

# THE BASICS OF EQUINE DENTISTRY

Preventative Medicine Course  
UMN College of Veterinary Medicine  
Alli Linn, DVM



Alli Linn, DVM

# Main Points

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- Brief history of equine dentistry
- Terminology
- Anatomy Review
- Why do horses need dental care?
- Appointment Basics
- Equipment Needs
- Dentistry Basics
- Complications and Considerations



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# History of Equine Dental Care

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- Evidence for ethical medical treatment of humans and animals dates back to at least 2200 BCE.
  - Horses were domesticated approximately 5000 years ago and by 300-400 BCE texts had been written about horsemanship.
    - These documents contained information about aging horses based on their teeth, eruption times, and diseases of the teeth.
- Practices that would be considered barbaric and unethical today were commonly performed from the 1500s to the 1700s.
  - Saws, chisels, and hammers were often used to correct malocclusions, and horses often sustained serious, sometimes fatal, injuries from the practice of dentistry.
  - Dentistry was usually performed by farriers or other lay people.
- More formal veterinary training throughout the 1800s and 1900s advanced the information and tools available and made the practice safer for practitioners and patients.
- Dentistry as we know it today began to develop in earnest in the 1970s, with the development of power floats, improved sedative drugs, and more research into equine specific dental topics.





# Basic Terminology – Why is it “floating” teeth?

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- Today, there are many terms used to describe various features of equine dental care. By far the most common and most used by clients is “floating.”
- “Floating” is a term from the carpentry/masonry industry which means “leveling.”
  - In the equine dentistry world, floating refers to the most basic examination and adjustment that is performed on the teeth. This generally includes removing sharp points and small malocclusions (abnormalities of bite) to make the horse more comfortable.
  - Dental prophylaxis (or a “dental prophy”) is a term used more commonly in small animal medicine but would be an appropriate term to replace “floating.”
- Other terms that are sometimes used interchangeably with floating are dental adjustment or dental equilibration, although these terms, particularly equilibration, should be reserved to describe the correction of more extensive dental problems or malocclusions.
  - Odontoplasty may also be used to refer to extensive adjustments of malocclusions.
- Performance dentistry involves specific adjustments or procedures designed to help the horse accommodate a bit or other tack items.

# Anatomy Overview

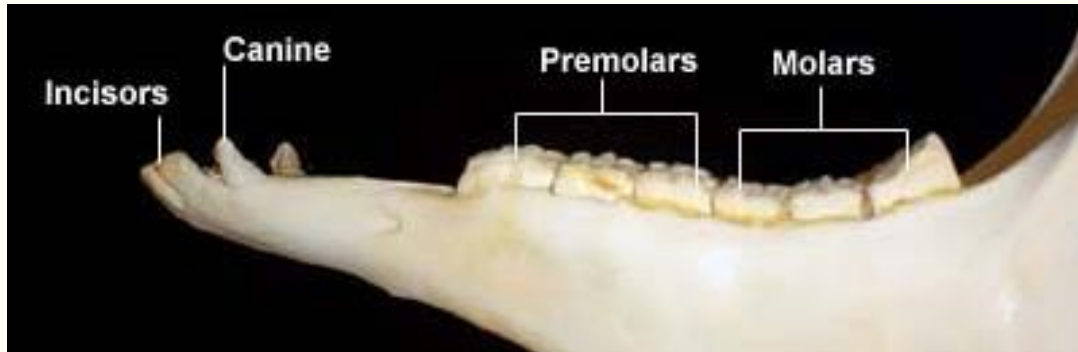
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- Horses are highly adapted to their grazing lifestyle.
  - They prehend food with their front incisors.
  - Large cheek teeth arcades (premolars and molars) have a rough occlusal surface that acts as a grinding surface for fibrous feeds.
- The horse's dental formula is  $2(I\ 3/3, C\ 0-1/0-1, PM\ 3-4/3-4, M\ 3/3)$ 
  - I = Incisors; C = Canines; PM = Premolars; M = Molars – top number is upper arcade, bottom number is lower arcade
  - Mares may or may not have canines, and are usually small if present.
  - Horses may or may not have the first PM (the “wolf tooth”). Wolf teeth are much more common on the upper arcades.

