.8	14.1	approx.	8,000>200	157.2
2000	52.9 10%	31.4 19%	12.9 17%	5.4 18%	2.8 36%	105.2 100%
2010	18.2 3%	12.8 8%	7.2 10%	4.3 15%	3.3 63%	45.8 100%
2020	2.8 1%	3.5 2%	2.7 4%	2.3 9%	3.4 85%	14.7 100%

Taken from "Future Structure of the Dairy Industry": LaDue, Gloy, Cuykendall 2003
http://agfinance.aem.cornell.edu/research.htm
Historical data from USDA/NASS

Blue #'s are % of US milk

Increased scale of production brings several changes in business practices. First, producers are no longer constrained to the local community and veterinary practitioner for inputs (pharmaceuticals) or expertise (consulting). Producers have also moved toward more forward planning and contracting relationships, and will insist that commodity providers also add value to their offerings, often in the form of consulting or management services. Coupled with the Internet, the dairy industry has entered a new era of access to information and expertise often independent of geography and local personnel. At the same time, dairy owners and managers are recognizing the value of proprietary information and are less likely to share information "over the fence," as was a common practice even as recently as a decade ago. Managers themselves are also more mobile and prone to investigating promising new technology in person, rather than relying exclusively on others to bring new technology to them. Larger dairies with well-developed information management systems have a decided advantage in their ability to monitor, identify problems early and manage issues in their operation, but it takes a knowledgeable person who can decipher and understand the variables in order to capitalize on this advantage.

Consolidation within the dairy industry has been pushing the number of herds downward for decades. Currently there are approximately 70,000 dairies in the US. By the end of the decade, projections estimate there will be fewer than 50,000 farms (a loss of 20,000 dairies in the next six years), and by 2020 as few as 15,000 dairies (Table 1).[9] Approximately 9 million dairy cows can currently meet demand for milk in the US. If all herds had 1,000 cows, 9,000 dairies could meet the US demand for milk. This rapid decline in the number of dairy herds will have a marked impact on dairy veterinary medicine. Herd numbers, not cow numbers, drive

much of the demand for veterinary services. The effort expended to provide cost-effective consulting service for a 1,000-cow dairy is not ten times greater than for a 100-cow dairy. Clinical service demand per cow also declines on large dairies, as lay staff perform more of the technical functions traditionally done by veterinarians in small herds. The net effect of this shift in demographics of dairy farms will be to significantly reduce demand for dairy veterinarians across the US for several of the profession's traditional roles. This conclusion is consistent with other evaluations of demand for food animal veterinarians in the US.[4,6]

This shift can be illustrated by comparing demographics of two major dairy states in the US, Minnesota and Idaho. Minnesota is the sixth leading dairy state in terms of total milk production. Minnesota's dairy industry is overwhelmingly made up of small, family owned dairies (sunset dairies). There are roughly 490,000 dairy cows in the state on 7,200 dairies producing 17,400 lb (7,909 kg) of milk per cow.[14] Average herd size is 68 cows, and only 8% of cows are on dairies with more than 500 cows. There are 200 members of the American Association of Bovine Practitioners (AABP) in Minnesota, and thus approximately 2,500 cows per AABP-member bovine veterinarian. This calculation assumes all dairy practitioners are AABP members, and ignores the small portion of practitioners in Minnesota who predominantly do beef work. Data on the number of practitioners is derived from the AABP member database.[1]

In contrast, Idaho is the number five dairy state in terms of total milk production. There are 380,000 cows on 950 dairies making 21,000 lb (9,545 kg) of milk per cow. Average herd size is 400 cows, and 80% of cows are in herds with more than 500 cows. Idaho represents the large herd industry, which is the future of the industry. There are 60 AABP members in Idaho, and thus roughly 6,500 cows per AABP-member bovine veterinarian.

