The diagnosis of locomotive disorders of domestic animals by contact thermography

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SUMMARY. The application of contact-thermography in veterinary medicine is discussed, based on a study of 360 cases with locomotor disorders in horses, cattle and dogs. The method being simple and harmless, is well tolerated by animals. The regressian or progression of clinical signs can be objectively followed and incurable animals can be more rapidly selected for emergency slaughter.

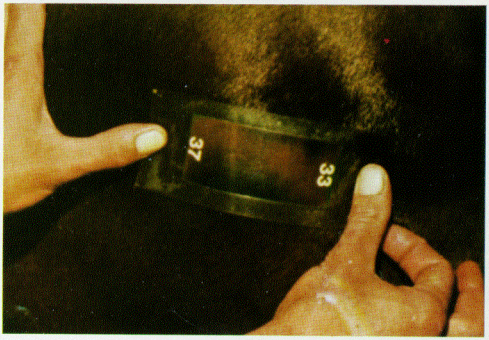
Key words: contact thermography, locomotive system, domestic animals.

INTRODUCTION

The USC of thermography in veterinary medicine has not been wide-spread despite its suitability for increasing the scope of veterinary diagnosis. This may in part be due to the fact that, in veterinary medicine, anamnesis is not important; certain animal species are very different in their reactions to pain and some are still active even with broken legs. The great potential of the method is due to the significance of local hyperthermia

Fig. 1. 9 year old, bay, halfbred, gelding. Following a road accident the horse was lame in the left foreleg.

On admission the animal was slightly torward leaning. On the left foreleg, the metacarpal medial surface (to the pastern articulation). was slightlv swollen and sensitive to pressure. Bending “and stretching of the carpus evoked slight pain. The liquid crystal sheet in the range 28-32 °C revealed a 7 cm dia. discolouration in the central third part of the metacarpal bone. A sinus of 2 mm dia. reaching the muscular medius interosscus was situated in the central part of a bluish coloured area. On the basis ot repeated contact thermographic reports showing progressively decreasing signs, the horse was returned for work after one week. Diagnosis: superinfected injury of the left leg.



A B C

Fig. 2. 6 year old, bay, halfbred gelding. Fell, injuring itself against a tence after bolting. On admission a permanent, but moderate lameness of a mixed type was seen in the left foreleg. The shoulder joint area was scarcely more swollen than that of the opposite side (A), but was sensitive to pressure. Passive movement (especially extension) was painful. Contact-thermography showed that in a range 33-37 °C the atfectcd joint changed colour to greenish-blue (B), while the control on the opposite side was scarlet (cold) (C). Synovial fluid obtained by aspiration was slightly turbid and of pale yellowish colour. Blood sugar was 113 mg%, and that of the aspirate 102 mg%. Synovial fluid cell count was 3800/mm^3 with 15-20 leukocytes in each visual field. Thermography showed gradual cooling while the symptoms progressively diminished over 14 days. Diagnosis: traumatic arthritis with effusion of the left foreleg.

occuring in both veterinary and human medicine.

METHOD

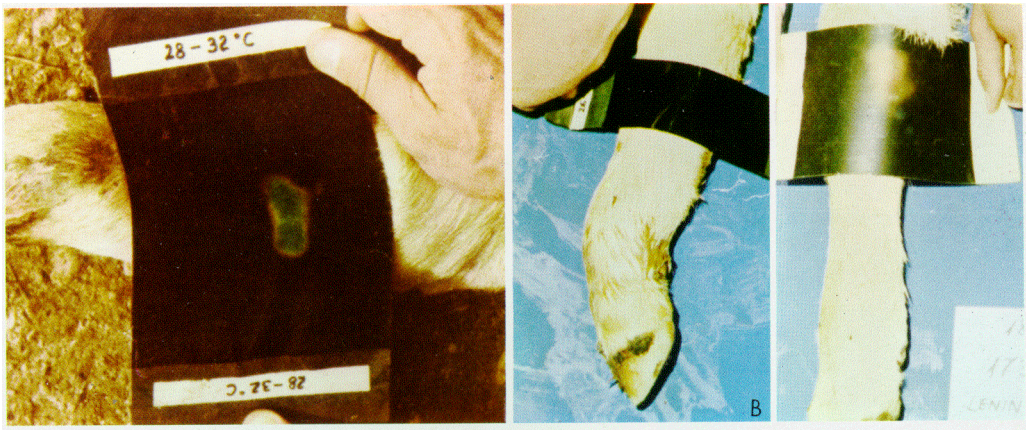
Liquid crystals in sheet form were adapted to the skin temperature sensitivity for the most important domestic animals in temperature ranges: (26-30°C. 28-32 “C, 30-34°C. 32-36 °C, 33-37 °C). These are simply placed over both the area to be examined, and the corresponding contralateral area. After 10 to 30 seconds, the results is read from the colour changes on the sheet. We have successfully applied this process to 960 cases, the major advantage being the speed of response. The animals have not shown excessive resistance to examination, and the process is not harmful to the operator or the animal. Tests may be repeated with the same sheet several times, malting the process very inexpensive.

