Study into the comparative efficiency of topical cooling agents in the equine limb

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Introduction

There is little or no readily available information on the relative efficiency of topical cooling agents. However there are many products on the market claiming to cool the equine limb. Each claims various benefits, including cooling, but there appears to be little or no scientific data to support these claims. This study was set up to ascertain which of the products was most effective at cooling the equine leg under normal yard conditions, when used following the manufacturers recommendations. It also aims to produce a baseline from which adjustments to instructions could be made and the results of these adjustments tested in future research.

Most of the recommendations and instructions accompanying the products are not supported by research or evidence and appear to be anecdotal. Therefore with many products the recommended usage times and or dosages may not be the most efficient. For example, the pre-set temperature of the Zamar may not be the most useful. The figure was set using veterinary advice but with no backup research into its effects. Important information required by owners and physiotherapists re the use of these products may be disparate and misleading.

Most research into the use of cold has been done in the human field in applications over muscle tissue. In the horse cold therapy is usually used in the lower limb over tendon and bone and over considerably hairier skin! The results of human research are therefore probably not fully transferable to the equine field. This may result in over or under treatment.

It should be remembered that this trial only tested temperature. Many of these products also claim to have a 'healing' and/ or anti inflammatory effect and no attempts were made to measure these effects.

Method

Subjects

To match breed, type and occupation three thoroughbreds horses in full race training were selected for use. These consisted of one mare and two geldings aged between 8 and 10 years (average age 8.6 years). All were in a regular training regime for jump racing, were fully fit, and had no current injuries. All had no previous injuries to the lower limb below the carpus.

Protocol

Leg temperature measurements were taken using a hand held digital thermometer with thermocouple probe. The thermometer used was a Caltek Instrument, model number

CM1200T, serial number S/N:J20183450. The thermometer was calibrated prior to the trial and at the conclusion of the trial with complete consistency shown. Prior to each measurement function was checked by blowing on the probe, this simply showed that the probe was responding to temperature change. The thermocouple was inserted through the hair on the lateral aspect of the cannon bone, until it came into contact with skin, three inches below the carpus. This site was chosen as it was well within the area being 'treated', easily accessible and safe for the researcher should the horse become agitated. The probe was held for thirty seconds or until a steady reading had appeared lasting at least fifteen seconds (whichever took longer). Digital thermometers take several seconds to 'settle', fifteen seconds is accepted in the engineering profession as the standard time that should elapse at a steady reading before a reading should be taken.

All testing took place between June and September 2005. Leg temperatures were taken on two separate occasions prior to any trials taking place. Prior to each trial the air temperature was taken in each stable, this varied over the weeks from 15 to 26 degrees centigrade. One limb was chosen for the trial and the contra-lateral foreleg was used as the control. The leg temperatures of both forelimbs were taken and recorded. The trial legs temperature was then recorded at fifteen minutes into treatment, at the end of treatment, ten minutes after treatment, twenty minutes after treatment and one hour after treatment. The control leg was tested at the end of treatment and one hour after treatment.

As far as was possible all three horses were subjected to the same trial on the same day at the same time. To fit in with work regimes this meant that all the 'short' trials took place first thing in the morning and all the 'long' trials took place overnight.

Pre Trial Testing

Prior to trialling the actual products all horses had their leg temperatures tested at least twice in the early morning prior to exercise, i.e. at the same time as the trial itself would take place. These measurements showed that leg temperature in the same horse at the same time of day can vary by up to 10 degrees C, air temperature appeared to have no effect on this. In addition six horses (all thoroughbreds in training, but not all taking part in the trial) had their legs tested last thing at night and first thing the following morning prior to exercise. This was to try and ascertain whether or not there was a normal level of leg temperature drop overnight without any external applications. From this latter set of data it was determined that a horses leg temperature drops by between six and eight degrees centigrade normally over night.

Short Trials

These trials were those that the manufacturers recommended treatment time was thirty minutes or less. These trials were Zamar, ice pack, Bonner bandage, Puffa gel boot, ice gel boot, and cold hose. In fact all modalities were used for thirty minutes except for the cold hose which was used for twenty minutes. All these trials were conducted in the morning prior to exercise. All trials were carried out using the manufacturers instructions. The Zamar was supplied pre-set to 3° C and the time was taken from the moment that the

machine indicated it had reached working temperature. The ice pack used was a Theraflex and was used direct from a domestic chest freezer, as was the Bonner bandage and ice gel boot. In addition the ice pack had a damp towel applied between it and the skin, and was bandaged into place. The Puffa boot was immersed in cold water prior to use as per instructions.