If the demographics of Idaho dairies were applied uniformly across the US to serve the nation's 9 million cows, there would be a demand for 1,300 dairy veterinarians. It is unlikely things will change that dramatically in the next decade, but the direction and general magnitude of the change seems clear. Currently there are roughly 4,500 AABP members in the US, mostly dairy practitioners. Despite the currently perceived shortage of practicing bovine veterinarians, the real need for dairy practitioners serving in traditional roles in the US dairy industry is likely to decline rapidly over the next decade. The key issue facing the profession may not be the number of veterinarians available to serve the dairy industry, but rather what roles they will play and whether they are suited to the roles the industry needs. Their suitability will depend on their education, experience, personal work and lifestyle preferences and geographic distribution.

As this consolidation progresses, types of services offered by the dairy veterinarian also change. Traditionally, and for the most part still currently, dairy veterinarians provide four kinds of services. Veterinary education has long reflected some of these roles for the profession, but has been slow to adapt to the educational preparation necessary for other roles.

1. **Technical services:** Much of a typical US veterinarian's time is still devoted to the provision of hands-on technical services like pregnancy examinations, sick cow diagnosis and treatment, dehorning, castration, etc. These services are the traditional mainstay of veterinary practice, and are the dominant focus of the content of veterinary school curriculums in the United States. On large dairies, much, if not all, of these activities are subsumed by lay staff, even dealing with dystocia and the correction of common surgical problems like displaced abomasum.
2. **Drug distribution**: Over the past several decades, veterinary practices have been the principal channel for distributing drugs and vaccines to dairy farms. Federal law and state practice acts dictate that only licensed veterinarians may prescribe prescription drugs or the extra-label use of non-prescription drugs. The reality on many dairies today often does not meet these standards. Extra-label use without documented prescription recommendations from the veterinarian-client-patient-relationship (VCPR)-holding veterinarians is common. There is a wide range of opinion and practice regarding what constitutes a valid VCPR, e.g., frequency of visits and what type of data or observations are needed. It is not uncommon for veterinarians who provide written prescriptions to write them for unlimited quantities. Pharmaceutical company sales efforts, rather than veterinary recommendations, may drive producer demand for drugs to be prescribed. The incentive for direct marketing by pharmaceutical companies will only increase as the number of dairies declines and sales per dairy increase.

   It seems likely that public perception and consolidation will change parts of this situation in the dairy industry in the future. Increased regulatory scrutiny and animal care auditing standards will move the industry toward written prescriptions for most drug use, opening the opportunity for more channels for drug distribution. Larger dairies are less likely to purchase drugs in volume through local practices at tra-

ditional mark-ups. We predict that the distribution channels for most drugs used by larger dairies will continue to move away from using the local veterinary practice as an intermediary. The profession thus faces the challenge of re-shaping its role in directing drug use on dairies, and yet must replace income streams previously supplied by mark-up on drug sales. Either the veterinary profession will adopt a more definitive role in the prescribing of drugs, or it will lose influence on the way drugs are used on dairy farms.

3. **Management consultant**: Dairy production medicine has made great strides in the United States in the past two decades. Practitioners have significantly improved their knowledge base and practical skills in consulting with management on a range of health and production issues. Continuing education programs offered by the AABP and veterinary certificate programs offered in several regions (e.g., Guelph, Michigan, Pennsylvania and Wisconsin) have become quite specialized and provide in-depth education in a broad range of dairy topics, bringing veterinary practitioners and dairy scientists together to an unprecedented degree. Practitioners now quite commonly consult with their clients on mastitis control, reproductive programs, cow welfare and comfort, disease control, nutrition and feeding programs, and calf and heifer rearing. More and more, the profession is blending economics into its biological recommendations as well. The impact on the health and welfare of dairy cows and the lives of dairy producers has been enormous.

While this aspect of the dairy veterinary profession has grown to a commendable degree, it still faces challenges. Much of this activity does not fall under the veterinary practice acts, thus there are others who compete to provide consultation services to the dairyman. Some of these competitors act as independent, fee-for-service consultants just like veterinarians, but many provide consulting services as "value added" for some product sales effort, such as feed or nutrient ingredients, or pharmaceuticals. While the dairyman certainly pays for those services in the end, the cost is often "bundled" into product sales and thus is less apparent than an invoice from the veterinarian. (There may be opportunities for "bundling" by veterinary consultants, but it is not widespread as a principal income source.) State extension and diagnostic services also provide consultation to producers, often for free. By its nature, management consultation tends to be self-limiting. As problems on a dairy are addressed and management improves, the need for consultation in that area on that farm wanes. In effect, good consultants may work themselves out of a job on a dairy. In addition, the profession suffers from a history of charging for physical services and drugs, and for many clients it is a difficult paradigm shift to pay their veterinarian for largely intellectual efforts or work done away from the dairy (e.g., records evaluation, ration balancing, protocol development, etc.). Our observations of the consulting role for dairy veterinarians over an extended time period suggest that few veterinarians manage to earn their full income from consulting alone. Those that do so find they must constantly widen their geographical span to find new clients who are interested in their services.