The liquid crystal sheets were prepared by one of the authors (O.S.) from basic materials (Medilex and Reanal, Budapest). The characteristic feature being a non reflective surface which simplifies photographic recording.

MATERIAL

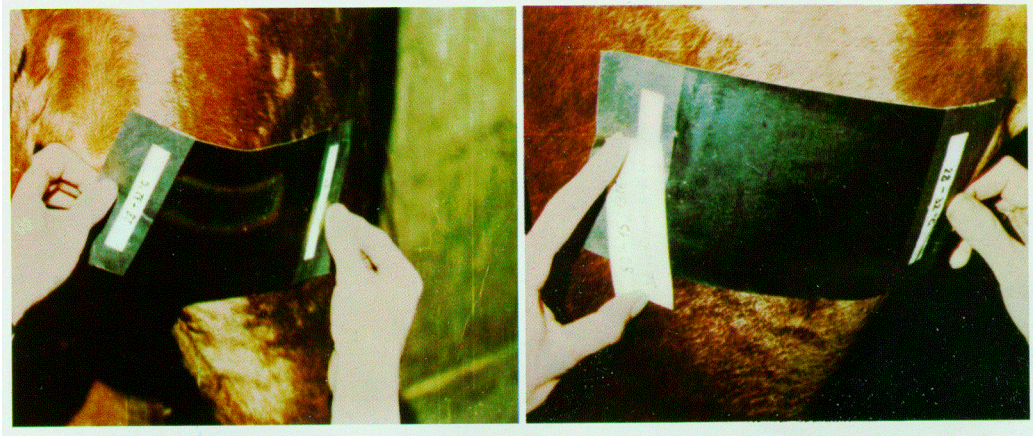
2,000 examinations have been carried out in six months, of which 960 were on 300 animals with disorders of the locomotor system (i.e. 195 horses, 54 cattle, 51 dogs).

In 286 animals, repeated tests have been



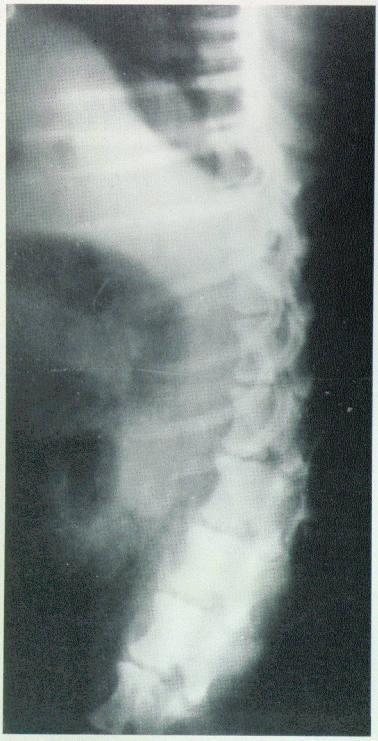
A C

Fig. 3. 6 week old hungarian speckled bullcalf, with a fractured right back leg which occurred during weighing, The first examination took place on the 12th day after the fracture, when both subjective and objective symptoms were evident. The calf could not stand and could move only on three legs with help. His general condition was poor. With a thermographic sheet (28-32 "C) the colour change over the fracture site can be well seen, in spite of a thick pelt (A). Thermography 5 weeks later with a 26-30°C sheet, clearly showed callus formation accompanied by deformity without the colour change (B). At the same time, however, a 28-32°C sheet revealed an incipient carpitis of the left foreleg due to long periods in a lying position and overloading (C). After 8 days suppurativc carpitis occurred due to infection from bedding with a sore on the carpus, and the calf was slaughtered. Diagnosis: fracture of III and IV metatarsal bone, of the right hind leg. Decubitus reg. carpi., suppurative carpitis and septicaemia.



