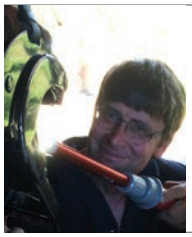
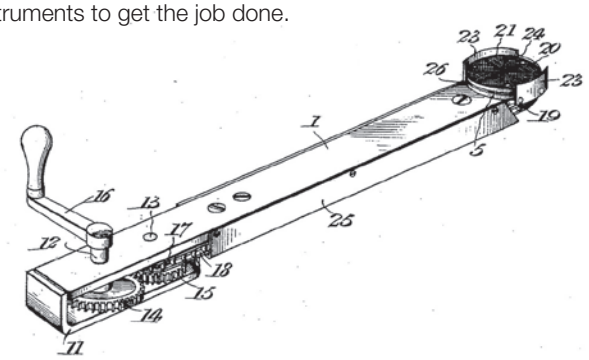


The technological side of equine dentistry: New is better.

By Ruedi Steiger, DACVIM, SWISSVET Veterinary Products, Knoxville TN

Horses' hypsodont teeth erupt throughout their lives and are worn down by the action of chewing. As such they have a tendency to form sharp enamel points and long hooks that may interfere with the physiologic process of eating and wearing a bit. Hence horses require regular dental examination, and if needed, floating or rasping of their teeth. While these issues are well known and have been treated for centuries, the equipment available to do this task has changed significantly over the last few years.

D'Ibn-Alwam's agricultural textbook from the 12th century has a reference to horses with dental problems. While the treatment is described, (rasp abnormally long teeth to the level of the adjacent teeth), no details are available about the nature of the instruments used. Lacking specialized manufacturing industries, people were using ordinary tools, hand rasps, chisels, saws and similar hand instruments to get the job done.

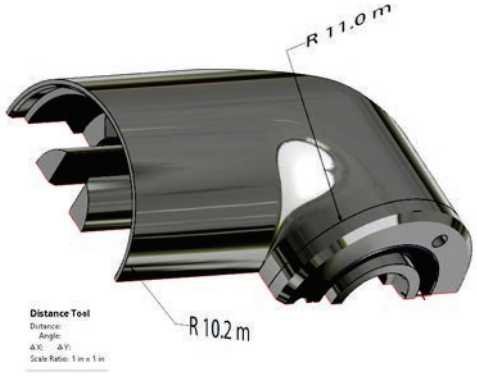


Pic 1. A "powerfloat" from 1904 shows familiar features.

Things changed eventually, and in the19th century the first patents for equine dentistry instruments were filed and advertisements tried to attract buyers for new equipment specifically made for equine dentistry. Many of these early instruments, maybe cumbersome to use, were surprisingly innovative and mechanically refined. Limitations were given by the materials and technologies available at the time but gradual improvements were made over the years. Only very recently we have seen significant changes indicating that we are entering a modern era with technologically advanced equine dentistry instruments.

Design

People have been mechanically skilled for a long time. There was a good understanding of engineering and floats with bevel gears, bearings and seals have been around for a while. The basic design of the first dentistry instruments were not that different from what we see today. It was harder and more time consuming to draw a blue print, to research what standard components such as bearings and screws were readily available, but people had a good grip on mechanical work. Today's computer programs allow easy calculation of weight and other physical properties and new designs can be looked at in any angles or cross sections, and even tested with animation programs. The basic idea of motorized instrument however has remained the same. However, some new materials and technologies are the reason for a new era.



Pic 2. A computer generated design of a modern equine dental float

Materials/Machining

Early dentistry instruments were made of steel, and they were forged or cast and welded, brazed or machined if needed into the final profile. The weight of these tools was high, the potential form to shape them into was limited and so were the tolerances. Plastics and other synthetic materials were unknown; Charles Martin Hall invented aluminum in the late 19th century and stainless steel was discovered in the beginning of the 20th century only.

Traditional products available today vary greatly in their quality. While most American or European made instruments are well done and are great to work with, many cheaper products, namely those from low cost countries do not have a consistent quality and cannot always be recommended. In equine dentistry failing instruments are not only a source of frustration when they break down at the worst moment and need early replacement, it also poses a potential risk for the operator getting injured. Even if low price items are cheaper to purchase, they are often more costly in the long run.

Today we have new amazing materials that are machined with incredibly accurate computerized equipment. There are different types of metal: stainless steel and aluminum being the most popular, and there is a increasing number of synthetic materials used. Each of them has its own physical property, way of processing and best area of application. Many medical instruments are made of stainless steel, they are sturdy, easy to clean and corrosion resistant. They are referred to as surgical steel, although this not a term that represents an industrial standard. They are often utilized for dentistry equipment, but their heaviness is an issue for many users.

If tensile strength or sharpness is less needed and easy machining and light weight more of a factor to consider, aluminum finds its use. Aluminum is not very strong, and not corrosion resistant but a number of treatment processes can alter these properties. Aluminum alloys, some of them referred to as aircraft aluminum, are almost as strong as stainless steel, and surface treatments such as anodizing increase corrosion and scratch resistance, improve lubrication and allow dyeing in almost any color at the same time.