4. **Herd manager**: There have always been a few dairy veterinarians who have owned their own dairies. Over the past decade or so in the US, however, a new trend has developed where more and more veterinarians—indeed some of the best of the breed—have moved from practice into direct management of dairy farms. Some are equity shareholders in the dairy and others work as employees. This trend appears to be growing and may attract more of the profession. By nature of the cost of employing a veterinarian as a manager, this career path is likely to be open mostly in large herds.

The roles needed for dairy veterinarians vary depending on the sector of the dairy industry being served (Table 2). The most significant challenge facing young and mid-career dairy veterinarians who wish to serve production dairy units may be whether they can shift the focus of their professional efforts to adapt to the changing demographics of the dairy industry they serve.

Table 2. Matching services to dairy type.

	Sunset	Niche	Lifestyle	Large
Technical services	XXX	XX	XX	X
Drug sales	XX		XX	-?
Consulting	X	XX		XX?
Managerial role	-	-	-	XX?

Can the veterinary profession make this transition?

Supply of Dairy Veterinarians

According to American Veterinary Medical Association (AVMA) figures for 2002, there are about 8,000 veterinarians in the US whose practice activities probably include at least some dairy veterinary work.[2] In contrast, there are fewer than 200 exclusively swine practitioners and about 250 poultry practitioners listed (Table 3); both are industries that have largely completed their consolidation. Interestingly, there are about the same number of exclusively pet bird practitioners in the US as there are veterinarians serving the entire poultry industry.[2] Notably, Americans eat more chicken than any other meat.[15]

Most large animal veterinarians in the US are men (77% male, in contrast to the practicing profession as a whole where men comprise 68% of the total and only 35% of new graduates) who generally work in small practices (two or three practitioners) and have slightly more than $150,000 of their own equity invested in the practice (Table 4).[2] Adjusting for a reasonable return on their equity, the annual earnings for large animal (bovine) veterinarians averages about $75,000 (Table 5).[2] Average starting compensation for new graduates entering food animal practice is roughly $55,000[15] (Table 6). Assuming that these new practitioners work 50 hours per week, this income is roughly comparable to the average incomes that would be possible working fewer hours as a dental hygienist, electrician, or bricklayer.[13] It seems clear that money alone does not motivate the choice to pursue a career as a dairy veterinarian, but inadequate earnings likely affect the level of interest in the profession and the rate of attrition.

Currently approximately 17% of new graduates enter large animal or mixed practice.[1] Only about 6% enter large animal exclusive or predominantly large animal practice. It seems likely that those 6% constitute the real entering pool of future dairy practitioners in terms of commercial milk production, roughly 150 new food animal practitioners per year. Spread evenly across the veterinary colleges of the US, this would be roughly six students per class. It is estimated that roughly one-half of all new food animal practitioners leave that sector of the profession within the first five years following graduation.[5,12] Attrition rate for female graduates entering large animal practice is nearly double that of male graduates.[11] If the long-term need for dairy veterinary practitioners is in the range of 2,000 private practitioners, then the current supply over an average of 25 years of practice should be nearly adequate, even with a roughly 50% attrition rate (150 * 0.5 * 25 = 1,875), particularly if some portion of those entering mixed practice are added to the total. If the role of veterinarians as dairy managers grows, then the demand would grow as well. What is also clear, however, is that the supply of new dairy veterinarians will not meet the demand of retiring bovine veterinarians for a new graduate to take their place and buy out the equity in their practice.

