



TRENDS IN VETERINARY NURSING

Pregnancy in the Veterinary Clinic: Understanding Risks and Safety Best Practices

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Veterinary medicine is ever-changing, but a constant should be the prioritization of the health of patients, clients, and veterinary team members. Protecting these individuals is the ethical oath we take as veterinary professionals, and that means being able to identify and understand potential clinical hazards for all, including those encountered by pregnant individuals.

The female population in the veterinary profession is large and continues to grow each year, with 67.3% of veterinarians¹ and 91% of veterinary nurses² in the United States identifying as female. As these percentages continue to progress, so do advancements in veterinary medicine. New pharmaceuticals, technology, and even diseases are being discovered daily, and continuing education on these advances and their potential health risks is vital to the safety of everyone involved in the veterinary profession, perhaps most especially pregnant individuals.

This article outlines different categories of potential clinical hazards and their associated safety best practices to be aware of to ensure the health and wellbeing of pregnant individuals in the veterinary clinic.

IMAGING AND RADIATION

Radiation has become among the most well-known occupational hazards in the veterinary workplace. With this evolved understanding has come an increase in protective measures being implemented and practiced. The 2 categories of imaging modalities of importance for pregnant healthcare workers are those that use ionizing radiation (e.g., diagnostic radiography, computed tomography [CT], fluoroscopy, radiation therapy), and those that do not (e.g., magnetic resonance imaging, ultrasonography).

Radiation ionization is a process where energy is added within the cell, causing electrons to be removed from an atom of a molecule, thereby causing cellular death or inactivation. Cells that are rapidly dividing are the most sensitive to this process, explaining why these forms of imaging pose the most significant risk to a growing fetus, particularly during the first trimester.³

Imaging modalities that do not use ionizing radiation are considered generally safe for pregnant individuals.

Safety Guidance

Radiation safety begins and ends with using practices that follow the 3 as low as reasonably achievable (ALARA) key protective and dose-reducing measures: distance, shielding, and limiting exposure. ALARA practices are recommended to all individuals involved in ionizing radiation imaging, pregnant or not, to protect themselves from unnecessary exposure and risks.³



Adverse outcomes for pregnant healthcare workers have decreased significantly over the years with advancements in safety regarding waste anesthetic gases (WAGs).

Distance

Scatter radiation, the secondary radiation created when the primary beam is deflected, is what veterinary medical personnel should avoid, as they should never be directly exposed to the primary beam that is obtaining the image of the patient. The distance recommended between the radiographer and the primary beam is at least 6 feet to significantly reduce scatter radiation exposure.³ To achieve that distance, the patient should be sedated while using positioning aids such as sandbags, tape, or foam pads, to name a few, and the radiographer should ideally be positioned behind a protective lead barrier.³ This recommendation includes those who are taking dental radiographs.

Shielding

Shielding includes the consistent use of lead-lined personal protective equipment (PPE) such as a thyroid guard, apron, glasses, and gloves, all of which are recommended when taking radiographs.³

Limiting Exposure

Limiting one's exposure to radiation means only being in the radiology room if it is essential, collimating the beam to the appropriate area of interest, and having the correct positioning of the patient and exposure settings for each radiograph. Whole-body dosimetry badges are required for everyone in the radiography room.³ These badges should be worn at the collar and outside of the apron. There are special fetal dosimetry badges for pregnant personnel that should be worn beneath the lead apron at waist level.

ANESTHESIA

Adverse outcomes for pregnant healthcare workers have

**TABLE 1 Common WAG Exposures⁴**

SOURCE OF EXPOSURE	AMOUNT OF EXPOSURE
Improperly inflated endotracheal tube	6 ppm
Induction chamber	10 ppm
Recovering extubated patient	5 ppm
Disconnecting patient under anesthesia	70 ppm

PPM = parts per million; WAG = waste anesthetic gas

decreased significantly over the years with advancements in safety regarding waste anesthetic gases (WAGs). These gases include isoflurane, sevoflurane, and desflurane, which are commonly encountered by veterinary professionals who work in surgery or recovery. Adverse outcomes have been primarily due to improper use and management of scavenging systems and leaks within the systems (see [TABLE 1](#)).

Safety Guidance

The National Institute for Occupational Safety and Health (NIOSH) has a recommended maximum exposure to these gases at 2 parts per million per hour.⁴

Avoiding WAG exposure altogether is a common and respected choice for pregnant healthcare workers. However, precautions and preventive measures can also decrease exposure among workers involved in anesthetic procedures.

