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Disease and Injury Among Veterinarians

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Key words: job tasks, hazards, trauma, infectious diseases, dermatoses, allergies, cancer, pregnancy, AIDS

Veterinarians have a unique position in agriculture. Their scientific knowledge of animal anatomy, physiology, and health makes them indispensable to the production of food. They are also important in the early identification of risks and hazards to food, especially from disease. Their close working relationship with production agriculture and animals exposes them to unique risks that will be explored in this chapter. In veterinary medicine, the patient is the animal, whether it is a reptile, bird, amphibian, fish, or mammal. The client is the owner of the animal, typically a farmer, agribusiness owner, or laboratory manager.

The job tasks of veterinarians are highly variable, as summarized in Table 21.1. They are involved in the clinical diagnosis and treatment of animal diseases, sometimes requiring subspecialization. Veterinarians are also engaged in teaching and research, regulatory medicine including food safety and inspection, public health, the military, and private industry (1).

Veterinarians may work in an office, or in farms, ranches, paddocks, and laboratories. They face many hazards, and the number of occupational illnesses and injuries they suffer is also high. Table 21.2 summarizes the hazards, injuries, and illnesses experienced by veterinarians (2).

A descriptive study conducted from 1967 to 1969 of the basic health characteristics of 1100 veterinarians in Illinois documented that 87% had consulted a physician concerning their health within the previous 30 months. Within the previous 18 months, 47% had been vaccinated against tetanus. Over one third of the veterinarians had received their last tetanus inoculation because of an injury. Thirty-one percent had been tested serologically for zoonotic infections other than at a meeting of the state veterinary association, and 12% were allergic to an antimicrobial (3).

TABLE 21.1. Veterinary job tasks.

Clinical diagnosis and treatment of animals (may be limited to a specific family, genus, or species)
Internal medicine
Surgery
Toxicology
Laboratory animal medicine
Poultry production health
Theriogenology (study of blood lines and reproduction)
Anesthesiology
Behavioral psychology
Clinical pharmacology
Dermatology
Emergency and critical care
Microbiology
Nutrition
Ophthalmology
Pathology
Radiology
Dentistry
Zoological medicine
Teaching and research
Classroom teaching and research
Field and laboratory work
Regulatory medicine
Animal quarantine and inspection, development and testing of new animal vaccines, implementation and enforcement of humane laws
Public health
Epidemiology, environmental health, food and medicine safety, supervision of laboratory animals
Military
Research, clinical work, epidemiology, food inspection
Private industry
Development of new production methods, drugs, chemicals, and biological products

Source: Data from Hoblet et al. (1) and Jeyaretnam et al. (2).

Trauma

Veterinarians are in close contact with animals of different families, genera, and species. Many of these animals are large, unwieldy, and uncooperative during examination or treatment. It is quite common for veterinarians to receive bites, scratches, crush injuries, and low-back injuries from these animals. In Australia, 71% of veterinarians surveyed reported a lost time injury within the last 10 years from handling animals. In a survey of zoo veterinarians in the United States, 61.5% of respondents reported major animal-related injury and 55% reported low-back injury. Full-time zoo veterinarians were more likely to report back injury and inadequate knowledge of occupational hazards (2,4).

TABLE 21.2. Veterinary hazards, illnesses and injuries.

Hazard	Injury	Illness
Trauma	Bites, scratches	Infections
	Crushing	Tetanus
	Lifting	Rabies
	Repetitive motion	Tenosynovitis
	Motor vehicles accidents	
	Assault	
	Scalpel cuts	
Zoonotic diseases		Infectious diseases
Dermatoses		Allergic contact
		Infectious
Allergies		Dermatitis
Animal hair		Asthma
Airborne dust		Bronchospasm
Equipment		Sinusitis
Medications		
Environment		
Toxic exposures	Chemical burns	Hepatorenal disease
Medications		
Anesthetics		Myelodysplastic disease
Pesticides		
Chemicals		
Emotional problems		Suicide
		Anxiety
Radiation	Radiation burns	Myelodysplastic diseases
Ionizing	Actinic skin lesions	Basal cell carcinoma
Nonionizing		
Drug abuse		Drug addiction and associated diseases
Medications		
Alcoholism		
Cancer risk		
Radiation		
Chemicals		
Pregnancy risk		Abortion
Chemicals		Preterm births
Radiation		
Needle sticks	Puncture trauma	Tetanus
		Rabies
		Infections
		Injection injury

Source: Data from Jeyaretnam et al. (2).