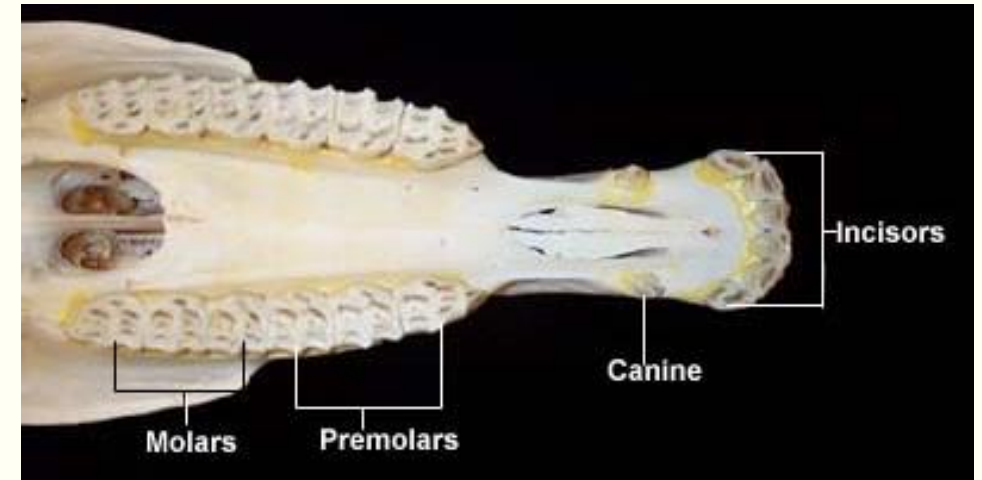


# Anatomy Overview

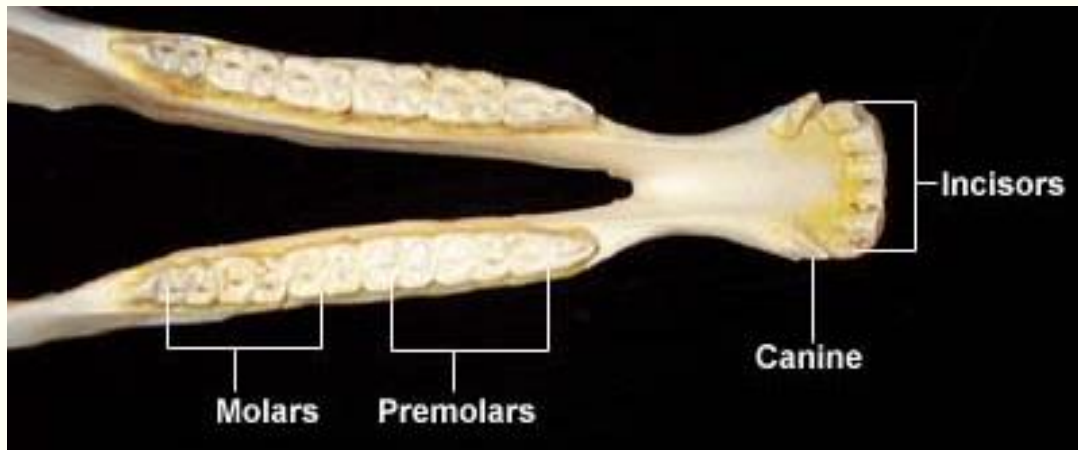
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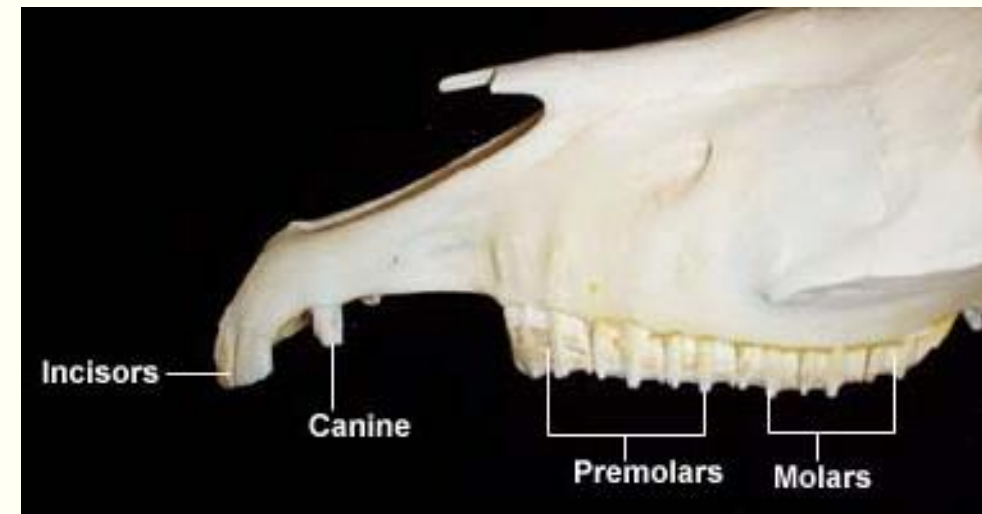
<http://arbl.cvmb.colostate.edu/hbooks/pathphys/digestion/pregastric/horsepage.html>



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<http://arbl.cvmb.colostate.edu/hbooks/pathphys/digestion/pregastric/horsepage.html>



# Naming of Teeth – Modified Triadan System

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- The modified Triadan numbering system is used to identify individual teeth in the horse's mouth.
  - The mouth is first divided into 4 quadrants, starting at the top right with 100 and moving clockwise to the bottom right with 400.
  - From there, the 11 teeth in each quadrant are numbered 1-11, starting with the central incisor and moving back to the last cheek tooth.
- This system allows veterinarians to talk to each other in a language everyone understands.

