UTILIZING THERMOGRAPHY
to ASSESS COMPLIANCE with
THE HORSE PROTECTION ACT

TRACY A. TURNER, DVM, MS
Diplomate, Am Col Vet Surgeons
Diplomate, Am Board Thermology
THERMOGRAPHY and THE HORSE PROTECTION ACT

- 1975 NELSON, detection of SORING in Tenn Walking Horses
- 1978 report in JAVMA: THERMOGRAPHIC ENFORCEMENT of the HORSE PROTECTION ACT
- 1978-1982 PUROHIT, AUBURN UNIV: THERMOGRAPHY IN DIAGNOSIS OF INFLAMMATORY PROCESSES IN HORSES IN RESPONSE TO VARIOUS CHEMICAL AND PHYSICAL FACTORS
WHAT IS THERMOGRAPHY??

ANATOMIC IMAGING
RADIOLOGY
ULTRASONOGRAPHY
COMPUTED TOMOGRAPHY
MAGNETIC RESONANCE IMAGING

PHYSIOLOGIC IMAGING
SCINTIGRAPHY
THERMOGRAPHY
HEAT IS EMITTED IN THE FORM OF INFRARED RADIATION
WHAT PHYSIOLOGY DOES THERMOGRAPHY MEASURE?

- LOCAL CIRCULATION
- BLOOD FLOW
- LOCAL METABOLISM
THERMOGRAPHY

ABILITY TO NON-IVASIVELY ASSESS INFLAMMATION

- MAKES THERMOGRAPHY AN IDEAL TOOL TO AID IN THE DIAGNOSIS OF LAMENESS
THERMAL PATTERN

- DICTATED BY
- CIRCULATORY PATTERN
- LOCAL VASCULARITY
- SURFACE CONTOUR
THERMAL PATTERN

- DORSAL VIEW = relatively cool
- TENDONS = relatively cool
- HEAT between MC/MTIII and FLEXOR TENDONS
THERMAL PATTERN

- CORONARY BAND and LAMINAR CORIUM are WARMER.
- BETWEEN BULBS of the HEEL is WARMEST.
THERMOGRAPHY as a DIAGNOSTIC TOOL

INFLAMMATION MAY BE DETECTED THERMOGRAPHICALLY AS EITHER:

➢ “HOT SPOT”
➢ “COLD SPOT”
THERMOGRAPHY can ENHANCE CLINICAL EXAMINATION

- QUALITATIVE ASSESSMENT OF THE VASCULATURE AND BLOOD FLOW TO TISSUES
- TELLS THE EXAMINER WHAT THEY DID NOT KNOW
- DETECTING HEAT WHERE IT WAS NOT PALPABLE
- DETECTS ABNORMAL
THERMOGRAPHY and THE HORSE PROTECTION ACT

A STUDY

- To develop an efficient protocol using thermal imaging and known standards of normality to identify horse’s with abnormalities with the potential to either effect performance or be in violation of the standards of the Horse Protection Act.
- To develop an objective process to assign a index of suspicion to abnormalities identified.
- To provide materials to be used for education of Veterinarians, the general public, and members of the TWH community concerning proper preparation of horses for athletic competition.
**STUDY DESIGN**

<table>
<thead>
<tr>
<th>Research Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Pre-exercise Thermographic exam</td>
</tr>
<tr>
<td>2) Clinical exam using the currently established protocol which includes a 3 part evaluation of General Attitude (GA), Locomotion/Lameness (L), and Physical Exam / Palpation (PE). Each segment is scored 1 - 3 in terms of normal =1 and severe = 3.</td>
</tr>
<tr>
<td>3) Horse to enter the ring and compete vigorously in its normal occupation at winning level of intensity. Horse to stay in motion for 10 minutes.</td>
</tr>
<tr>
<td>4) Post Exercise Physical exam</td>
</tr>
<tr>
<td>5) Post Exercise Thermal Exam</td>
</tr>
<tr>
<td>Horses allowed to cool out and rest.</td>
</tr>
<tr>
<td>6) Horses all received DP and Lateral Digital Radiographs of all four feet.</td>
</tr>
<tr>
<td>7) 2 hour post exercise Physical Exam.</td>
</tr>
<tr>
<td>8) 2 hour post exercise Thermal Exam.</td>
</tr>
</tbody>
</table>