Proper anesthetic maintenance and practices start with the anesthesia machine and consists of the entire anesthetic team being aligned during the procedure. Anesthetic machines should be inspected by a professional on an annual basis, checked for leaks prior to use, and rechecked after any change to the tubing or rebreathing bag. The active scavenging system should be double-checked to ensure that it is working properly, and the portable activated charcoal canisters should be

weighed and replaced before each anesthetic procedure if the canister has absorbed more than 50 grams.

An additional best practice includes keeping the vaporizer turned off unless the patient is connected to the anesthesia machine with a properly inflated endotracheal tube, especially when intubating and disconnecting patients to reposition during surgery.

Anesthetic dosimetry badges are available to veterinary personnel and are recommended by NIOSH to monitor WAG exposure for both nonpregnant and pregnant workers.⁴

HAZARDOUS DRUGS

New pharmaceuticals are being released daily, and keeping current on the potential hazards of these drugs is critical when handling them. Each clinic in OSHA (Occupational Safety and Health Administration) compliance should have a safety data sheet for all on-site drugs and chemicals, and it should be available for employees to access at any time. Otherwise, reading the drug package insert is recommended.

Hazardous drugs include antineoplastics, immunosuppressants, antivirals, vasodilators, anticonvulsants, and hormones, to name a few. The specific drug hazard for pregnant individuals are genotoxic drugs, which cause DNA damage at the genetic level and subsequent developmental malformations of the fetus.⁵

Prior to 2015, the FDA categorized drugs as A, B, C, D, and X to represent their safety from the least likely to cause adverse effects to those with the potential for the greatest level of harm ([TABLE 2](#)), the latter of which should be avoided entirely by pregnant individuals.⁶ Most antineoplastics, such as cisplatin, vinblastine, and doxorubicin, fall into Category D, with known risks to fetal development.⁶ The most hazardous drugs, which belong in Category X, are

TABLE 2 FDA Drug Pregnancy Risk Categories⁶

CATEGORY	SUMMARY
A	Animal and human studies imply no risk to a fetus during any stage of pregnancy
B	Animal studies (not human) imply no risk to a fetus
C	Animal studies (not human) imply potential adverse effects on a fetus
D	Evidence of risk in human studies
X	Contraindicated handling during pregnancy due to the risk of fetal abnormalities/adverse effects

TABLE 3 NIOSH List of Hazardous Drugs^{5*}

DRUG NAME	DRUG USE	FDA CATEGORY
Spironolactone	Mineralocorticoid receptor antagonists	C
Cyclosporine	Immunosuppressant	C
Chloramphenicol	Antibiotic	C
Apomorphine	Dopamine receptor agonist; emetic	C
Oxytocin	Hormone	C
Voriconazole	Antifungal	D
Zonisamide	Anticonvulsant	D
Methimazole	Antithyroid agent	D
Estradiol	Estrogen	X
Diethylstilbestrol	Synthetic estrogen	X
Misoprostol	Prostaglandin	X

**This list is not exhaustive and is intended to provide examples of hazardous drugs that veterinary professionals should be aware of in the clinical setting.
NIOSH = National Institute for Occupational Safety and Health*

hormones, synthesized or otherwise, such as progestins, prostaglandins, and estrogen.⁶

The NIOSH drug list contains a compiled list of hazardous workplace drugs (TABLE 3).⁵ The most recent release of the NIOSH List of Hazardous Drugs in Healthcare Settings of 2024 replaced the alphabetical categorization of pregnancy hazards with further explanation of the potential effects of these substances. While this list is extensive, multiple pharmaceuticals are not on this list, such as sodium pentobarbital, the standard euthanasia solution⁷; dexmedetomidine, with its known blood pressure effects⁸; and preservatives that can be absorbed through the skin and cross the placental barrier resulting in serious adverse effects, such as formaldehyde.⁹

In equine practice, there are multiple products that pregnant individuals should be cautious with or avoid altogether, including nitrofurazone and diclofenac, neither of which is listed in the NIOSH list of hazardous drugs. Nitrofurazone belongs to the class of drugs known as nitrofurans, which has been prohibited in the use of food animals since 2002 due to its known carcinogenic effects.¹⁰ Diclofenac, a commonly used topical NSAID, should be avoided by pregnant women after 30 weeks of gestation due to premature closure of the patent ductus arteriosus.¹¹

Safety Guidance

When handling preservatives, the CDC recommends the use of nitrile or neoprene rubber gloves due to the

degeneration and lack of protection from common latex or polyethylene gloves when in contact with the solvent materials.⁹ When workers are handling chemotherapy and therapeutics, gloves should be approved by the American Society for Testing and Materials.¹² Ideally, 2 pairs of these types of gloves are recommended when administering these types of drugs, as well as gowns, goggles, a full face shield, and a respiratory barrier such as a respirator.¹² It is recommended to follow safety protocols and to wear gloves when handling any pharmaceuticals, no matter the pregnancy status or field of medicine.



