

Occlusal Issues

Judy Rochette, DVM, FAVD, DAVDC
West Coast Veterinary Dental Services
Vancouver, British Columbia



You have asked...

What are the most common occlusal issues in dogs and cats, and how are they treated?

The expert says...

Before any discussion about malocclusions (ie, misaligned teeth) can begin, a thorough understanding of healthy occlusions is necessary. The *wild* phenotype of domestic dogs and cats has interdigitating cheek teeth that create a *pinking shears* effect (Figures 1 and 2, next page), a mandibular canine tooth that interdigitates with the maxillary third incisor and canine tooth, and mandibular incisors that rest on the cingulae of the maxillary incisors. This model of occlusion has been naturally selected as the most efficient and durable for grabbing, holding, tearing, and masticating a predator's diet.

The canine and feline facial architecture complements this oral arrangement with stress- and/or load-bearing reinforcement of the facial bone, where maximum forces occur. Historically, humans have created new phenotypes for dogs and cats and selected for genes that would normally be selected against in nature. What is considered acceptable as a breed standard may not be ideal for quality of life.

Malocclusions may result in self-induced soft-tissue trauma or repetitive concussive dental trauma. These can cause irreversible pulpitis, dysmastication, and tooth crowding, which may make an area prone to periodontal disease.

Malocclusions can be dental (ie, jaw lengths are correct but one or more teeth are displaced or improperly oriented) or skeletal (ie, discrepancy between jaw lengths is responsible for the occlusal issues).

Malocclusions, or misaligned teeth, may result in self-induced soft-tissue trauma or repetitive concussive dental trauma.

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Dental Malocclusions (Class 1)

Class 1 dental malocclusion may be assigned to a tooth that is tipped, rotated, and/or displaced relative to its expected position and orientation within the dental arcade.

Some dental malocclusions may be transmitted genetically. Mesioversion of maxillary canine teeth has a strong familial tendency in the Shetland sheepdog, but this condition is now seen in other canine and feline breeds. Palatoversion of mandibular canine teeth also has a strong genetic heritage, as orientation of the tooth buds and retention of deciduous canine teeth are both genetically controlled. Some dental malocclusions are truly a developmental accident or trauma induced, resulting in phenotypic growth that does not represent the animal's genotype; these exceptions are the minority.

Contact of the Maxillary Fourth Premolar with Buccal Mandibular Molar Tissues in Cats

This class 1 occlusal problem, which does not have an obvious instigating cause, can be found in cats of any breed or head type. When the tip of the major cusp of the maxillary fourth premolar contacts the soft tissues on the vestibular aspect of the mandibular molar tooth, the insult can range from the soft tissue ulceration and pain to bone loss, which can compromise the periodontal health of the mandibular molar (Figure 3). Signs may include head shaking, pawing at the affected side, and/or sudden cessation of or aversion to eating. If untreated, the chronic soft tissue irritation can lead to formation of hyperplastic granulation tissue, which can physically mimic a soft tissue tumor.

Treatment involves extraction of the offending tooth (ie, maxillary fourth premolar). On occasion, damage to periodontal tissues may be so severe that the mandibular molar is compromised and should also be extracted. Rarely will mandibular molar extraction alone be sufficient. Caution must be exercised with any attempt at blunting the cusp tip, as the enamel and dentinal layers are thin. Blunting can easily lead to pain by exposing dentinal tubules or even pulp and subsequent loss of vitality. Given the extreme difficulty in treating this tooth endodontically, the end result is almost always extraction, hence the recommendation to extract as the first line of therapy.

Mesioversion, Palatoversion, & Linguoversion

Mesioversion refers to any tooth that is in its correct anatomic position but abnormally angled mesially or toward the midline at the front of the face (Figure 4). *Palatoversion* refers to a tooth that is tipped toward the palate. *Linguoversion* describes a tooth that is tipped toward the tongue.



Normal canine occlusion



Normal feline occlusion

Mesioversion of maxillary canine teeth can impede the mandibular canine teeth from occluding in their proper positions, resulting in buccal tipping and tooth-on-tooth contact, which can lead to concussive pulpitis and pain. The misoriented maxillary canine tooth can cause crowding and possible subsequent periodontal disease of the adjacent maxillary incisor. The affected canine tooth may be poorly erupted with pericoronitis or, in severe cases, unerupted with possible dentigerous cyst formation.

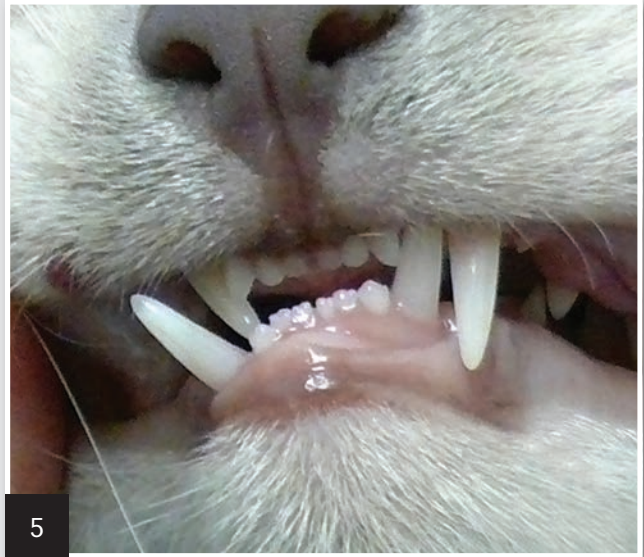
Teeth in mesioversion, palatoversion, or linguoversion can prevent the mouth from closing, creating an open bite.