New Roles for Dairy Veterinarians

While it is reasonable to expect a decline in demand for production dairy veterinarians, it is apparent at the same time that the nation as a whole has a pressing need to expand the cohort of food animal veterinarians to address public issues of national biosecurity, food safety and product certification, protection of the food supply, environmental protection and to address issues of animal care and welfare, etc.[6] There is a growing demand from society that food animal production be transparent in its practices, that food be produced under systems of oversight and monitoring, and that consumer products can be traced back to the producer. Consumers have concerns that reach beyond the nutri-

Table 3. Distribution of food animal practices.

Likely bovine veterinarians	#		Other sectors	#
Bovine practice exclusive	827		Porcine practice exclusive	185
Mixed practice: 80% large	3,519		Poultry practice exclusive	251
Mixed practice	4,040		Avian exclusive (not poultry)	233
Totals	8,386			

September 2002 AVMA statistics for numbers.

Table 4. Size of food animal practices and assets per veterinarian.

	Number of practices	Number of vets / practice	Practice assets / veterinarian
Large animal exclusive	967	1.89	$162,246
Large animal predominant	1,318	2.22	$164,995
Mixed practice	1,391	2.76	$168,096
Totals	3,676	2.34	$165,445

With ~70,000 dairies in the US and ~3,500 practices: ~20 dairies per practice.
September 2002 AVMA statistics for numbers; 2001 income figures.

Table 5. Supply of food animal practitioners (does not include equine exclusive.

	Number	% male	% female	Average pre-tax income
Large animal exclusive	1,827	83%	17%	$84,526 ($73,189)
Large animal predominant	2,925	85%	15%	$73,080 ($61,530)
Mixed practice	3,839	67%	33%	$73,602 ($61,835)
Totals/ averages	8,591	77%	23%	$75,747 ($64,166)

American Association of Bovine Practitioners membership in 2004 is approximately 4,500 members in the US and 500 in Canada.
Statistics from September 2002 AVMA data; 2001 income figures. Mixed and large animal predominant have lowest incomes of practitioner groups.
(Income in parentheses is adjusted for return on practice equity at 7%/year.)

Table 6. Starting salaries: new graduates.

Practice type	Compensation	% of U.S. graduates	# (approx)	Other job earnings: average income	
Large animal exclusive	$60,605	3.0	75	*Dental hygienist*	*$57,300*
Large animal predominant	$54,227	3.3	75	*Electrician*	*$44,660*
Mixed practice	$54,331	9.4	220	*Bricklayer*	*$39,840*

AVMA statistics for numbers; 2003 income figures.
Average debt: $76,558
For non-veterinary trades: Bureau of Labor Statistics 2002. Assumes average hourly wages for 40 hours/week. Dairy vets typically work 50 hours or more.

ent content or even safety of their food, and retailers and food chains are demanding that specific production practices be adopted by suppliers and producers. Recent global political events have highlighted the vulnerability of US animal agriculture to introduction of rapidly contagious exotic animal diseases. Integrated food chains that tie food systems from the producer to the consumer seek professional expertise in production practice efficiency, standardization and certification of production practices, and risk management. All are potential areas of growth for veterinarians trained to work at a broader scale with the dairy industry.

Recent changes in the nation's scrutiny of food animal production and the turnover of veterinarians in federal regulatory agencies suggest increased need for veterinarians with close working knowledge of food animal production and a strong basis in veterinary science.[7] These "food system veterinarians" will shape and implement national disease control, eradication, surveillance and outbreak response efforts. An entire recent issue of the *Journal of Veterinary Medical Education* was devoted to this topic.[8] These career paths for food animal-capable veterinarians will require additional training and expertise in epidemiology, administration, public health and communication skills. Ideally, these veterinarians will also possess a firm understanding of practical animal production systems, so well-meaning public policy and regulatory programs do not fail due to impracticality or suffer from severe unintended consequences of naïve or narrowly considered recommendations.