A survey of veterinarians in Minnesota and Wisconsin revealed that 64.6% of respondents had sustained a major animal-related injury in their careers. Seventeen percent were hospitalized within the last year, 25.3% requiring a surgical procedure. Hand injuries were most common in a veterinarian's career (52.6%), followed by trauma to the arms (27.6%) and the head (20.8%). The thorax (8.3%), genitalia (3.9%), and intraabdominal viscera (2.8%) were injured less often. Operative procedures were frequently required

to treat veterinarian injury from animal patients. Thirty-five percent of veterinarians required treatment for suture of lacerations, 10% for reduction of fracture/dislocation, and 5% for dental work during their career. One craniotomy and one carotid artery repair were necessary. Mechanisms of injury were animal kick (35.5%), bite (34%), crush (11.7%), scratch (3.8%), and miscellaneous causes (14.9%), including the patient pushing, goring, head butting, running over, and falling on the veterinarian. Additional work-related hazards included zoonotic disease, autoinoculation of live brucella vaccine, and self-inflicted scalpel injuries from sudden patient movement. The most common animals involved were bovine (46.5%), canine (24.2%), and equine (15.2%). Lost days from work secondary to animal injury averaged 1.3 days in 1986 and 8.5 days during the veterinarian's career. Job-related automobile accidents also occurred. Veterinarians averaged more than 300 miles driven per week, and only 56% reported following the speed limit. Fifteen percent did not wear seat belts. Self-treatment of injuries was common (5).

Even though animal bites are common and a real risk for rabies exists, surveys have demonstrated a relatively low rate of rabies immunization in veterinarians and veterinary workers. The cost of preexposure rabies vaccine was found to be a major barrier, especially in young, part-time workers (6).

In a survey of all 1970 to 1980 female graduates of all United States veterinary colleges, 64.0% of all respondents reported one or more needle sticks after graduation. Substances most often injected include vaccines, antibiotics, anesthetics, and animal blood. The estimated overall needle stick injury rate was 9.3 sticks per 100 person-years of practice, comparable to reported rates among health care workers such as nurses, laboratory technicians, and hospital housekeeping staff. All-small-animal and mixed-practice veterinarians demonstrated the highest rates, with all-large-animal practitioners demonstrating a rate lower by 40% (7).

Infectious Diseases

Most zoonotic diseases in veterinarians are self-diagnosed and treated. See Chapters 27 and 29 for a more extensive discussion of the diagnosis and treatment of these diseases. Nonzoonotic diseases in veterinarians include coccidioidomycosis, histoplasmosis, malaria, and other diseases common to areas where they work (see Chapter 28). In addition, veterinarians are at risk for infections from mishandled biological material in laboratories.

A survey of 88 veterinarians employed at a faculty of veterinary science found that 63.6% of veterinarians interviewed had suffered from a zoonotic disease. Veterinarians predominantly involved in farm animal practice were three times more likely to have contracted a zoonotic disease than those working in other veterinary fields. Fifty-six percent of disease incidents were initially diagnosed by the veterinarians themselves. Fifty-three percent of

incidents required treatment by a medical practitioner, but the majority (61%) of incidents did not require absence from work. The incidence density rate for contracting a zoonotic disease was 0.06 per person year of exposure. Kaplan-Meier survival analysis estimated that the probability of having contracted a zoonotic disease was 50% after 11 years in practice. The risk of contracting a zoonotic disease appeared to be higher early in practice, and the most common mode of transmission was by direct contact (8).

Another risk to agriculture and the veterinary profession is the possibility of veterinarians acting as carriers of zoonotic illness and infecting herds that they may be examining or treating. Although the spread of zoonotic infections from humans to animals is rare, it does occur; rapid treatment and monitoring of veterinarians for infection may be necessary to protect herds (9).