3
Soft tissue damage buccal to the mandibular molar from the maxillary fourth premolar in a cat



4
Mesioversion of the maxillary canine tooth in a dog



5
Feline palatoversion
Photo courtesy Dr. Bryan Hall

Examples of Class 1 Malocclusions

- *Mesioversion*: Any tooth in correct anatomic position but abnormally angled mesially or toward the midline at the front of the face
- *Palatoversion*: A tooth tipped toward the palate
- *Linguoversion*: A tooth tipped toward the tongue

Palatoversion of the maxillary canine teeth (Figure 5) can cause extensive trauma to the mouth floor and/or the tongue. Linguoversion of the mandibular canine teeth can cause extensive palatal mucosal trauma with subsequent possible oronasal fistula formation, damage to the alveolar ridge with subsequent bone loss, or disruption of the periodontal apparatus supporting the maxillary canine tooth, with possible loss of that tooth to periodontal disease. Affected dogs are often head-shy, as any head handling may cause them to bite themselves; these dogs should not be placed in a head halter or collar until the bite has been corrected.

Mesioversion, palatoversion, and linguoversion can be treated by extraction of the offending canine tooth or with placement of an orthodontic appliance. Alternatively, the height of the crown can be reduced, but only if the practitioner can provide immediate endodontic treatment. *Clipping*, whether of a deciduous or permanent tooth, without immediate endodontic treatment will expose pulp chamber to infection and pain.

MORE ►

Skeletal Malocclusions (Class 2 & 3)

Skeletal malocclusions result from discordant growth of one or more areas of tooth-bearing bones. The more severe the skeletal malocclusion, the farther the facial contours are from the wild phenotype. Teeth may be correctly positioned within their discrete area of bone, but the overall occlusion is incorrect because the bone fails to mimic the ideal phenotype.

The shape and length of the upper arcades are closely associated with the genes for head type, with the brachygnathic maxilla tied to the brachycephalic genotype. The final contours of each lower arcade are determined by two growth centers within each jaw. The first is located in the area of the ramus, a site that is completely under genetic control but, unlike the maxilla, is not tied to head type. Abnormal growth from this area can be detected by loss of interdigitation of the cheek teeth. Animals with these skeletal malocclusions should be culled from the breeding pool, as this bite will likely be passed to the offspring. A second growth center is located in the area of the lip fold, and influences on this center tend to be multifactorial. An animal with normal cheek-tooth interdigitation but one or more incisor teeth in an even, or reverse, scissor may not be as certain to have affected progeny.

Skeletal malocclusions have a genetic basis, and owners should be made aware of this when selecting breeding stock.

The degree of affectedness in either the maxilla or mandible can vary (eg, severity of maxillary brachygnathism and mandibular prognathism in bulldogs). Regardless, skeletal malocclusions have a genetic basis, and owners should be made aware of this when selecting breeding stock.

Jaw Length Discrepancy

When an abnormal rostral-caudal relationship between the dental arches exists, there is potential for soft tissue trauma, rotation of teeth, and crowding. These situations may predispose the area to periodontal disease development and loss of function. Selective extractions can reduce soft tissue damage and crowding. Occasionally, orthodontics can move individual teeth, or whole sections of an arch, into a more physiologic position. In cases of severe jaw length discrepancies, the teeth will never function as intended.

Closing Remarks

The ultimate goal is to offer the patient a pain-free, functional mouth that stays in a relative state of equilibrium and health. Veterinarians should strive to guide owners and breeders toward making treatment decisions that can sustain the long-term oral health. ■ **cb**

See **Aids & Resources**, back page, for references & suggested reading.

TRIFEXIS® (spinosad + milbemycin oxime) Chewable Tablets

Before using TRIFEXIS chewable tablets, please consult the product insert, a summary of which follows:

Caution: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Indications:

TRIFEXIS is indicated for the prevention of heartworm disease (*Dirofilaria immitis*). TRIFEXIS kills fleas and is indicated for the prevention and treatment of flea infestations (*Ctenocephalides felis*), and the treatment and control of adult hookworm (*Ancylostoma caninum*), adult roundworm (*Toxocara canis* and *Toxascaris leonina*) and adult whipworm (*Trichuris vulpis*) infections in dogs and puppies 8 weeks of age or older and 5 pounds of body weight or greater.

Contraindications:

There are no known contraindications to the use of TRIFEXIS Chewable Tablets.

Warnings:

Not for human use. Keep this and all drugs out of the reach of children.