Long Trials

These trials were those that the recommended treatment time went into hours. To fit training schedules all these trials took place overnight. These trials included all the 'clays', i.e. Ice Tight, Like Ice and Stay Sound plus Alvowrap Aloe Vera bandages. The bandage tests were repeated twice, once with medium wraps and once with large. Measurements were taken at the same time intervals as for the short trials but some additional intermediate measurements were also taken. Due to logistical problems these are not truly comparative so have been left out of the results. The clays and bandages were all applied as per manufacturers instructions.

Results

When the results from all three horses were averaged out the temperature drop at 15 minutes into treatment was greatest for the ice pack at 17° C. The Bonner bandage followed at 9° C with cold hosing at 8° C, ice gel boot at 7° C, Zamar at 6° C, both aloe vera bandage tests and Staysound at 2° C. Staysound was the only clay to produce an initial temperature drop. By the end of treatment, apart from the ice pack which still had the biggest drop, there were five other modalities showing a greater than five degree drop and were within two degrees of each other. By one hour after, the gaps had widened again. See Fig. 1.
Probably graph 4 but if you have room for all 4 they do show the variation between the horses. The table would also be relevant at this point
The control legs in the short trials all maintained their original temperatures within a couple of degrees, interestingly if they did anything the tendency was to rise by a degree. The control legs in the long trials tended to track the temperature drop of the trial leg overnight and finish the trial the same as the trial leg. Staysound was the only clay to produce lower leg temperatures than its control at end of treatment in all three horses.
As can be seen more easily from the graphs, the most efficient method of producing a fast and dramatic drop in temperature is to use an ice pack. The Bonner bandage and ice gel boot had a good success rate initially but temperatures rose again slightly at the end of treatment probably due to the bandage drying out and the gel melting. Cold hosing and Zamar held temperatures down in the short trials at the end of treatment but were still higher than the ice pack.
The clays have the best long term cooling effect i.e. they maintain the drop in temperature for the hour after their removal.

Discussion

Introducing a layer of water under the application appeared to greatly increase the efficiency of the product, this makes sense as it reduces the ability of the hair to insulate

the leg. The clays look good for longer term cooling but is this effect purely from their action or from the fact that legs cool down overnight anyway? Clay is washed off, does wetting the legs rather than the clay alone effect the temperature? Interestingly the Zamar had one test done over a wet leg (these results were not included) and showed a temperature drop at 15 minutes of 10° C, 4° C better than with a dry leg.
From a practical point of view these are some comments about the use of the products. Puffa boots we found hard to use as they sagged and dropped down the leg however well we did them up. Clay is messy to apply and difficult to get to the required thickness but gets easier to use with practise! It is also relatively expensive if used in large quantities. Ice packs and Bonner bandages are easy to apply if you have a good bandaging technique but rely on easy access to a freezer. Likewise for gel boots in that they thaw quickly and need using from the freezer. Alvowrap is easy to transport and use as long as it has had its time in the fridge and is kept cool in a freezer bag until wanted. Zamar is large, cumbersome, expensive, needs a horse to be sensible and is labour intensive, however it could prove very useful in a large commercial yard. Cold hosing is labour intensive, needs ample running water and is therefore questionable ecologically.

Potential future research

This trial was an initial evaluation of eleven different cooling agents and raised many further questions.
Suggestions for further research are:

1. Further leg temperature testing should be carried out on a larger sample of animals at differing times of day and at differing times of year to ascertain the normal variations of leg temperature between these variables.
2. The sample size was very small to enable the trial to initially test many different cooling agents. Each agent now needs further testing on a larger sample to verify the results.
3. Each type of agent, e.g. clays, would benefit from looking at in isolation to ascertain whether the recommended methods of use are the most appropriate.
4. All testing was carried out prior to exercise. All products should also now be tested post exercise to see if efficacy is improved or not.
5. Only temperature was tested. Some products claim anti- inflammatory and/ or healing properties, these properties were not tested and should be subject to separate testing.
6. The Zamar was only tested as it came (set to 3 degrees C). This needs much more extensive testing at different settings and also with the use of a damp cloth or wet leg under the wrap.

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References

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TRM, Ireland, 00353 45434258
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