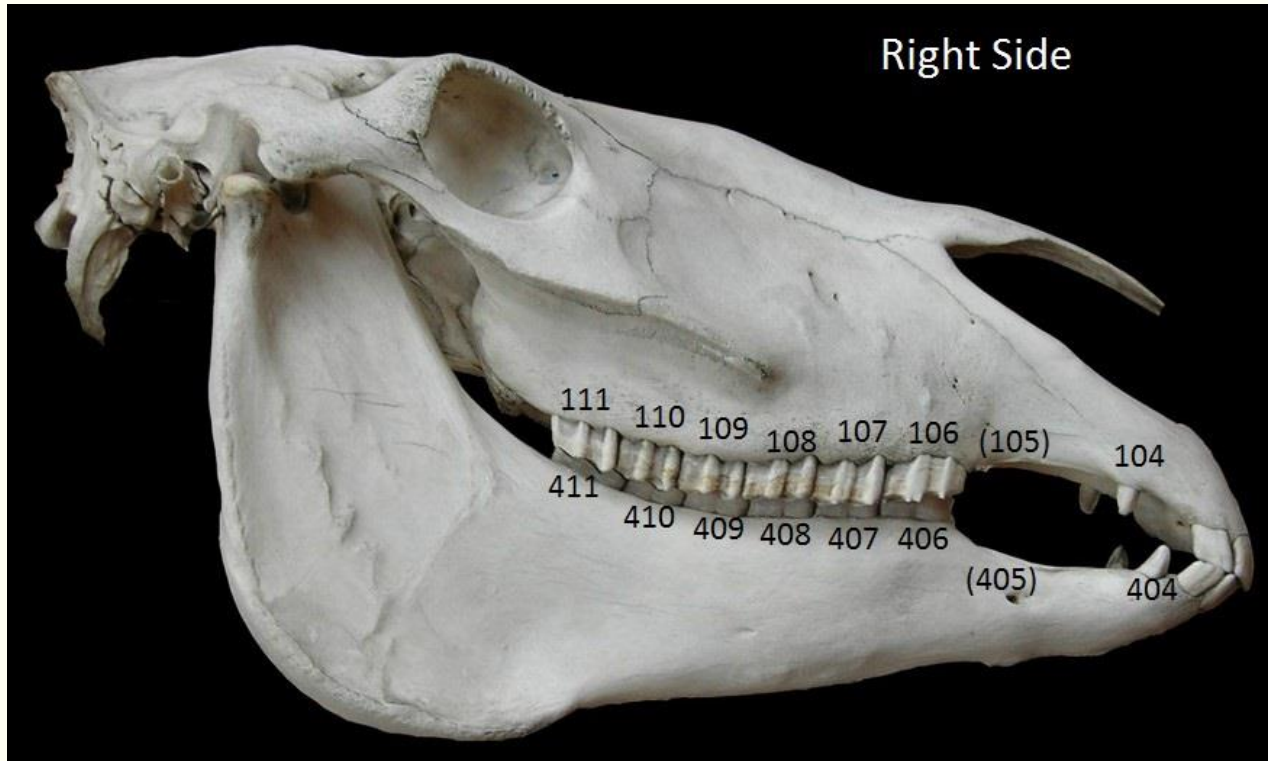


<http://files.dorset-horse-watch.webnode.com/200000037-07c1909b1f/Noggin%20head%20front.jpg>

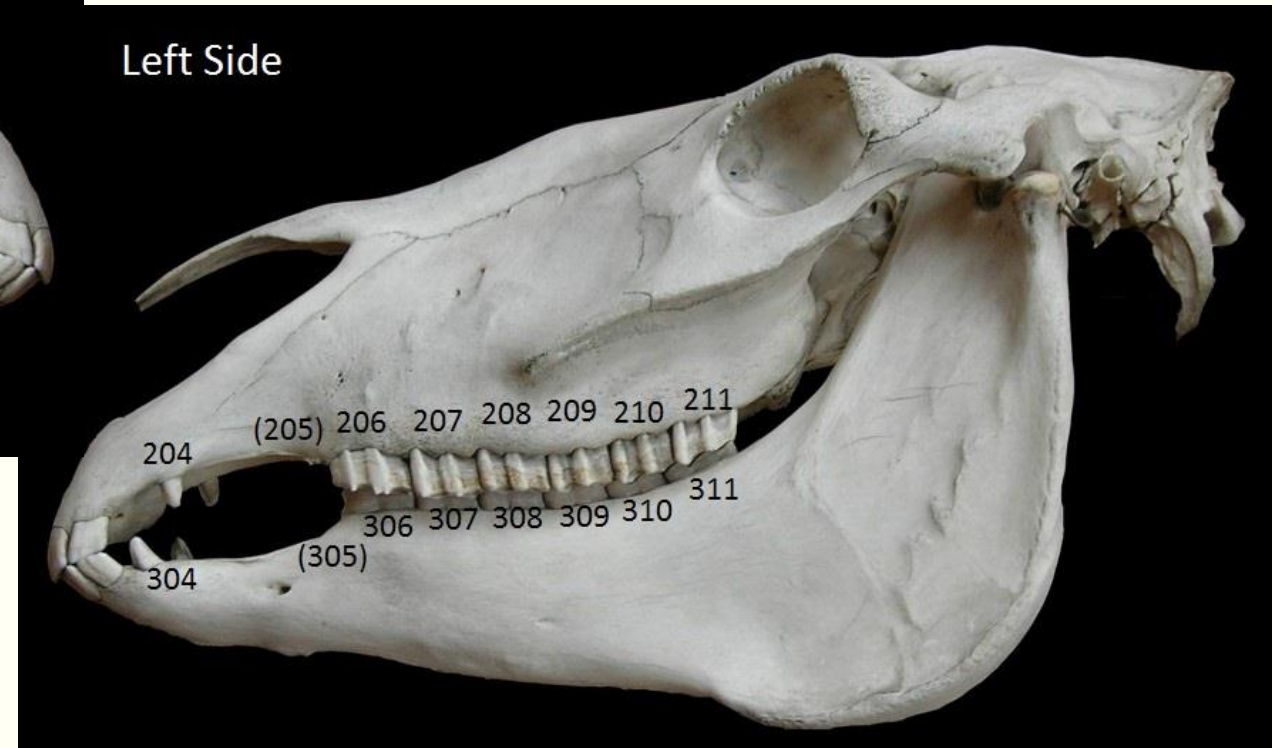
[http://www.pro-equinedentistry.com/equine\\_veterinary\\_education\\_paper\\_files/image017.jpg](http://www.pro-equinedentistry.com/equine_veterinary_education_paper_files/image017.jpg)

# Naming of Teeth – Modified Triadan System

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<http://www.equine-dentist-scotland.co.uk/wp-content/uploads/2013/02/horse-skull.jpg>



<http://www.equine-dentist-scotland.co.uk/wp-content/uploads/2013/02/horse-skull.jpg>



# Anatomy Overview

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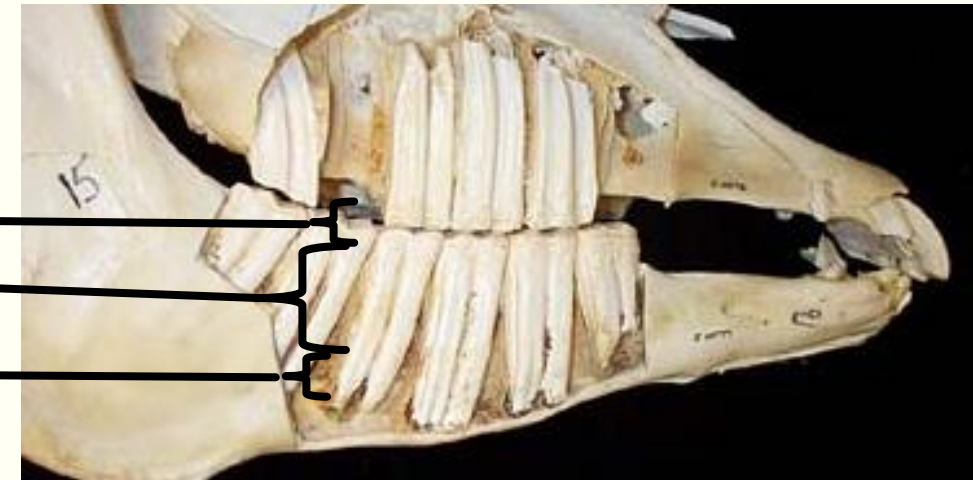
- Equine teeth are *hypsodont* (meaning “high crowned”) and erupt continuously over their lifetime.
  - Teeth are originally very long and wear out over the life of the horse due to their fibrous diet (generally between 20-30 years old).