Serious adverse reactions have been reported following concomitant extra-label use of ivermectin with spinosad alone, one of the components of TRIFEXIS Chewable Tablets (see **ADVERSE REACTIONS**).

Precautions:

Treatment with fewer than 3 monthly doses after the last exposure to mosquitoes may not provide complete heartworm prevention (see **EFFECTIVENESS**).

Prior to administration of TRIFEXIS, dogs should be tested for existing heartworm infection. At the discretion of the veterinarian, infected dogs should be treated with an antidiarrheal to remove adult heartworms.

TRIFEXIS is not effective against adult *Dirofilaria immitis*. While the number of circulating microfilariae may decrease following treatment, TRIFEXIS is not indicated for microfilariae clearance. Mild, transient hypersensitivity reactions manifested as labored respiration, vomiting, salivation and lethargy, have been noted in some dogs treated with milbemycin oxime carrying a high number of circulating microfilariae. These reactions are presumably caused by release of protein from dead or dying microfilariae.

Use with caution in breeding females. The safe use of TRIFEXIS in breeding males has not been evaluated. Use with caution in dogs with pre-existing epilepsy. Puppies less than 14 weeks of age may experience a higher rate of vomiting.

Adverse Reactions:

In a well-controlled US field study, which included a total of 352 dogs (176 treated with TRIFEXIS chewable tablets and 176 treated with an active control), no serious adverse reactions were attributed to administration of TRIFEXIS chewable tablets. All reactions were regarded as mild.

In some cases, dogs vomited after receiving TRIFEXIS. To ensure heartworm prevention, observe your dog for one hour after administration. If vomiting occurs within an hour of administration, re-dose with another full dose.

Reactions that occurred at an incidence $\geq 2\%$ (average monthly rate) within any of the 6 months of observation are presented in the following table:

Average Monthly Rate (%) of Dogs With Adverse Reactions

Adverse Reaction	TRIFEXIS Chewable Tablets*	Active Control Tablets*
Vomiting	6.13	3.08
Pruritus	4.00	4.91
Lethargy	2.63	1.54
Diarrhea	2.25	1.54

*n=176 dogs

In the US field study, one dog administered TRIFEXIS experienced a single mild seizure 2½ hours after receiving the second monthly dose. The dog remained enrolled and received four additional monthly doses after the event and completed the study without further incident.

Following concomitant extra-label use of ivermectin with spinosad alone, a component of TRIFEXIS, some dogs have experienced the following clinical signs: *trembling/twitching*, *salivation/drooling*, *seizures*, *ataxia*, *mydriasis*, *blindness and disorientation*. Spinosad alone has been shown to be safe when administered concurrently with heartworm preventatives at label directions.

In US and European field studies, no dogs experienced seizures when dosed with spinosad alone at the therapeutic dose range of 13.5-27.3 mg/lb (30-60 mg/kg), including 4 dogs with pre-existing epilepsy. Four epileptic dogs that received higher than the maximum recommended dose of 27.3 mg/lb (60 mg/kg) experienced at least one seizure within the week following the second dose of spinosad, but no seizures following the first and third doses. The cause of the seizures observed in the field studies could not be determined.

For technical assistance or to report an adverse drug reaction, call 1-888-545-5973. Additional information can be found at www.TRIFEXIS.com.

Post-Approval Experience (March 2012):

The following adverse reactions are based on post-approval adverse drug event reporting. The adverse reactions are listed in decreasing order of frequency: vomiting, depression/lethargy, pruritus, anorexia, diarrhea, trembling/shaking, ataxia, seizures, hypersalivation, and skin reddening.

Effectiveness:

Heartworm Prevention:

In a well-controlled laboratory study, TRIFEXIS was 100% effective against induced heartworm infections when administered for 3 consecutive monthly doses. Two consecutive monthly doses did not provide 100% effectiveness against heartworm infection. In another well-controlled laboratory study, a single dose of TRIFEXIS was 100% effective against induced heartworm infections. In a well-controlled six-month US field study conducted with TRIFEXIS, no dogs were positive for heartworm infection as determined by heartworm antigen testing performed at the end of the study and again three months later.

Flea Treatment and Prevention:

In a well-controlled laboratory study, TRIFEXIS demonstrated 100% effectiveness on the first day following treatment and 100% effectiveness on Day 30. In a well-controlled laboratory study, spinosad, a component of TRIFEXIS, began to kill fleas 30 minutes after administration and demonstrated 100% effectiveness within 4 hours. In field studies conducted in households with existing flea infestations of varying severity, flea reductions of 98.0% to 99.8% were observed over the course of 3 monthly treatments with spinosad alone. Dogs with signs of flea allergy dermatitis showed improvement in erythema, papules, scaling, alopecia, dermatitis/pyodermitis and pruritus as a direct result of eliminating the fleas.

Treatment and Control of Intestinal Nematode Infections:

In well-controlled laboratory studies, TRIFEXIS was $\geq 90\%$ effective in removing naturally and experimentally induced adult roundworm, whipworm and hookworm infections.

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