

Problem Drugs

Many different drugs and drug classes have been reported to cause problems in dogs with the MDR1 mutation. The VCPL continues to work to identify drugs that may be dangerous to dogs with the MDR1 mutation and to determine alternative drugs and doses for these dogs.



Drugs that have been documented to cause problems in dogs with the MDR1 mutation include:

- **Ivermectin (antiparasitic agent)**- While the dose of ivermectin used to prevent heartworm infection is SAFE in dogs with the mutation (6 micrograms per kilogram), higher doses, such as those used for treating mange (300-600 micrograms per kilogram) *will* cause neurological toxicity in dogs that are homozygous for the MDR1 mutation (MDR1 mutant/mutant) and can cause toxicity in dogs that are heterozygous for the mutation (MDR1 mutant/normal).
- **Selamectin, milbemycin, and moxidectin (antiparasitic agents)**- Similar to ivermectin, these drugs are safe in dogs with the mutation if used for heartworm prevention at the manufacturer's recommended dose. Higher doses (generally 10-20 times higher than the heartworm prevention dose) have been documented to cause neurological toxicity in dogs with the MDR1 mutation.
- **Loperamide (Imodium™; antidiarrheal agent)**- At doses used to treat diarrhea, this drug will cause neurological toxicity in dogs with the MDR1 mutation. This drug should be avoided in all dogs with the MDR1 mutation.
- **Acepromazine (tranquilizer and pre-anesthetic agent)**- Based on collaborative research, the VCPL has determined that dose reductions are required for dogs MDR1 mutant/mutant and MDR1 mutant/normal.
- **Butorphanol (analgesic and pre-anesthetic agent)**- Dose reduction required for dogs MDR1 mutant/mutant and MDR1 mutant/normal.
- **Chemotherapy Agents (Vincristine, Vinblastine, Doxorubicin, Paclitaxel)**- Based on collaborative research, the VCPL has determined that dose reductions are required for dogs MDR1 mutant/mutant and MDR1 mutant/normal in order to avoid SEVERE toxicity.
- **Apomorphine** - this drug is used to induce vomiting in dogs that have ingested poisons/toxins. It can cause central nervous system depression in dogs with the MDR1 mutation at standard doses.

Drugs that are known to be pumped out of the brain by the protein that the MDR1 gene is responsible for producing but appear to be safely tolerated by dogs with the MDR1 mutation:

- **Cyclosporin (immunosuppressive agent)**- While we know that cyclosporin is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of cyclosporin for dogs with the MDR1 mutation, but we do recommend therapeutic drug monitoring.
- **Digoxin (cardiac drug)**- While we know that digoxin is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of digoxin for dogs with the MDR1 mutation, but do recommend therapeutic drug monitoring.
- **Doxycycline (antibacterial drug)**- While we know that doxycycline is pumped by P-glycoprotein (the protein encoded by the MDR1 gene), we have not documented any increased sensitivity to this drug in dogs with the MDR1 mutation compared to "normal" dogs. Therefore, we do not recommend altering the dose of doxycycline for dogs with the MDR1 mutation.



Drugs that are known to be transported by the human or rodent forms of the protein encoded by the MDR1 gene but appear to be tolerated by dogs with the MDR1 mutation:

- **Morphine, buprenorphine, fentanyl (opioid analgesics or pain medications)**- We suspect that these drugs are pumped by P-glycoprotein (the protein encoded by the MDR1 gene) in dogs because they have been reported to be pumped by P-glycoprotein in people, but we are not aware of any reports of toxicity caused by these drugs in dogs with the MDR1 mutation. We do not have specific dose recommendations for these drugs for dogs with the MDR1 mutation.

The following drugs have been reported to be pumped by P-glycoprotein (the protein encoded by the MDR1) in humans, but there is currently no data stating whether they are or are not pumped by canine P-glycoprotein. Therefore we suggest using caution when administering these drugs to dogs with the MDR1 mutation.

- Domperidone
- Etoposide
- Mitoxantrone
- Ondansetron
- Rifampicin

There are many other drugs that have been shown to be pumped by human P-glycoprotein (the protein encoded by the MDR1 gene), but data is not yet available with regard to their effect in dogs with the MDR1 mutation.

Tests:

- [Blood Sample](#)
- [Cheek Swab](#)
- [Pricing](#)
- [Shipping](#)

Pricing:

- \$60 (US) per dog for tests paid online by credit card

Process:

Once your dog has been genotyped by the Veterinary Clinical Pharmacology Laboratory, you will have [online access](#) to a veterinary pharmacology expert (DVM, PhD Pharmacologist boarded in the American College of Veterinary Clinical Pharmacology) for questions that may arise regarding the safety of drug treatment for your dog.

Contact Us:

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