Nearly Expired (Worn Out) Teeth



<http://www.animaldental.com.au/images/image2.jpg>

Young Horse Teeth



<http://arbl.cvmbs.colostate.edu/hbooks/pathphys/digestion/pregastric/horsepage.html>

Clinical Crown

Reserve Crown

Roots

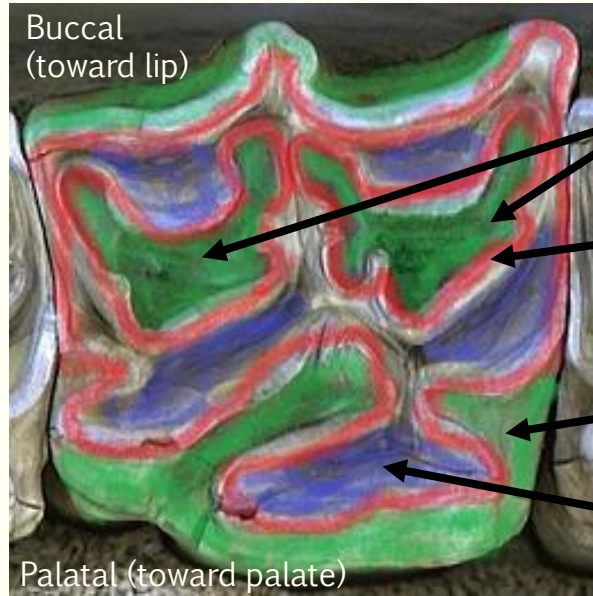
# Anatomy Overview

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- Hypsodont teeth are comprised of 3 primary tissues with a very rough occlusal (chewing) surface.
  - 1. Enamel: This is the hardest tissue in the body and is responsible largely for grinding fibrous feedstuff.
  - 2. Dentin: This is a softer calcified tissue which wears faster than enamel and acts as a cushion for the brittle enamel.
  - 3. Cementum: This tissue is similar to dentin in that it is softer than enamel. It cushions enamel and also helps anchor the tooth to the periodontal ligament.
- Cheek teeth on the maxillary arcade have 2 *infundibulae*, which are deep infoldings of enamel filled with cementum in the center of the teeth. Mandibular cheek teeth do not have infundibulae.
- Equine cheek teeth have either 5 or 6 pulp horns each.

# Anatomy Overview

## Maxillary Cheek Tooth



Infundibulae

Enamel (Red)

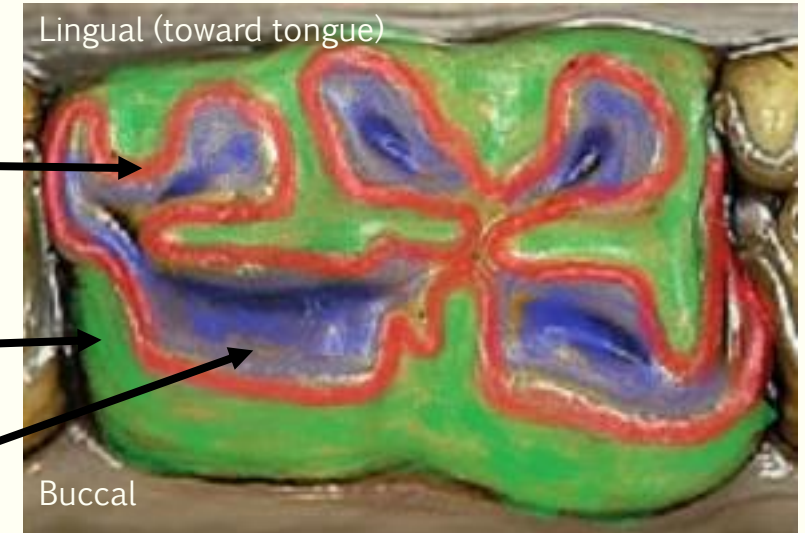
Cementum (Green)

Dentin (Blue)  
(surrounding pulp horns)



[http://animaldiversity.ummz.umich.edu/media/skulls/equus/e\\_caballus/164990.um2.jpg](http://animaldiversity.ummz.umich.edu/media/skulls/equus/e_caballus/164990.um2.jpg)

## Mandibular Cheek Tooth



Lingual (toward tongue)

Buccal



[http://www.zoodent.com/images/photos/clinical/equids/cheek\\_link.jpg](http://www.zoodent.com/images/photos/clinical/equids/cheek_link.jpg)



# Key Reasons Horses Require Dental Care

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- Remove sharp points to prevent injury to oral soft tissues
- Help improve mastication and digestion of feedstuff
  - Prevent gastrointestinal issues
  - Prevent weight loss due to inadequate intake or digestion
- Prolong tooth life (when performed regularly and correctly)
- Correct malocclusions that put extra stress on jaws or abnormal teeth
- Allow better comfort in all horses, particularly performance horses
- Catch problems early
  - Including: Periodontal disease, tooth root abscesses, fractured teeth, sinus infections, etc.



<http://www.theanimalcenter.net/siteimages/horse%20mouth%20float.jpg>

# The Appointment

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- At the time of the appointment, a thorough history and physical exam should be performed on every patient.
  - Information like age and use of the horse, diet, turnout situation, and potential vices or problem behaviors may be very important considerations for the horse's dental health.
  - Body condition score is a significant physical exam parameter when assessing a horse before a dental procedure.
    - Other physical examination parameters such as muscle development, attitude, coat condition, and any abnormalities in the respiratory system, gastrointestinal system, or head may provide clues to a dental issue.