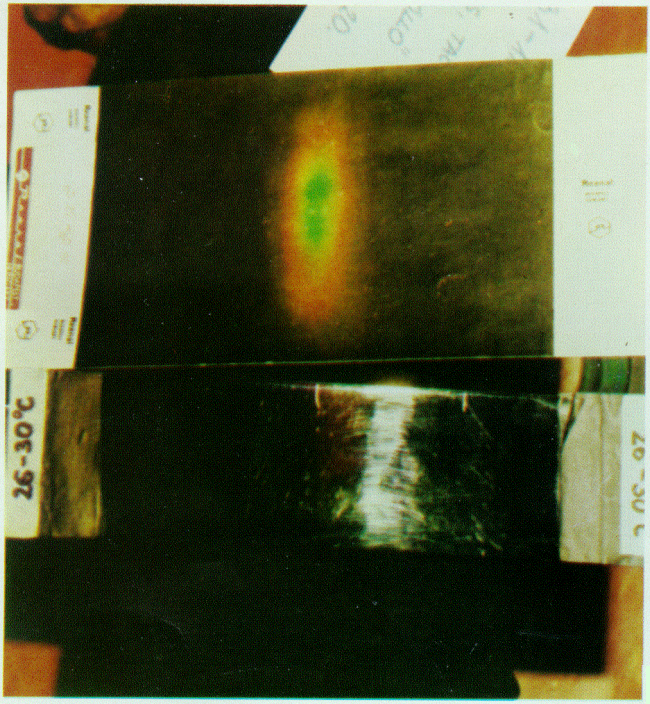
A B

Fig. 4. « Arva », 12 year old yellow mare. Kicked by another horse on the left thight 3 weeks previously. A moderate, mainly forward-leaning limping was observed on the left hind leg. On inspection of the femoral area of the left leg, atrophy of the quadriceps femoris was evident and varus deformity of the joint. The lateral and medial sides of the knee joint were sensitive to pressure. Passive movement of the leg increased the pain. Contact-thermography with a 28-32 °C sheet revealed marked limits of colour change to scarlet (A) which was most distinct on the lateral surface. The test on the opposite side showed no colour change (B). Aspiration: 60 m m^3 turbid exudate, 20-25 granulocytes in each visual field. Slight limping persisted on discharge. Diagnosis: arthritis of the left knee with effusion.



A

B



C

Fig. 5. 5 year old male dachshund which had fallen from a balcony one week previously.

On first examination the dog was found in moderate condition, but unable to raise the body, even with help. The intercostal regione between ribs 7-10 was found hyperaesthetic. Repeated radiography did not prove helpful (A). Contact-thermography was carried out on the 8th day, it can be seen that the 33-37 °C sheet revaled greenish-blue colour change (B) over the 8th and 9th intervertebral spaces. The 28-32 °C sheet applied 26 days later continued to show colour changes of bluish-green, while the 26-30 °C sheet placed over the last dorsal and the first lumbar vertebra showed only scarlet (27 °C) (C). On the 52nd day the 26-30 °C sheet placed over the dorsal vertebra 8-9 shows a scarlet colouration (27 °C), but at that time the dachshund was already mobile, though with some difficulty. Diagnosis: contusion of the medulla spinalis in the dorsal region. Subdural haematoma.

carried out to observe the regression of clinical symptoms or unsuccessful treatment, indicating the need for slaughter.

14 animals were identified as uncurable on admission and sent for immediate slaughter.

DISCUSSION

The application of liquid crystal sheets is useful because these animals are homeothermic and of stable internal body temperature. Recording of precise profiles is difficult due to individual differences prevailing within a given species. Although the body surface appropriately reflects the internal temperature of animals, its function is that of maintaining homeothermia. The temperature of the pelt can be considered stable under standardised conditions and was in our study (at 20-23 °C ambient temperature and 75-80 p.c. relative humidity) as follows: horse: 24-38 'C; cattle: 26-39 °C; dog: 28-40 °C.

Our thermographic diagnoses were controlled clinically by x-ray examination and by laboratory analyses. The full potential of this technique has yet to be explored. However certain cases have shown positive contact thermography, even in subclinical conditions, when other methods have been negative. In joint and muscle diseases some aspirates were contaminated with blood and laboratory analyses could not be carried out. However from clear exudates clear glucose analyses were undertaken in both plasma and aspirate. In inflammation the glucose levels of the aspirate was lower than in plasma. But in traumatic situations (non-infected) the glucose content of the plasma and aspirate were approximatively the same. Where the articular cartilage was damaged, the glucose content of the aspirate was higher than that in the plasma. If slight turbidity of the aspirate was observed, microscopical analysis was carried out and bacteriological investigations made. Our thermographic interpretation has been based on the fact that the vascular synovial membrane responds to inflammation or trauma by hyperaemia, the extension and degree of which varies according to injury. The localised hyperthermia can be reliably demonstrated by contact-thermographic sheets. The greatest increase has been found in infective arthritises, while the smallest are due to trauma. In exudative inflammatory lesions, hyperthermia does not exceed the margins of the synovial cavity. With traumatic injury, hyperthermia could only be observed in the area around the ruptured blood vessel. In infected effusions, the hyperthermic area considerably overran the margins of the joint cavity. In traumatic injury we have observed the localised healing process of fractures. A large number of ruptured periosteal blood vessels are being reformed and - as stated by Trueta - hypervascularisation is a decisive factor.

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