- **Study Event took place in December 2007**
- **15 TWHs of various disciplines participated**
- **All horses were teamed by Persons Responsible to be fit to compete, and were currently being actively shown.**
- **Researchers were blinded as to the individual horse’s identity or competition records.**
RESULTS

- 15 HORSES EXAMINED, 1 WAS NORMAL
- 5 HORSES HAD AN ABNORMAL PASTERN
- 3 HORSES HAD ABNORMAL HOOVES
- 5 HORSES HAD ABNORMAL PASTERN AND HOOVES
- 1 HORSE HAD ABNORMAL CANNON
RESULTS

- 14 ABNORMAL HORSES
- 11 CONFIRMED ABNORMAL BY FURTHER EXAMINATION, PALPATION or DIGITAL RADIOGRAPHY
Horse 1

- Dorsal view asymmetry
- LF pastern cold
- RF medial heel cold
- LF medial pastern
- Inspection: general appearance normal, locomotion normal, p.e. normal
- Rads WNL
Horse 2

- LF coronary band hot
- LF Pastern cold
- LF medial coronary band
- RF medial quarter
- Inspection: general appearance normal, locomotion normal, p.e. normal
- Rads: fx RF lat sidebone
Horse 3

- Asymmetric pasterns
- RF hot coronary band
- LF cold pastern
- Hot both feet medial and lateral coronary band at quarter
- Inspection: general normal, locomotion normal, p.e. LF inconsistent palp RF normal, smell of kerosene present
- Rads coronary band edema
Horse 4

- LF foot hot
- LF pastern cold
- RF pastern cold
- Medial hoof wall quarter hot RF/LF
- Inspection: general normal, locomotion normal, p.e. LF painful to palp
- Rads: LF – palmar angle
Horse 5*

- LF coronary band hot
- RF LF inside quarter hot
- Inspection: general normal, locomotion normal. P.e. normal, traveled high LF under saddle
- Rads WNL
Horse 6

- Hot wide coronary bands
- LF heat pastern
- Inspection: general normal, locomotion normal. P.e. very reactive both fore pasterns
- Rads WNL
Horse 7

- LF cold pastern
- RF hot coronary band toe
- Pastern asymmetry
- Heat medial quarter RF/LF
- Inspection: general normal, locomotion normal, p.e. LF consistent over pastern, RF over palmar pastern
- Rads RF dished toe LF – palmar angle
Horse 8

- Hot LF coronary band
- Rf pastern hotter
- RF/LF cold toes
- Hot medial/lateral quarters LF/RF
- Inspection: general normal, locomotion abnormal, p.e. LF/RF + palp pastern hoof tester –
- Rads: severe chronic laminitis!!!!!
Horse 9

- RF pastern warmer
- LF, LF cold
- LF lateral quarter
- RF medial quarter
- Inspection: general normal, locomotion, normal, p.e. normal
- Rads: WNL
Horse 10

- Pasterns cold R>L
- Hot quarters lateral RF/LF
- Inspection: general normal, locomotion normal, p.e. mild + hoof testers RF @toe, sunscreen applied to pasterns
- Rads WNL
Horse 11

- Irregular coronary band
- Coronary hairline hot
- LF medial pastern
- Inspection: general normal, locomotion normal, p.e. +palp RF/LF + hoof testers RF/LF
- Rads; moderate p3 rotation
HORSE 11

Owner: USDA
Animal: #11
Date: 13-Dec-2007
LF Foot Lateral
Akin Equine Veterinary Services
Horse 12

