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| **BusterAlert.org*****Canine MDR1 MutationInfo Center*** | **MDR1 Veterinary Fact Sheet** |

The multi-drug resistance gene (mdr1) encodes P-glycoprotein, a protein that functions as a drug-transport pump across cell membranes. A lack of P-glycoprotein means certain drugs cannot be absorbed, distributed or metabolized normally. Dogs with the mdr1 genetic mutation have a
P-glycoprotein deficiency and are extremely susceptible to toxicosis from many common drugs.

**Affected Breeds**

The mdr1 mutation has been documented in many herding breeds and some sighthounds. Affected breeds include Australian Shepherds (all sizes), Collies, English Shepherds, German Shepherds, Longhaired Whippets, McNabs, Old English Sheepdogs, Shetland Sheepdogs, and Silken Windhounds. Researchers are currently testing more than 100 additional breeds for the mutation.

**MDR1 Mutation Test**

The Veterinary Clinical Pharmacology Laboratory (VCPL) at Washington State University has developed a commercially available test for the mdr1 mutation. Any dog of any breed can be tested via DNA collected from a cheek swab. Results are reported as homozygous for the normal mdr1 allele (normal/normal), heterozygous (mutant/normal), or homozygous for the mutant mdr1 allele (mutant/mutant). **Dogs carrying the mutant gene or dogs from affected breeds that have not been tested for the mutation should not be given any of the mdr1 problem drugs.**

**Problem Drugs**

P-glycoprotein transports many drugs including antiparasitic agents, opioids, cardiac drugs, immunosuppressants, steroid hormones, and anticancer agents. Research is ongoing to determine which P-glycoprotein substrates cause toxicity in dogs with the mdr1 mutation. The most commonly used medicines identified so far are acepromazine, butorphanol, cyclosporine, ivermectin, loperamide, and morphine. All of the problem drugs are prescription medicines except for some of the over-the-counter diarrhea medicines like Imodium.

The BusterAlert.org *MDR1 Problem Drugs List* includes the generic problem drugs identified by the mdr1 researchers along with the brand names under which these drugs are marketed, as compiled by BusterAlert.org. Brand names were obtained from many sources including the FDA, Health Canada, and *Martingale: The Complete Drug Reference*. For drugs with no specific veterinary formulation, human drug brand names were included.

Additional problem drugs will be added to the list as mdr1 research progresses. For the most up-to-date version of the *MDR1 Problem Drug List*, visit the BusterAlert.org website.

**Additional Information**

VCPL MDR1 Research and MDR1 Testing: http://www.vetmed.wsu.edu/depts%2DVCPL/

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| **BusterAlert.org*****Canine MDR1 MutationInfo Center*** | **MDR1 Problem Drugs List*with North American Brand & Trade Names*** |

**Dogs who test as having a mutated mdr1 gene OR dogs from affected breeds\* who have not been tested for the mutation should avoid these drugs.**

*Drug names in bold are the generic drugs identified as problems by the mdr1 researchers. Below each generic drug is a list of some of the synonyms, brand, and trade names for the generic drug provided by BusterAlert.org. More drugs are likely to be added as mdr1 research progresses*.

## Drugs PROVEN to Cause Problems

**Acepromazine**

Ace

Acepro

Aceproject

Acevet

ACP

Atravet

PromAce

**Butorphanol**

Dolorex

Stadol

Torbugesic

Torbutrol

Torphajet

**Digoxin**

Digibind

Digitalis

Lanoxicaps

Lanoxin

Mapluxin

**Doxorubicin**

Adriamycin

Adriblastina

Caelyx

Doxil

Doxolem

Doxotec

Hydroxydaunomycin

Hydroxydoxorubicin

Hydroxyldaunorubicin

Myocet

Oxicina

Rubex

**Ivermectin**

Abamectin

Acarexx

Advantage DUO

Avermectin

Bimectin

BMD/Ivomec

Ecomectin

Equell

Equimax

Equimectrin

Eqvalan

Heartgard

Ivercare

Ivercide

Iverhart

Iver-On

Iversol

Ivexterm

Ivomec

Mectizan

Megamectin

Noromectin

Panomec

Phoenectin

Primectin

Privermectin

SparMectin

Stromectol

Tri-Heart

Unimectrin

Virbamec

Zimecterin

**Loperamide**

Acanol

Acqta

Anti-Diarrheal
 Formula

Cryoperacid

Deroser

Diahalt

Diamode

Diarr-Eze

Diarrhea Relief

Hurplex

Imodium

Imogen

Imotil

Imperim

Kao-Paverin Caps

Lop

Loperacap

Nodiamex

Permidal

Pramidal

Raxamida

Rediarin

Top-Dal

Valfam

**Vinblastine**

Lemblastine

Velban

Velbe

**Vincristine**

Citomid

Leurocristine

Oncovin

Vinblax

Vincasar

Vincrex

Vintec

**Drugs SUSPECTED to Cause Problems *(research is ongoing)***

**Cyclosporin**

Atopica

Cicloral

Ciclosporin

Cyclosporine

Gengraf

Immulem

Modusik-A

Neoral

Optimmune

Restasis

Sandimmune

SangCya

Supremunn

**Digoxin**

Digibind

Digitalis

Lanoxicaps

Lanoxin

Mapluxin

**Domperidone**

Motilium

**Etoposide**

EPEG

Etopophos

Etopos

Toposar

Vepesid

VP-Tec

**Mitoxantrone**

Formyxan

Mitroxone

Neotalem

Novantrone

**Morphine**

Analfin

Apokyn

Astramorph

Avinza

DepoDur

Doloral

Duralmor

Duramorph

Graten

Infumorph

Kadian

M-Eslon

MOS

MS Contin (MSC)

MSIR

Oramorph

RMS

Roxanol

Statex

**Ondansetron**

Zofran

**Paclitaxel**

Abraxane

Asotax

Bris Taxol

Onxol

Paclisan

Praxel

Taxol

**Quinidine**

Biquin

Chinidinum

Cin-Quin

Quinact

Quinaglute

Quinalan

Quinatime

Quinidex

Quinora

**Rifampicin**

IsonaRif

Rifadin

Rifamate

Rifampin

Rifater

Rimactane

Rofact

**For more information and updates, please visit www.busteralert.org**

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| \*Affected breeds include Australian Shepherds (all sizes), Collies, English Shepherds, German Shepherds, Longhaired Whippets, McNabs, Old English Sheepdogs, Shetland Sheepdogs, and Silken Windhounds.  | **List updated9/8/07**© 2007 MARS, Inc. |