Dermatoses

Researchers studying California veterinarians found a reported history of skin atopy in 11% and respiratory atopy in 63% of respondents. Dermatoses during their career were reported by 46% of respondents, and hand and/or forearm dermatitis was reported more than once during the past year by 22% of women and 10% of men. Dermatitis with work-related exacerbating factors was reported by 28%. Almost one in five veterinarians reported animal-related skin symptoms. Other aggravators were medications (2%), gloves (4%), and other chemicals (7%). Of those with animal-related dermatitis, 65% reported only one animal (dog, 66%; cat, 29%; horse, 9%; and cattle, 8%), and 66% reported the symptoms appeared in minutes after the contact. The risk factors for the appearance of hand/forearm dermatitis during the past 12 months and more than once during their career were history of skin atopy, childhood hand dermatitis, history of respiratory atopy, and female gender (10).

In a study of the Kansas Veterinary Medical Association, 24% of respondents reported noninfectious, recurrent/persistent hand or forearm dermatoses, of which 66% were work related. Large-animal veterinarians and persons with a history of atopy were more likely than their counterparts to attribute their dermatoses to work-related factors. Thirty-eight percent of respondents had contracted at least one infectious skin disease from an animal. Veterinarians who never or rarely use gloves during obstetric procedures were more likely to report work-related dermatoses than those who use gloves (11).

The use of latex gloves in veterinary practice is common, and latex allergies are a routine finding in veterinarians as well as in other health care fields (see Chapter 18).

In Poland, bull terrier seminal fluid was found as a source of contact urticaria and rhinoconjunctivitis. In Belgium, contact sensitivity was documented in health care workers, including veterinarians, to penicillins,

cephalosporins, and aminoglycosides. In Germany, itching, swelling, and urticaria on the hands on arms of veterinarians were found after contact with amniotic fluid of cows and pigs. Immunoglobulin G (IgG) levels were elevated, radioallergosorbent test (RAST) investigations were positive to amniotic fluid, and skin tests were also positive to amniotic fluid. In all these cases, the use of gloves, either latex or a substitute, was recommended (12–14).

Researchers in the Netherlands assessed the incidence of pustular dermatitis after deliveries in cattle and sheep. One or more episodes of pustular dermatitis on an arm after a delivery in cattle or sheep was noticed by 81.5% of the respondents. Sometimes it was associated with secondary symptoms such as headache, fever, and lymphadenitis. *Listeria monocytogenes* and *Salmonella dublin* were the agents cultured most often (15).

Allergic Exposures

Allergic exposures not affecting the skin impact primarily on the respiratory system, including the nasal passages, bronchial tubes, and lungs. Allergens may include organic dusts in the air; dust, hair, and dander from animals; veterinary pharmaceuticals; and farm chemicals. Allergic respiratory disease is discussed in Chapter 19 and allergic skin disease in Chapter 18.

Radiographers process x-ray films using developer and fixer solutions that contain chemicals known to cause or exacerbate asthma. In a Canadian study, radiographers' personal exposures to glutaraldehyde (a constituent of the developer chemistry), acetic acid (a constituent of the fixer chemistry), and sulfur dioxide (a by-product of sulfites, present in both developer and fixer solutions) were measured. Average full-shift exposures to glutaraldehyde, acetic acid, and sulfur dioxide were 0.0009 mg/m^3, 0.09 mg/m^3, and 0.08 mg/m^3, respectively, all more than one order of magnitude lower than current occupational exposure limits. Local exhaust ventilation of the processing machines and use of silver recovery units lowered exposures, whereas the number of films processed per machine and the time spent near the machines increased exposures. Developments in digital imaging technology provide options that do not involve wet-processing of photographic film and therefore could eliminate the use of developer and fixer chemicals altogether (16).

Hazardous Chemical Exposures

Veterinarians and their assistants may be exposed to anesthetic gases, pharmaceuticals (including antineoplastic agents), disinfectants such as phenol and formaldehyde, and sterilants such as ethylene oxide. Typical chemicals that veterinarians may come in contact with include dark room chemicals, formaldehyde, glutaraldehyde, halothane, iodine, methylated spirits, and pentobarbital (2,17).