Implications for the Profession and the Potential for Dairy Veterinary Medicine

Shifting demographic trends in the dairy industry and in veterinary professional education have significant implications for the profession. First, very few colleges of veterinary medicine have a significant compelling local interest in maintaining any strength in food animal education any longer. For most veterinary schools, the farm sector in their state is relatively ineffective as a source of political (funding) support, and the overwhelming majority of veterinary students have no interest in food animal practice. Curricula tend to shift to match faculty interests, which are in turn shaped by funding sources and student demographics. Bovine education at most schools is well on the way to the status experienced by swine, poultry and exotic animal disease education. Students with a genuine interest in food animal medicine must pursue their interest outside the general curriculum, often by traveling to other schools or to practices in other regions. Periodic efforts are made to attract more students to food animal practice, both by the profession and within veterinary colleges. Even if these efforts were successful, it is not clear that increased production of traditionally prepared clinical dairy veterinarians is really needed. Training more students only for traditional dairy practice roles may not address the real need and may be a disservice to the student.

Student tuition and state tax resources drive funding of American veterinary education, and thus it has proven difficult to create any regional or national program to educate specialized food animal veterinarians. Few deans of veterinary colleges will see a strategic advantage in giving up student tuition or state funding to another institution to accept their state's students into an educational program of sufficient intensity, practical experience, critical mass of faculty, and duration to truly prepare students for the future dairy industry. At the same time, relevant education of veterinarians to serve in the new paradigms of milk production and food systems management demands very specialized training in dairy production medicine, epidemiology and

public health. Veterinary curricula dominated by small animal and general medical science interests are resistant to opening space for these topics, even if directed only at a subset of students. As food animal faculty positions come open, the positions are often re-directed to other areas within the colleges. It is doubtful that many veterinary colleges can succeed in mounting a fully integrated effort on their own, or that state governments would see fit to add significant additional dollars to fund such an effort.

The recent effort to combat the outbreak of exotic Newcastle disease in California poultry, and the scramble to find competent veterinary personnel, graphically illustrates the problem of responding to hardship when the pool of educated professionals has been allowed to wane. Should a widespread outbreak of foot-and-mouth disease happen in the US, a similar or worse catastrophe would unfold. As the number of private bovine practitioners declines (consider the experience of the swine industry), the relatively small cadre of experienced public-sector dairy veterinarians will become a larger proportion of the available workforce in an outbreak. It is all well and good to assume the private practitioner would step into the breach in a serious biosecurity event; this is unlikely to happen if those practitioners are no longer there or if no system exists to compensate them for their efforts. Developing a "mixed model" of public and private funding to educate and sustain private practice food animal veterinarians would help assure the necessary manpower needed to respond to a major animal disease outbreak in the US when it happens.

Unfortunately, these veterinary "public goods" (safe, secure, wholesome food, rapid response to emergency situations, specified animal production practices, etc.) often cannot be financed solely from dairy producer payments to their local practitioner. First, many tasks involved in these levels of food animal veterinary work would not include the local practitioner, since they are applied in the food chain after the milk leaves the farm. Second, improvements in the public good, such as national biosecurity, producer education and technical support, and oversight of food production system processes and food safety assurances, may not increase the value of the milk sold from the farm directly. This leaves no increase in income to the dairyman to pay for increased expenses. The way to create a system of financial support for veterinarians in food animal practice from a source other than the producer may not be obvious, but it is clear that sectors of society and society as a whole would benefit from having additional support for the food animal veterinary infrastructure. There are small-scale examples of this kind of partnership between private and public veterinary programs. The state of Wisconsin has just announced a program whereby private practitioners will be trained via the web and paid on a per-herd basis to provide risk assessment and education in Johne's disease control.

Conclusions

The US government, food industries, or both should move toward regional or national systems to support education, employment, and professional function of veterinarians serving the dairy and other food animal industries. Colleges of veterinary medicine must look to creating practical consortia of opportunities for food animal and public health education, allowing specialization within the DVM curriculum and in continuing education after graduation. This is very unlikely to happen without the infusion of federal dollars to underwrite these new efforts.

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BRIEF SUMMARY
(For full Prescribing Information, see package insert.)

Banamine®

(FLUNIXIN MEGLUMINE)

Injectable Solution 50 mg/mL Veterinary

For Intravenous or Intramuscular Use in Horses and for Intravenous Use in Beef and Nonlactating Dairy Cattle Only. Not for Use in Lactating and Dry Dairy Cows. Not for Use in Veal Calves.