Pic 3. Cutting edge technology: the TARO 2015 speculum

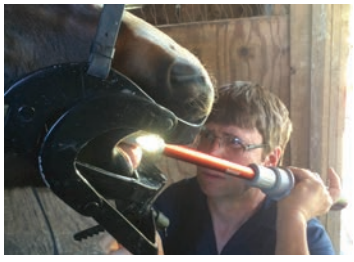
An example is the TARO 2015 speculum. Produced in Germany and available through SWISSVET, it is made of high tensile strength aluminum alloy. Computer assisted machining allowed the makers to achieve a design that combines features not previously seen in a single instrument. The speculum is easy to open and it has a quick release to close it down. The in incisor plates are adjustable to

accommodate horses with overbites. New, radiolucent incisor plates are under development for this device to allow improved dental imaging. The speculum is lightweight and precisely machined and it is not only a very functional instrument, it is also just wonderfully manufactured.

Plastics on the other hand have a lower tensile strength but they are relatively cheap, easy to machine, and have a wide range of properties. Take Delrin, a Polyoxymethylene, which is characterized by high strength for a plastic, it is light weight, and completely resistant to corrosion; with great electric insulation, it is heat resistant and has a low friction coefficient. These plastics are used alone or in combination with other materials, depending on the properties that are needed. Delrin for instance is used in the TARO2015 speculum to cover the bite plates, which provides an extra protection for the incisors from chipping when in contact with the hard plates.

Batteries

Batteries have been around since the 18th century, but their tremendous weight, low energy density and often dangerous chemical composition made them unsuitable for practical applications for long time. This is all different for lithium batteries; invented in the 70' and refined and improved until they became a regular components of consumer electronics in the 90's, they have all it takes to be a great mobile energy source: they are light weight, have a high energy density, no memory effect, a very slow loss of charge and they allow a high number of charging cycles. While this is very convenient for a digital camera and allows us to make a computer of the size of a wrist watch, it has been a game changer for equine dentistry equipment. Without a battery all motorized instruments have to be used with corded electric power (or pneumatic power which is even more cumbersome). Plug in power means shock hazard, the need for extension cords, and of course the need for power outlets. Instruments powered by light weight batteries are compact, versatile, powerful and safe. They do for us the same they have done to telephones, they make dentistry instruments mobile. Early lithium batteries were prohibitively expensive, but they have become very affordable today.



Pic 4. Lithium batteries power the new lightweight TERAFLOAT

LED lights

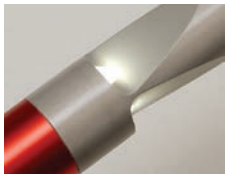
Another game changer are LED lights. LED's have been around since the early 1900, but they were not very strong or practical until the second half of the century and only in the last decade they have become a really amazing light source.

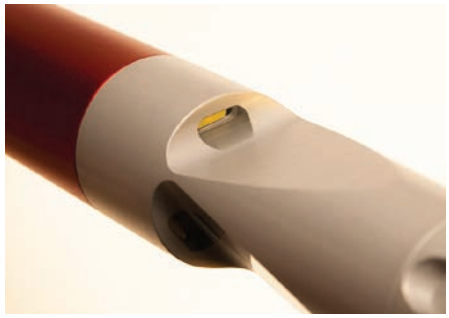
LEDs offer a number of advantages over traditional light sources such as halogen or xenon light bulbs. LED lights are available at a fraction of the cost of these previous lights. They are extremely energy efficient and they produce very little heat. This means that they do not crack when suddenly cooled down by water (provided they are mounted in a waterproof fixture). They are shock resistant and they have an incredible life span, and when they start to fail, they indicate it by a lower light emission and not simply by complete darkness as regular light bulbs do. As a consequence, they can be placed directly in the area where they are needed and they do not require a lot of energy, i.e. batteries are just right power source for the job.

Often these new technologies are used in combination. For example the Dr. Fritz wireless dental endoscope. An Lithium battery powers the instrument and LED lights next to the camera at the end of the endoscope provide the light. A wireless transmission of the signal is reviewed or recorded on a remote wireless monitor. This endoscope does not require an external power or light source and is completely mobile and waterproof.

Another example that has a much larger target group of operators is the new Terafloat by SWISSVET. It combines battery power, LED lighting and lightweight construction in a new mobile power float for horses. It basically just the float handle with a small motor. No large and heavy drill engine or external motor with drive cable and foot pedal is needed. The float has three built in LED lights, and the shaft uses a clever turnflex mechanism, a precision machined portion that allows the instrument to be straight or in a flexed position.

Pic 5. Powerful built in LED lights of the TERAFLOAT to visualize the grinding area





These are examples of a new generation equipment for equine medicine. They are designed for highest operator satisfaction using the latest technology and materials. As a large animal veterinarian I remember how often I had to improvise to get a job done. If successfully mastered, these challenges can be exciting and are part of the job, but often I felt frustrated, wondering what clients think of our work on horses, if we do not even have proper equipment.

It is wonderful to see state-of-the-art equipment for equine medicine. It allows us to do a straightforward and perfect job. These cutting edge instruments may be more expensive than a hand float with a flash light duct taped onto it. But they justify a higher prices asked for a professional service well done. Last but not least, it makes a modern veterinarian look more professional and ultimately leaves everybody more satisfied.

About the Author Dr. Ruedi Steiger is a graduate of the University of Zurich, Switzerland. After working at the University of Zurich in the equine department and in a private equine practice, he moved to Auburn AL to complete a residency program and to become a diplomat of Large Animal Internal Medicine. He is the owner of Swissvet Veterinary Products, a company specialized in equine dentistry products, and he also teaches and works in his equine dentistry practice in Knoxvillle TN. He has been a frequent contributor to the Equine Solution.