When workers are handling chemotherapy and therapeutics, gloves should be approved by the American Society for Testing and Materials.¹²

PARASITES AND ZOOSES

Close proximity and interaction with patients with potential to spread zoonotic diseases do not typically make veterinary professionals shake in their boots. However, it is something that needs to be at the top of mind for pregnant individuals. Pregnancy can weaken

TABLE 4 Infectious Diseases of Potential Zoonotic Risk to Pregnant Veterinary Team Members¹³

DISEASE	ETIOLOGIC AGENT	SPECIES	TRANSMISSION	VETERINARY PATIENT SYMPTOMS
Toxoplasmosis	Protozoan parasite: <i>Toxoplasma gondii</i>	Cats primarily; all other warm-blooded animals, including avian species and marine mammals¹⁴	- Fecal-oral¹⁴ - Contaminated soil¹⁴ - Undercooked meat¹⁴	- Asymptomatic in healthy patients¹⁴ - Reproductive failure in large animals¹⁴ - In immunocompromised patients, symptoms can vary from respiratory to neurologic in nature due to systemic infection.¹⁴
Leptospirosis	Bacteria: <i>Leptospira</i> species	Commonly carried by rodents. Affects many mammalian species, including domestic animals, livestock, and marine animals.^{15,16}	Direct contact with infectious urine and contaminated environmental sources, including water and soil^{15,16}	Farm animals and equine: reproductive failure¹⁶ Equine: recurrent uveitis¹⁶ Domestic animals: fever, lethargy, anorexia, joint pain¹⁵ All: Subsequent kidney damage^{15,16}
Psittacosis	Bacteria: <i>Chlamydia psittaci</i>	Over 100 avian species¹⁷	- Fecal-oral¹⁷ - Inhalation of infectious aerosolized environmental material¹⁷	Subclinical and nonspecific symptoms of anorexia, diarrhea, lethargy, and respiratory disease¹⁷
Brucellosis	Bacteria: <i>Brucella</i> species	Cattle, bison, swine, sheep, goats, marine mammals, canines, equines¹⁸, camels, and cervids¹⁹	- Direct contact with infectious blood, fetal material, uterine secretions, and contaminated environments¹⁸ - Animal products such as unpasteurized dairy products and undercooked meat¹⁹ - Vaccine exposure to broken skin barrier¹⁹	- Subclinical and nonspecific symptoms of anorexia, lethargy, and lymphadenopathy¹⁹ - Reproductive failure and disorders¹⁹ - Lameness, incoordination, and muscle weakness¹⁹
Q fever	Bacteria: <i>Coxiella burnetii</i>	- Livestock, including cattle, sheep, goats, swine, camelids, and buffalo²⁰ - Domestic animals, including dogs, cats, horses, and rabbits²⁰ - Wild animals, such as kangaroos and foxes²⁰ - Avian and arthropod species are reservoirs²⁰	- Direct contact with infective animal bodily fluids such as urine, feces, milk, and birth products²⁰ - Inhalation of infective aerosolized environmental materials²⁰	- Asymptomatic²⁰ - Reproductive failure and disorders²⁰

the immune system and, therefore, can create significant risk in handling potentially infectious materials and patients. Many parasites and infectious diseases found in animal patients are transmittable to humans. **TABLE 4** lists those that are particularly hazardous to pregnant individuals.

Safety Guidance

Refreshing oneself on the PPE protocols, transmission methods, and clinical symptoms of infectious patients can be beneficial (**TABLE 4**). The best practices for personal safety include good hand hygiene, wearing new gloves with each patient, and handling bodily fluids with caution.



SUMMARY

Veterinary professionals encounter all types of workplace hazards, but staying current on the safest practices will reduce those risks exponentially. The first line of defense starts with wearing appropriate PPE for all procedures, whether performing imaging or anesthesia, handling medications, or collecting patient samples. Limiting hazardous exposures is secondary. While these practices are recommended for all individuals in the field, special safety measures should be implemented for pregnant workers specifically, such as wearing a fetal dosimetry badge to measure and monitor the ionizing radiation exposure, not handling drugs that are known to pose a specific danger to the reproduction process, and following anesthesia best practices that reduce the amount of WAGs. The safety of each veterinary team member is as essential as they are, no matter their pregnancy status. **TVN**

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