Anesthetic Gases

Anesthetic gases have been associated with toxic and chromosomal effects on the users. Investigations have shown that many of the anesthesia machines used in veterinary medicine have leaks that contribute to operating room contamination. Many others do not have appropriate scavenging attachments to remove escaping gases. Personnel have been frequently observed carelessly using equipment or handling anesthetic agents in a manner contributing to excessive exposure. Proper maintenance of equipment and careful use of gaseous anesthetic agents can significantly reduce waste gas levels and exposure of personnel (18).

In Austria, operating room personnel exposed to an 8-hour time-weighted average of 12.8 ppm nitrous oxide and 5.3 ppm isoflurane had a mean frequency of sister chromatid exchanges significantly higher than controls (19).

In Colorado, a survey of veterinarians in an 11-county region indicated that inhalation anesthetics were used in 80.8% of the 210 practices. Exposures to waste anesthetics in veterinary practices were far less than reported in human hospitals. Waste anesthetic concentrations were affected by size of the patient, type of breathing system, and use of scavenging systems. Dilution ventilation had no effect on breathing zone concentrations. The endotracheal tube and occasionally the anesthetic machine were the major sources of leakage of anesthetic gases (20).

In Canada, concerns were raised by several workers from veterinary clinics in Manitoba regarding potential exposure to isoflurane and halothane during anesthetic administration. No guideline have been established for isoflurane by the American Conference of Governmental Industrial Hygienist (ACGIH) or a permissible exposure limit by the Occupational Safety and Health Administration (OSHA) or a recommended exposure limit (REL) by the National Institute for Occupational Safety and Health (NIOSH). The ACGIH threshold limit value (TLV) time-weighted average (TWA) for halothane is 50 ppm and NIOSH has established 2 ppm as a recommended level based on a 1-hour sampling; OSHA has established no guideline for halothane. All veterinary clinics inspected had installed the passive waste gas scavenging system. Veterinarians' personal exposures for isoflurane ranged from 1.3 to 13 ppm, and for their assistants, personal exposures ranged from 1.2 to 9 ppm. Veterinarians' personal exposures for halothane ranged from 0.7 to 12 ppm; for their assistants, personal exposures ranged from 0.4 to 3.2 ppm. One clinic had significant leaks in the anesthetic gas delivery lines. Personal halothane exposure for the veterinarian at this clinic was 7.2 to 65 ppm. Peak exposures were recorded when the cuffed endotracheal tube was removed from the animal. Equipment leaks were minimal when the system was maintained at its optimum operating condition (21).

Veterinary Pharmaceuticals

Many veterinarians compound and apply their own pharmaceuticals to their patients. Safety guidelines in both the manufacture and use of these

medications are less stringent than in humans, although the risk of injury to the people who come in contact with them is just as great. Substances in this group include antibiotics, immunizations, hormones, anesthetics, steroids, disinfectants, sterilants, prostaglandins, special feed formulas, and insecticides. A good example is the accidental injection of brucellosis vaccine into the hand of the veterinarian as he gives an injection to an animal. The veterinarian is faced with multiple exposures including infection, tetanus, toxic injection injury, and an immunological response. Aggressive treatment with antibiotics, steroids, and sometimes surgery is often delayed by the reluctance of veterinarians to admit their injuries and their tendency for self-treatment.

Pesticides

In a health and safety survey of all licensed pet groomers and pet-animal veterinarians in New Jersey, approximately 36% of the respondents indicated that during the 1994 flea season they had experienced at least one of the 17 symptoms associated with insecticide application. Central nervous system symptoms (headache, dizziness, or confusion) and skin symptoms (skin rash or numbness/tingling) were reported most frequently. Logistic regression results suggest that applications per season, years as an applicator, certain hygiene variables, certain classes of products, and status of applicator (lay person vs. veterinary) are potentially important risk factors (see Chapters 13 and 16) (22).

Emotional Problems

Stress in veterinarians is associated with the ordering of drugs, staff supervision, public relations, professional working hours, heavy responsibilities, and the fear of burglaries. While most veterinarians manage these stressors adequately, there is an ongoing problem of suicide, drug addiction, and "burnout" in the profession. Especially in small-animal veterinarians, the euthanasia of animals and the supervision of the slaughter of animals for public health reasons add further stress (see Chapter 22) (2).