# The Appointment

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<http://www.news.cornell.edu/sites/chronicle.cornell/files/EquineDentistry.jpg>

## ■ Restraint and Safety:

- Horses should be properly restrained with a halter and lead rope by a competent and attentive handler (aka: no cell phones!). Even when sedated, horses are capable of kicking, rearing, and breaking free.
  - Whenever possible, DO NOT have the client hold the horse for dentistry due to liability issues.
- The procedure should be performed in a quiet area safe for a horse to stand. A stall or bathing area are the most commonly used, although other veterinarians will design specially made stocks or trailers to work in.
  - A wash stall, etc. doubling as a storage area could pose a safety hazard to the veterinarian, the client or other personnel, and the horse.



[http://www.equusvet.com/0i/0e-ii/lrg-dentistry\\_002.jpg](http://www.equusvet.com/0i/0e-ii/lrg-dentistry_002.jpg)



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<http://www.tntequine.com/photos/teeth-float.jpg>



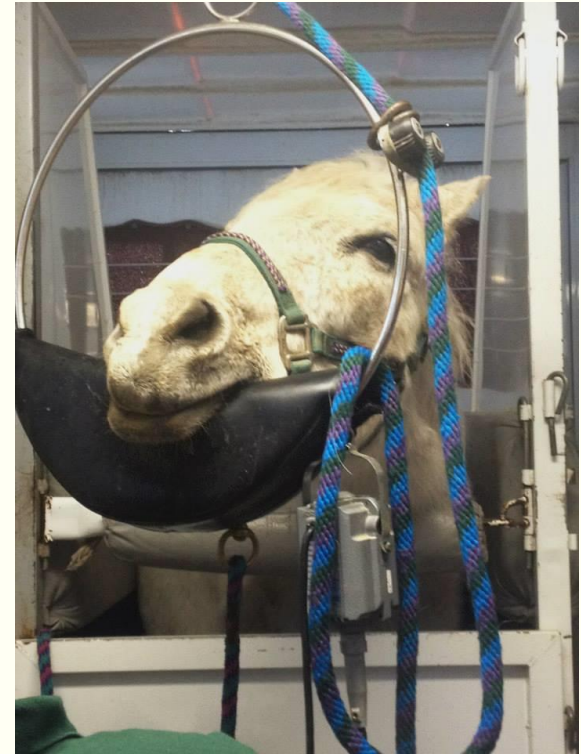
# The Appointment

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<http://www.regardinghorses.com/wp-content/uploads/2009/07/ace-sedated.jpg>

- Horses should be sedated for all dental procedures. Many practitioners will do a cursory unsedated look inside the horse's mouth with a headlamp or flashlight before recommending a sedated exam and float. Be cautious when using this technique, as this often grossly underestimates pathology and can be dangerous.
- The horse should be positioned before or immediately after sedation. Many practitioners will back the patient into a corner, although others need them in the doorway of a stall to use a particular type of dental halter.
  - Remember, horses can be significantly ataxic after sedation, so positioning them properly before this is very important. Make sure the horse's limbs are properly underneath them by gently asking the horse to adjust their position before they become very sedate. NEVER pick up the limbs of a very sedate horse, as they may lose their balance and fall.



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# The Appointment

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- Commonly used sedatives include:
  - Alpha-2 Agonists:
    - Xylazine (0.2-1.1mg/kg IV)
    - Detomidine (0.005-0.02 mg/kg IV)
    - Romifidine (0.04-0.12mg/kg IV)
  - Opioids:
    - Butorphanol (0.02-0.05mg/kg IV)
- After sedation, the halter may be slipped over the ears and remain around the neck to accommodate a dental speculum.
- A competent handler should monitor/hold the horse for the duration of the procedure whenever possible.



[http://horse\\_tooth\\_floaters.tripod.com/webonmediacontents/350840.jpg?1430430332533](http://horse_tooth_floaters.tripod.com/webonmediacontents/350840.jpg?1430430332533)

Improper and unsafe technique



More appropriate technique

[http://www.park-vets.com/images/iStock\\_000016453441XSmall.jpg](http://www.park-vets.com/images/iStock_000016453441XSmall.jpg)

# Equipment - Speculum

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- Once the horse is sedated, a speculum can be placed to keep the horse's mouth open. There are many different versions available, but all are designed to achieve 2 basic things:
  - 1. Allow visualization of the oral cavity
  - 2. Keep a practitioner and horse relatively safe when accessing the oral cavity with tools or hands.
- There are many types of speculums available in many price ranges. Some of the most commonly used models for general dental prophylaxis are included on this page.



<http://www.albertsequine.com/capps-pony/mini-speculum/407b-capps-biothane-pony/mini-full-mouth-speculum/407b>



<http://noahfriendsvet.com/equine-dentals-and-floats/>



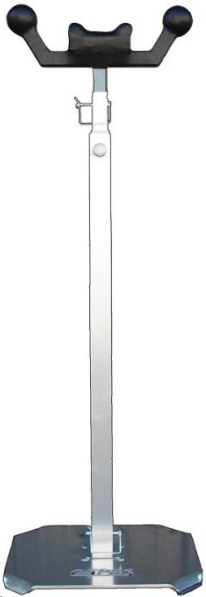
<http://www.theedgeequine.com/alumispec-equine-speculum>

The McPherson speculum (top right) is the most common and economical speculum on the market today. The other two models, a Capps full mouth (top left) and an Alumispec (bottom) are more expensive but more customizable.



# Equipment – Head Stand

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<http://www.cappsmanufacturing.com/store/ProdImages/CHS%20B.jpg>

A head stand is used to support the horse's head in a position accessible to the practitioner. These range from free standing posts with head rests to modified halters or padded rings that need to be tied up and secured over stall doors or stocks.