- Abnormal pasterns
- Abnormal hooves @toes
- RF heat lateral quarter heel
- LF medial quarter
- Inspection: general normal, locomotion normal, p.e.+hoof testers RF/LF
- Rads LF lg horizontal crack at toe, mild rotation RF/LF
Horse 13

- Coronary band too wide RF heat @ toe
- LF pastern hot
- LF medial pastern
- LF medial wall
- Inspection: general normal, locomotion normal, p.e. LF+pastern
- Rads: WNL
Horse 14

- LF heat @ toe
- LF pastern cold lateral
- RF pastern cold
- LF cold spotchy
- Rf cold
- Coronary bands wide
- Inspection: general normal, locomotion normal, p.e.+LF pastern
- Rads:-palmar angle L<R
Horse 15

- RF medial hoof
- RF lateral cold pastern
- LF heat quarters
- Heat lateral heel quarter
- LF, medial HOT
- RF heat medial quarter
- Inspection: general normal, locomotion normal, p.e. normal
- Rads: WNL
OTHER RESULTS

➢ “TREATED PASTERN”

3 MONTHS POST TREATMENT
OTHER RESULTS

➢ “GO-JO TREATED”

TECHNOLOGY SHOWS EXACTLY WHERE
OTHER RESULTS

- “EXCESSIVE WORK 3 HOURS EARLIER”
CONCLUSION

- This study supports previous findings that thermography can be used to determine if a horse is in compliance with the Horse Protection Act.
Future Plans for Regulatory Use

- Horses deemed “not normal” will be either excused from competition, or referred for further veterinary evaluation.
- 2008 Season will see thermography introduced.
- Plans are to incorporate thermographic imaging as part of the inspection process for 2009 show season.
DIGITAL RADIOGRAPHY

and

THE HORSE PROTECTION ACT

TRACY A. TURNER, DVM, MS,
Dipl.ACVS
RADIOLOGY

- X-RAYS DISCOVERED IN 1895 by WILHEM ROENTGEN
- 1929: FIRST RADIOGRAPHIC EXAMINATION of the NAVICULAR BONE
- 1935: FIRST DESCRIPTION of the RADIOGRAPHIC CHANGES ASSOCIATED WITH NAVICULAR DISEASE
COMPUTERS

- HAVE CHANGED
  THE WAY WE LIVE
ARE ALL RADIOGRAPHS CREATED EQUAL?

- FILM vs DIGITAL (CR and DR)
  - X-RAYS EXPOSE FILM
  - X-RAYS EXPOSE PLATE WHICH IS READ BY COMPUTER (CR)
  - X-RAYS EXPOSE PLATE WHICH INSTANTLY and ELECTRONICALLY PRODUCES IMAGE (DR)
RADIOLOGY
DIGITAL RADIOGRAPHY
GRAY SCALE

>4000 SHADES OF GRAY

BLACK

HUMAN EYE PERCEIVES 256 SHADES OF GRAY

WHITE

- COMPUTER CAN MAKE BLACK MORE WHITE AND WHITE MORE BLACK
- MEANS GREATER DIFFERENCE IN DENSITY CAN BE SEEN
DIGITAL RADIOLOGY

FILM RADIOGRAPHY

DIGITAL RADIOGRAPHY
HPA Specific Prohibitions

- Prohibitions on shoeing:
- Shoeing or hoof trimming that can reasonably be expected to cause a horse to suffer pain or distress
- Any object or material inserted between the pad and the hoof other than acceptable hoof packing
SHOEING

Specific Prohibitions

- Pads not made of leather, plastic, or other pliant material
- Weights attached to the outside of the hoof wall, horseshoe, or any portion of the pad
- Single or double rocker bars on the bottom surface of horse shoes extending more than 1 ½ inches back from the point of the toe

49 nails needed to hold pads together?
SHOEING
Specific Prohibitions

- Artificial extensions of toe length that exceed 50 percent of natural hoof length
- The use of “poly” and other hoof building methods, combined with “hoof black” polish has made this very difficult to determine
- Toe length that does not exceed the height of the heel by 1 inch or more
QUESTIONS?