CAUTION: Federal law restricts this drug to use by or on the order of a licensed veterinarian.

DESCRIPTION: Each milliliter of BANAMINE Injectable Solution contains flunixin meglumine equivalent to 50 mg flunixin, 0.1 mg edetate disodium, 2.5 mg sodium formaldehyde sulfoxylate, 4.0 mg diethanolamine, 207.2 mg propylene glycol; 5.0 mg phenol as preservative, hydrochloric acid, water for injection q.s.

INDICATIONS: *Cattle:* BANAMINE Injectable Solution is indicated for the control of pyrexia associated with bovine respiratory disease and endotoxemia. BANAMINE Injectable Solution is also indicated for the control of inflammation in endotoxemia.

DOSE AND ADMINISTRATION: *Cattle:* The recommended dose for cattle is 1.1 to 2.2 mg/kg (0.5 to 1 mg/lb; 1 to 2 mL per 100 lbs) given by slow intravenous administration either once a day as a single dose or divided into two doses administered at 12-hour intervals for up to 3 days. The total daily dose should not exceed 2.2 mg/kg (1.0 mg/lb) of body weight. Avoid rapid intravenous administration of the drug.

CONTRAINDICATIONS: *Cattle:* There are no known contraindications to this drug in cattle when used as directed. Do not use in animals showing hypersensitivity to flunixin meglumine. Use judiciously when renal impairment or gastric ulceration are suspected.

RESIDUE WARNINGS: Cattle must not be slaughtered for human consumption within 4 days of the last treatment. Not for use in lactating or dry dairy cows. A withdrawal period has not been established for this product in preruminating calves. Do not use in calves to be processed for veal. Not for use in horses intended for food.

PRECAUTIONS: As a class, cyclo-oxygenase inhibitory NSAIDs may be associated with gastrointestinal and renal toxicity. Sensitivity to drug-associated adverse effects varies with the individual patient. Patients at greatest risk for renal toxicity are those that are dehydrated, on concomitant diuretic therapy, or those with renal, cardiovascular, and/or hepatic dysfunction.

Since many NSAIDs possess the potential to induce gastrointestinal ulceration, concomitant use of BANAMINE Injectable Solution with other anti-inflammatory drugs, such as other NSAIDs and corticosteroids, should be avoided or closely monitored.

Cattle: Do not use in bulls intended for breeding, as reproductive effects of BANAMINE Injectable Solution in these classes of cattle have not been investigated. NSAIDs are known to have potential effects on both parturition and the estrous cycle. There may be a delay in the onset of estrus if flunixin is administered during the prostaglandin phase of the estrous cycle. The effects of flunixin on imminent parturition have not been evaluated in a controlled study. NSAIDs are known to have the potential to delay parturition through a tocolytic effect. Do not exceed the recommended dose.

SAFETY: *Cattle:* No flunixin-related changes (adverse reactions) were noted in cattle administered a 1X (2.2 mg/kg; 1.0 mg/lb) dose for 9 days (three times the maximum clinical duration). Minimal toxicity manifested itself at moderately elevated doses (3X and 5X) when flunixin was administered daily for 9 days, with occasional findings of blood in the feces and/or urine. Discontinue use if hematuria or fecal blood are observed.

ADVERSE REACTIONS: In horses isolated reports of local reactions following intramuscular injection, particularly in the neck, have been received. These include localized swelling, sweating, induration, and stiffness. In rare instances in horses, fatal or nonfatal clostridial infections or other infections have been reported in association with intramuscular use of BANAMINE Injectable Solution. In horses and cattle, rare instances of anaphylactic-like reactions, some of which have been fatal, have been reported, primarily following intravenous use.

HOW SUPPLIED: BANAMINE Injectable Solution 50 mg/mL is available in 50-mL (NDC 0061-0851-02), 100-mL (NDC 0061-0851-03), and 250-mL (NDC 0061-0851-04) multidose vials.

Store between 2° and 30° C (36° and 86° F).

Schering-Plough Animal Health Corp. Union, NJ 07083