<http://www.olsenezcuts.com/images/stand.jpg>



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<http://www.collegian.com/wp-content/uploads/2014/09/Dr-Garrison-Roy-dental-mirror-Crowe-web.jpg>

# Equipment - Basics

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- A light source is needed to illuminate the mouth for adequate visualization.
  - There are many models that attach to dental speculums or a bright head lamp may be utilized.
- Water is essential for rinsing the mouth and cooling tools or areas being worked on to prevent thermal damage.
  - There are many tools on the market today with built in irrigation, although buckets of water are used by many veterinarians.
- PPE: Personal Protective Equipment
  - At the least, a practitioner should wear gloves when performing dentistry to prevent abrasions or cuts from sharp enamel points in the mouth.
  - It is an excellent idea to wear protective glasses and an N-95 respirator to prevent tooth dust and debris from lodging in eyes or being inhaled.
  - Hearing protection is also indicated if using motorized equipment, particularly if the tool must be held at the shoulder.
- Examination/Charting Form:
  - All history, examination findings, diagnostics, and treatments should be recorded on a form for inclusion in the patient's medical record.



# Equipment – Hand Instruments

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- A wide variety of tools are available to today's ambulatory equine practitioner. Hand tools are still widely utilized either in part or whole to perform basic dental prophylaxis.
- Hand floats are the most commonly utilized hand equipment. These generally have a carbide chip or tungsten carbide blade attached to the end of a long stainless steel shaft with a handle. Sizes and shapes for hand floats abound, with nearly any angle and size available for purchase.
  - Most blades can be re-sharpened or relatively easily replaced from a float handle.



[http://www.harltons.com/Products/floats\\_float\\_blades\\_sfiles/images/harltons\\_mini\\_floats.gif](http://www.harltons.com/Products/floats_float_blades_sfiles/images/harltons_mini_floats.gif)



<http://www.dearonequine.co.uk/media/catalog/product/cache/1/image/9df78eab33525d08d6e5fb8d27136e95/e/d/edit.jpg>



# Equipment – Hand Instruments

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<http://www.equinedentalinstruments.com/Images/Web%20ready%20pictures/Handfloatcappsroundmilled.gif>



- Blades are available with cutting surfaces ranging from very fine to very course. Generally, fine blades are reserved for finishing work. Course blades are used for initial sharp point removal or work on malocclusions.
- The cutting direction of a float blade can be set on the push or on the pull. Care should be taken to know which direction is being utilized. Significant oral damage can be inflicted with a float blade cutting the back of the mouth.

[https://my.vetmatrixbase.com/clients/13507/images/Horse\\_skull\\_demo\\_with\\_float.jpg](https://my.vetmatrixbase.com/clients/13507/images/Horse_skull_demo_with_float.jpg)

# Equipment – Power Instruments

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- A variety of power equipment is available today.
  - Most clinics will have one or two power units available for use by the entire clinic, as this equipment can be cost prohibitive to provide to every practitioner in the practice.
- Some of the most basic motorized floats have a round rotating diamond or carbide burr.
  - Other specialized heads for most equipment are available that gives the practitioner different options to reach inaccessible areas, work with a difficult horse, or provide a different grinding angle or surface.



<http://www.4-horsepower.com/images/HPD-products.png>



<http://fisherequinedentistry.com/wp-content/uploads/2014/02/New-Picture-15.png>

# Equipment – Power Instruments

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- Instruments may be battery powered or require electrical access.
- Some motorized equipment is held with the motor at the shoulder. This can result in significant shoulder strain for the veterinarian, especially considering the crouching position one must assume to perform the procedure. Other models are now being designed to keep most of the weight and noise of the unit at waist level.
- Power instruments are capable of taking off significant amounts of tooth very quickly and can overheat teeth as well. Care must be utilized when using motorized equipment to ensure the teeth sustain no damage.



Swissfloat

[http://www.swissvet.com/images/swissfloat\\_blk2.jpg](http://www.swissvet.com/images/swissfloat_blk2.jpg)



PowerFloat

<http://www.powerfloat.net/images/product%20images/PowerFloat%20-%20Plugin%20-%202001.jpg>

Swissfloat HDE



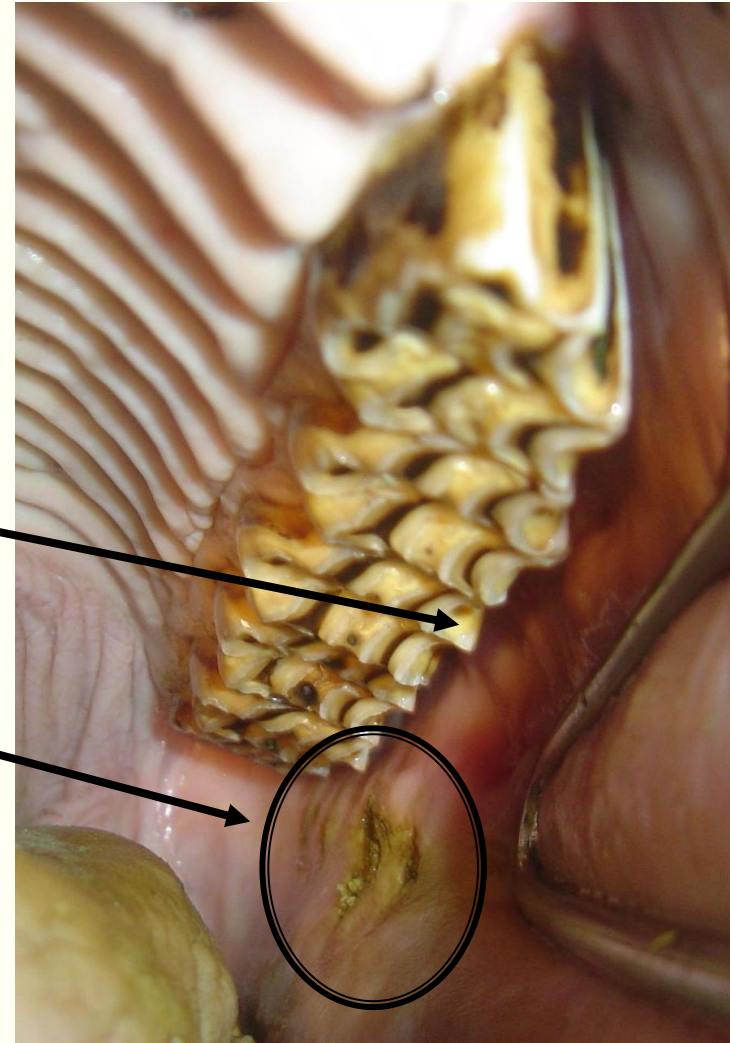
[http://www.swissvet.com/images/evolution\\_HDE.jpg](http://www.swissvet.com/images/evolution_HDE.jpg)



# Dentistry Basics

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- As mentioned before, horses use their rough occlusal surface to chew grass and hay.
- The cheek teeth arcades glide back and forth across each other to chew.
  - Sharp points develop on the buccal (lip) side of the maxillary arcades and the lingual (tongue) side of the mandibular arcades.
  - These points hinder full side to side grinding motion and additionally can cause significant damage to oral tissues.



