

Special Considerations for Special Patients

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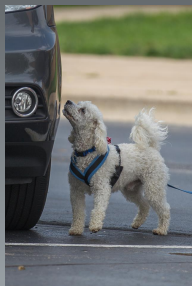
Scent Detection Dogs

- There are currently thousands of dog used by DEA, HS, US Military and others trained as scent detection dogs.
- They can be trained to detect drugs, explosives, fire accelerants, human remains and other animal species including bed bugs.



Canine Nose Work – competitive scent detection for companion dogs.

- Dogs are trained to find and alert on specific scents (Birch, Anise, Clove, Cypress, Myrrh and Vetiver) and are rewarded with food by their handler for a successful search.



- Owners compete for titles in three different organizations.
- 19,500 dogs registered with NACSW in 2018



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Some scenting background


- Olfactory receptors (ORs) are the first dedicated molecule with which odorants physically interact.
- Dogs are macrosomatic with more than 300 million ORs.
- By comparison humans are microsomatic, having approximately 400 ORs

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- OR genes were first discovered in *Rattus norvegicus* in 1991.
- They form the largest known gene superfamily, known as the olfactory subgenome.
- Humans have 900 OR genes (60% nonfunctional pseudogenes)
- Dogs have 1,094 OR genes (18% nonfunctional pseudogenes)
- Rats have 1,493 OR genes

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- ◆ The average dog inhales 30 ml of air per nostril per sniff.
- ◆ Each nostril samples air separately assisting with odor localization.
- ◆ Active sniffing is “nose down, tail up”



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Olfaction in animals and people

- ◆ Over 1300 new drugs approved by the FDA between 1950 and 2013
- ◆ Evaluations of clinical trials, medication inserts and clinical reports identified over 350 drugs that elicit taste complaints and over 70 with olfactory effects.
- ◆ 50% of the top 100 drugs of 2017 have the potential to induce chemosensory complaints and side effects.

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Chemosensory Disorders

- ◆ Anosmia – total loss of smell
- ◆ Hyposmia – decreased smell sensation
- ◆ Dysosmia – distorted smell sensation
- ◆ Hyperosmia – heightened sensitivity to smell
- ◆ Phantosmia – odor that occurs in absence of stimulation

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Drug targets and olfaction

- ◆ Human OR are G protein coupled which is linked to adenylyl cyclase.
- ◆ Receptor activation leads to intracellular increase in cAMP, which targets olfactory specific ion channels.
- ◆ Drugs interfering with this cascade could modulate olfactory signaling.
- ◆ Opioids, Caffeine, Theophylline



Known problem drugs - Steroids

- ◆ Eze 1992 administered dexamethasone (2 mg/kg/day) and found decreased olfactory acuity in laboratory dogs after 7 days.
- ◆ However, in humans with nasal inflammation administration of steroids improved olfaction, likely due to resolution of inflammation.
- ◆ Weigh risk vs benefit



Metronidazole

- ◆ Jenkins administered metronidazole (25 mg/kg PO BID x 10 days) to 18 adult Labrador Retrievers enrolled in detection dog training.
- ◆ 9 of 18 dogs had degradation of the detection threshold for ammonium nitrate and trinitrotoluene (days 5 and 10).
- ◆ All dogs returned to normal after a 10 day washout period.



- ◆ Jenkins administered doxycycline (5 mg/kg PO BID x 10 days) to the same 18 dogs.
- ◆ No significant degradation was noted at days 5 and 10 during doxycycline administration.

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Zinc

- ◆ Zinc metabolism is directly related to olfaction function in both humans and laboratory animals.
- ◆ Zinc nanoparticles added to explosives enhanced the odorant response in trained detection dogs.
- ◆ Zinc chelation causes hyposmia at the OR level.
- ◆ Some CV drugs such as ACE Inhibitors (enalapril) chelate zinc and cause hyposmia in humans


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Dietary Fat Sources

- ◆ 17 certified detection dogs were fed 3 different diets (HF, LF, HPUF) for 12 weeks.
- ◆ The dogs then completed 8-12 scent trials.
- ◆ Dogs on the HPUF diet utilizing corn oil showed mild improvement in olfaction.


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- ◆ 18 male English Pointers were fed either A) 12% fat as beef tallow, B) 16% fat as equal amounts beef tallow and corn oil, or C) 16% fat as equal amounts beef tallow and coconut oil.
- ◆ Dogs fed coconut oil had decreased odorant-detecting capabilities when week 4 values were compared with week 12 values.




Pregnancy

- ◆ Average length of gestation in the bitch is 63 days.
- ◆ Implantation of the embryo in the uterus occurs at day 19. Potentially harmful drugs administered before this time are likely to result in acute embryotoxicity and loss of pregnancy. Pregnancy may also be lost if the embryo is exposed to drugs that inhibit implantation.



- ◆ Organogenesis begins at approximately day 22. The embryos are at their most susceptible to drugs that may affect the CV or CNS.
- ◆ By day 55 organogenesis is complete and the embryos are growing larger. They are now resistant to teratogenic effects of drugs but will still be impacted by drugs that alter the onset of parturition or cause vasoconstriction of placental vessels leading to hypoxia.



Raspberry Leaf

- ◆ Red raspberry leaves contain fragarine, a plant compound that helps tone and tighten muscles in the pelvic area.
- ◆ Rats administered 10 mg/kg daily for full gestational period, gestation was an average of 1.6 days longer compared to control