In a study of 450 California veterinarians who died between January 1960 and December 1992, white male and female veterinarians had significantly elevated mortality from suicide. Significantly elevated rates were noted for suicide in veterinarians in the profession for less than 30 years (23).

Radiological Exposures

In the early years of veterinary and medical radiology, many severe radiation injuries occurred in radiologists. Unfortunately, there are still cases of skin lesions of the hands affecting veterinarians, mainly caused by careless handling during the imaging. Safety advice includes staying out of the primary

beam and being aware that lead gloves are no protection against primary rays. In contrast, the risk of placing the feet in the primary beam is relatively low. Monitoring of radiation shows that if veterinarians take appropriate precautions, there is no danger of radiation damage (24).

Drug Abuse

Especially in small practices, there is access to opiate analgesics, anesthetics (especially nitrous oxide, which is inhaled to produced a heightened sexual experience), and steroids that can be diverted for personal use by veterinarians or their staff. As with other agricultural occupations, veterinarians are susceptible to a number of agents in addition to those used in their offices, including amphetamines, barbiturates, hallucinogens, and alcohol (see Chapter 10) (2).

Cancer Risks

The incidence of cancer in veterinarians is generally low, in part due to the low prevalence of cigarette smoking in this group. However, they come into contact with several potentially carcinogenic exposures including radiation, anesthetic gases, pesticides, and zoonotic agents. Other sources of carcinogenic exposure are solar radiation, veterinary pharmaceuticals, and office and laboratory chemicals (25).

Veterinarians have elevated risks for several specific cancer types including leukemia, Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma, and cancers of the lip, stomach, prostate, brain, and connective tissue. Two major groups of risk factors have been proposed as causes of hematological malignancies in agricultural workers. The first group includes various agricultural chemicals. In particular, several studies have found increased risks of malignant lymphoma and soft tissue sarcoma in persons exposed to phenoxy herbicides. However, the evidence is inconsistent, and there is a wide variation in relative risk estimates. The second group of risk factors includes various animal viruses. There is currently little evidence concerning the zoonotic nature or human carcinogenicity of these viruses. However, an association has been suggested by recent evidence of increased risks of hematologic malignancies in abattoir workers, veterinarians, and meat inspectors. A third hypothesis, for which little evidence is currently available, is that agricultural work may involve prolonged antigenic stimulus leading to lymphoproliferation. The factors responsible for the increased risks for cancers other than hematologic malignancies are not well understood but may also involve exposure to chemicals or viruses (26).

Using the Swedish Cancer Environment Registry, researchers compared the incidence of cancer among male veterinarians with that in the rest of the population. Veterinarians experienced increased risk of esophageal, colon,

pancreatic, and brain cancers, and melanoma of the skin. The increased risks did not seem to be explained by the high socioeconomic status of this occupational group, and it was postulated that some of these results reflected the carcinogenicity of occupational exposures, including animal viruses, solar or ionizing radiations, and anesthetics (27).

A study of 450 California veterinarians who died between January 1960 and December 1992 demonstrated that in comparison to the California general population statistics, white male veterinarians had significantly elevated mortality from malignant melanoma of the skin, cancer of the large intestine, and rheumatic heart disease. Significantly elevated ratios were noted for deaths due to malignant melanoma of the skin and rheumatic heart disease in veterinarians in the profession 20 years or more; and cancer of the large intestine in veterinarians in the profession 30 years or more (23).

In the United States a cancer surveillance investigation using death certificates from 24 states for the period 1984 to 1989 was used to identify multiple myeloma and occupation associations. Women demonstrated significant excess risk among managers and administrators, post–secondary school teachers, elementary school teachers, social workers, other sales workers, waitresses, and hospital maids. Men showed significant risks among computer system scientists, veterinarians, elementary teachers, authors, engineering technicians, general office supervisors, insurance adjusters, barbers, electronic repairers, supervisors of extracting industries, production supervisors, photoengravers, and grader/dozer operators (28).