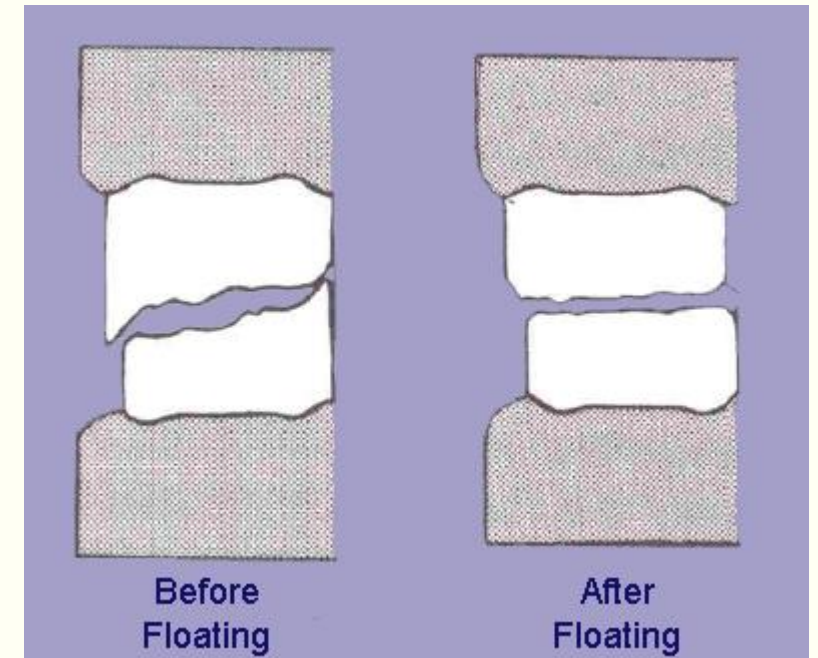
# Dentistry Basics

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- The goal of the basic “float” is to remove sharp points while maintaining a rough occlusal surface for chewing.
  - Sharp point removal corrects abnormal chewing patterns and allows damaged tissues to heal.
  - The occlusal surface must remain rough or the horse cannot break down fibrous feed and is prone to quidding (dropping hay), choke, colic, and weight loss.
- In addition to sharp point removal, mild malocclusions may be corrected during a basic dental float.



[https://my.vetmatrixbase.com/clients/13507/images/Horse\\_skull\\_demo\\_with\\_float.jpg](https://my.vetmatrixbase.com/clients/13507/images/Horse_skull_demo_with_float.jpg)



<http://www.mobileequinediagnostics.com/wp-content/uploads/2013/01/teeth-floating-1.gif>

# Dental Basics - Malocclusions

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- Malocclusions further hinder normal mastication.
- Common malocclusions may include:
  - Hooks (a focal overgrowth at the end of an arcade)
  - Steps (an individual tooth that is taller than the surrounding teeth)
  - Ramps (a slanted overgrowth involving over  $\frac{1}{2}$  the tooth)
  - Wave mouth (malocclusion of opposing arcades in the shape of a wave)



<http://www.equinemedcenter.com/images/upload/fullsize/2008-11-29-Rostral-Hooks2.jpg>



[http://static1.squarespace.com/static/51b1e9b8e4b0e926e379978e/51c13177e4b0d4df85227775/51c13329e4b0bdca91278dbe/1431208410778/IMG\\_4725.jpg](http://static1.squarespace.com/static/51b1e9b8e4b0e926e379978e/51c13177e4b0d4df85227775/51c13329e4b0bdca91278dbe/1431208410778/IMG_4725.jpg)



<http://www.equidental.co.uk/public/frontend/i/illustrations/hooks-horse-teeth.jpg>



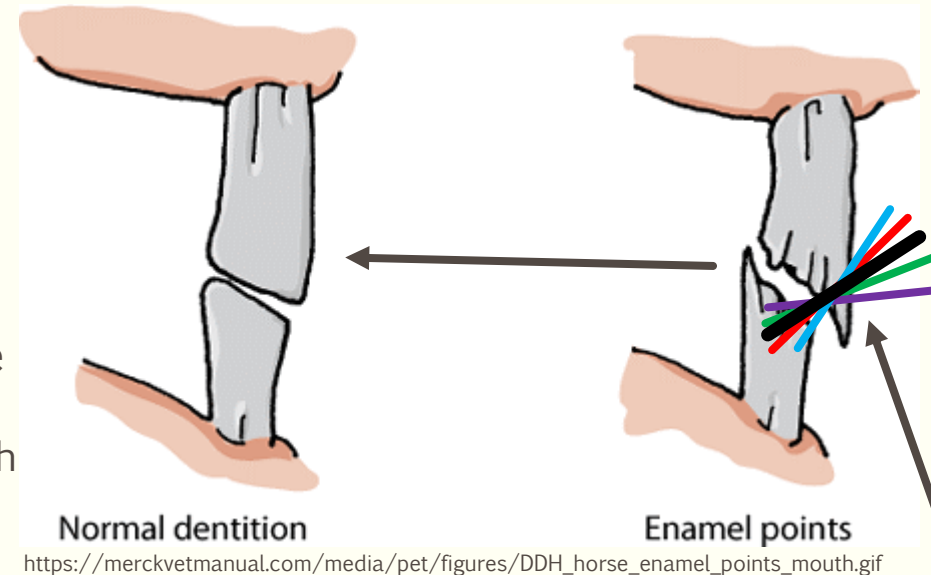
<http://equinedentalservices.org.uk/images/wave.jpg>



