



## Drug Sensitivity Information

In Miniature Australian Shepherds and other breeds of dogs.

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Many herding breeds, including Australian Shepherds and Miniature Australian Shepherds, are sensitive to a variety of commonly used medications, in particular one of the most frequently prescribed heartworm preventatives, ivermectin (commonly known as Heartguard).

Up until recently, it was unknown why some breeds are more sensitive to certain drugs than other breeds. But recent advances in molecular biology at the Veterinary Clinical Pharmacology Laboratory at Washington State University's College of Veterinary Medicine have led to the discovery of the cause of multi-drug sensitivities in affected dogs.

The reason is a mutation in the multi-drug resistance gene (*mdr1*). This gene encodes a protein, P-glycoprotein, that is responsible for removing many drugs and other toxins from the brain. Dogs with the mutated gene cannot rid the brain of certain drugs properly, and these drugs may cause abnormal neurologic signs. The results can be extremely serious, and may even cause death.

There is now a test which was developed at Washington State University to screen for the presence of the mutant gene. Rather than avoiding drugs such as ivermectin in known susceptible breeds, veterinarians can now determine if a dog is normal, in which case the drug can be administered, or abnormal, in which case an alternative treatment can be given.

It is estimated that 3 out of every 4 Collies in the United States, France and Australia have the mutant *mdr1* gene. This is likely a worldwide problem. To read the entire Washington State University article, go to:

<http://www.vetmed.wsu.edu/depts-VCPL/>

It is also estimated that 1 in 4 Miniature Australian Shepherds have the mutant *mdr1* gene, with the numbers being slightly less in Australian Shepherds. Other susceptible breeds include McNabs, Shetland Sheepdogs, English Shepherds, Longhaired Whippets, Old English Sheepdogs, and Silken Windhounds. It is also suspected in Skye Terriers and testing is currently being done.

The list of drugs reported as causing problem in dogs with the mutated mdr1 gene are:

**Ivermectin** (anti-parasitic used in the trade name drug Heartguard and commonly used to treat demodic mange). Use Interceptor instead.

**Avermectin**

**Metronidazole** (diarrhea and giardia)

Trade names: Flagyl; Rozex; Metrogel

**Butorphanol** (pain relief after spay/neuter; cough suppressant and canine flu)

Trade names: Torbutol; Butorphic; Dolorex; Morphasol; Turbogesic

**Acepromazine** (tranquilizer/calming agent and pre-anesthetic)

Trade names: Ace; ACP; Atravet

**Cyclosporine or Ciclosporin** (allergy treatment/immunosuppressant)

Trade names: Atopica; Sandimmune; Neoral; Cicloral; Gengraf; Restasis

**Vinblastine and Vincristine** (chemotherapy for cancers & leukemia)

Trade names: cancer regimens called CHOP and Stanford V

**Doxorubicin or Adriamycin or Hydroxydaunorubicin** (chemotherapy for cancers & leukemia)

Trade names: Doxil; cancer regimens called ABVD, CHOP, and FAC

**Loperamide** (diarrhea)

Trade names: Imodium; Lopex; Dimor; Pepto

**Digoxin** (heart ailments)

Trade names: Digitalis (Foxglove) family

Additionally, neurotoxicity in dogs with the mdr1 genetic flaw is suspected to have been caused by:

**Ondansetron** (nausea and vomiting)

Trade names: Zofran; Emeset; Emetron; Ondemet

**Domperidone** (nausea, vomiting, and to stimulate lactation)

Trade names: Motilium

**Paclitaxel** (cancer)

Trade names: Taxol; Abraxane

**Mitoxantrone** (cancer/leukemia)

**Etoposide** (cancer/leukemia)

Trade names: Eposin; Etopophos; Vepeside; VP-16

**Rifampicin or Rifampin** (antibiotic - infections, influenza, pneumonia, staph, meningitis)

Trade names: Rifadin; Rifater; Rimactane; Rifinah; Rimactazid

**Quinidine** (heart)

**Morphine** (pain relief, anesthesia, cough suppressant, anti-diarrheal, shortness of breath)

More are likely to be added as the research progresses.