Studies of the Danish Cancer Registry on the possible association between exposures of parents at the time of conception and cancer in their offspring have provided no clear answer. Significantly increased risks for renal cancer (mainly Wilms' tumor) and for osteogenic and soft tissue sarcomas were observed in children in association with mothers' employment in medical and dental care. The risk for cancers at all sites was significantly elevated in children of female nurses and of male and female physicians, dentists, dental assistants, veterinarians, and pharmacists combined. Handling of drugs and exposure to anesthetics and infections during pregnancy are suggested to be potential risk factors. The suggestion in earlier studies that exposures to hydrocarbons and lead are risk factors for childhood cancer could not be supported by the analysis (29).

Causes of death among 5,016 white male veterinarians were compared to a distribution based on the general U.S. population. Proportions of deaths were significantly elevated for cancers of the lymphatic and hematopoietic system, colon, brain, and skin. Fewer deaths were observed than expected for cancers of the stomach and lung. Although socioeconomic and methodological factors may be involved, the patterns suggest that sunlight exposure is responsible for the excess of skin cancer among veterinarians whose practices are not exclusively limited to small animals, and ionizing radiation exposure contributes to the excess of leukemia among veterinarians practicing during years when diagnostic radiology was widely used (30).

Risks to Pregnancy

In a major needle-stick study, one accidental self-injection of a prostaglandin compound resulted in a spontaneous abortion, heightening awareness that occupational needle sticks may also represent a serious human reproductive health hazard (7).

In a survey of 2,997 female graduates from United States veterinary colleges between 1970 and 1980, absolute and relative risks of preterm delivery (PTD) were highest for veterinarians employed in exclusively equine clinical practice. Occupational involvement with solvents among exclusively small animal practitioners was associated with the highest relative risk of PTD. Overall absolute risks of PTD and small for gestational age births among cohort members were much lower in comparison with the general female population (31).

Another study of female pregnancies concluded that veterinarians employed in all-equine practices were at highest relative risk of spontaneous abortion when compared with pregnancies reported by unemployed veterinarians. Agent-specific relative risk estimates ranged from 0.7 to 1.1, suggesting little or no excess risk. When analyses were restricted to small-animal practitioners, there was a weak association between miscarriage risk and job-related exposure to ionizing radiation (32).

Antineoplastic Medications

Antineoplastic medications such as mitotane (Lysodren), chlorambucil (Leukeran), and azathioprine (Imuran) are usually teratogenic but can also be mutagenic, carcinogenic, and abortigenic. The principle governing working with cytotoxics is to keep exposure as low as possible. This may necessitate premix syringes and bottles prepared at a pharmacy under special mixing hoods, personal protective equipment, and isolation procedures. The clients and other people close to the patient are also potentially at risk and should be told of this and informed about drug administration and the disposal of feces, vomit, urine, saliva, and blood that may contain the active pharmaceutical. The prescription and/or administration of cytotoxic drugs, including those that are used as immunosuppressive agents in veterinary medicine, should be restricted to specialist veterinarians who have adequate knowledge and appropriate facilities to work with these agents (33,34).

AIDS-Infected Persons in the Veterinary Workplace

The American Veterinary Association had reminded veterinarians that acquired immune deficiency syndrome (AIDS) is a human disease and that human immunodeficiency virus (HIV) does not infect animals other than nonhuman primates. Veterinarians and their employees are no more at risk by reason of their employment than are workers in offices. Cautions for

health care workers do not generally apply to animal health care workers, but they are good rules to follow if it is necessary to render first aid for human injuries in the workplace (35).

Persons infected with the AIDS virus may be more susceptible to zoonotic transmission due to their immunocompromised status. Animal-associated pathogens of concern to immunocompromised persons include *Toxoplasma gondii*, *Cryptosporidium* spp., Salmonella spp., Campylobacter spp., *Giardia lamblia*, *Rhodococcus equi*, *Bartonella* spp., *Mycobacterium marinum*, *Bordetella bronchiseptica, Chlamydia psittaci,* and zoophilic dermatophytes. However, with the exception of *Bartonella henselae* and zoophilic dermatophytes, infections in humans are more commonly acquired from sources other than pets, and the infectious disease risk from owning pets is considered low. Nonetheless, HIV-infected persons may still be advised not to own pets because of their compromised immune status and the possibility of contracting a zoonotic disease (36).

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