# Dentistry Basics – The Procedure

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- Any combination of tools as described in the equipment section can be used to perform a basic dental float.
  - Many practitioners use a variety of tools, while others perform the same quality work with only one or two tools.
- Generally, tools are held at a 45 degree angle to the occlusal surface to remove sharp points.
  - It is important to rotate the tool slightly back and forth across the points being removing. This rounds the edge and prevents new sharp ridges from being created.
- Correcting mild malocclusions does involve using equipment directly on the occlusal surface.
  - Usually we do not file the occlusal surface. This is an exception to the general rule and is necessary to re-establish a more normal grinding surface.
- Be aware that no more than 2-3 mm of tooth should be taken off in a given dental procedure.
  - This means correcting moderate to severe problems may take months or years - this is appropriate to prevent iatrogenic damage!

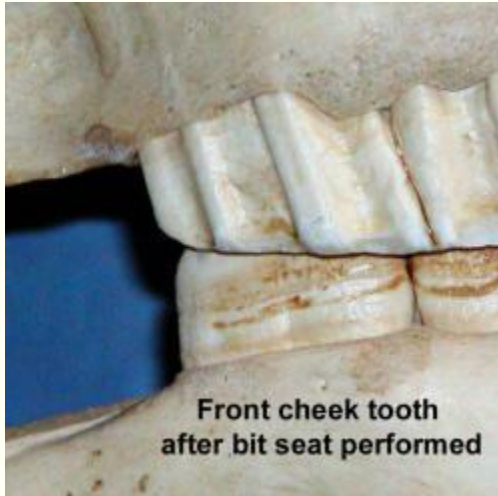


The black line is approximately 45 degrees, but notice that it is important to rotate the tool to slightly different angles to create a rounded, smooth edge with no sharp ridges.

# A Note on “Bit Seats”

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Appropriate “bit seat”



<http://www.equmed.com/images/Post%20Bit%20Seat2%20copy.jpg>

Likely excessive “bit seat”

Evidence of pulp damage may take years to develop or may never be obvious.



<http://www.localriding.com/image-files/horse-teeth-bit-seats.jpg>

- Although considered “performance dentistry,” the most rostral (cranial) aspects of the first cheek teeth of all arcades are typically gently rounded and smoothed into “bit seats.”
  - This is a misnomer that has stuck, as bits generally do not come close to these teeth.
  - However, sharp points in this area can irritate soft tissues and should be addressed.
- Historically, significant amounts of tooth were removed.
  - This is no longer recommended, as each tooth has a pulp horn in this area!
- Just as with other sharp points, practitioners smooth the edge of the tooth and correct any malocclusions, but removing excessive amounts of tooth is not necessary.

# Float – Before and After

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**Before:** Notice sharp points and mild mucosal irritation. Incidentally, this horse also has a small wolf tooth (PM 1, tooth 205)



<http://cdn.thehorse.com/images/cms/2014/09/yearling-filly-teeth-use-only-with-article-34462.jpg?preset=medium>

**After:** Notice smooth buccal and lingual edges without excessive tooth removal. Bit seats are conservative and the horse's occlusal surface remains intact.



<http://www.horsetrust.org.uk/assets/images/horse-dentistry.jpg>



# Complications and Considerations

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In general, equine prophylactic dentistry is a relatively safe procedure.

Becoming proficient requires practice and routine is only established after performing the procedure many times.



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- There are a few considerations and complications to keep in mind whenever a dental float is performed:
- 1. Pain Management: Professional preference
  - Many practitioners prefer to give a one time non-steroidal anti-inflammatory (NSAID) dose due to TMJ strain from the speculum.
  - Others choose to forego this due to potential NSAID side effects.
- 2. Power Instrumentation: Excessive Tooth Removal
  - As mentioned earlier, motorized equipment is capable of quickly taking off a significant amount of dental tissue.
    - Taking off more than 2-3 mm of tooth can result in pulp exposure and eventual death of the tooth.
  - Additionally, horses have limited tooth to last their entire lifetime. Repeated excessive floating over the life of the horse may result in teeth that expire too early.
- 3. Power Instrumentation: Thermal Injury
  - Remember, dental tissue can heat up quickly with the use of motorized equipment. The tool should be moved across the arcade regularly to prevent excessive heating. The cutting surface should not be left in one place for more than 2-3 seconds at a time.
  - Built in irrigation or manually rinsing the tooth or tool can additionally help prevent thermal damage.

# Summary

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- Prophylactic dental procedures are an important part of equine preventative medicine.
- Procedures have developed throughout history resulting in the advanced care available today.
- Equine teeth are highly adapted to grazing and continuously erupt, contributing to the formation of sharp points and malocclusions.
- Dental procedures may be performed in a wide variety of places with varied equipment provided that safety is considered paramount.
- Tools for performing dentistry on horses range widely and practitioner preference largely dictates what may be available at a given practice.
- A basic dental float includes removing sharp points from the buccal side of the maxillary arcades and the lingual side of the mandibular arcades.
  - Correction of mild malocclusions is also often performed in basic float procedures.
- It is important to refrain from excessive tooth removal, as damage or death of the tooth may occur due to pulp exposure.
  - Additionally, veterinarians aim to extend, rather than limit, the lifetime of each tooth with conservative dental practices.
- Thermal injury is possible with dental instrumentation. Moving the tools every few seconds and cooling the tool and teeth with water reduce the risk of damage.
- Floating teeth takes practice!

# Questions?

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## Resources:

*Equine Dentistry, 3<sup>rd</sup> Ed.* Easley, Dixon, and  
Schumacher.

*Principles of Equine Dentistry.* Klugh.



<http://www.besthorsestalls.com/wp-content/uploads/2013/02/terrific-teeth.jpg>