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EMPIRIC SYSTEMS TO REDUCE HEAT STRESS IN RABBIT *

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ABSTRACT

Two trials to reduce heat stress in rabbit were performed in a climatic cell. In both cases trials were carried out on 20 N.Z.W. bucks and body temperature and respiratory rate were recorded.

In the first trial the ambient temperature (22°C) was quickly raised to 32°C (R.H. 60%). After 2 hours 10 animals were wetted by completely dunking in tepid water.

In the second trial 10 animals were sheared and then exposed to a daily variable ambient temperature: 5 hours at 30°C and 19 hours at 22°C (R.H. 75%) for 10 weeks.

Wetting the animals appeared to be a very quick, easy and efficient system to reduce heat stress effects. Body temperature in the controls continued to increase till about 41°C, but in the treated animals it decreased suddenly to normal values and the difference was about 1.2°C. Six hours later body temperature in the wetted animals showed a moderate trend to increase again, remaining significantly lower in comparison to controls ($P<0.01$). To avoid body temperature to rise excessively the controls suffered also a mean breathing increase of 25 breaths/min ($P<0.05$).

Shearing was a less easy and less efficient system but, since hair was not observed to grow again, its effect in reducing body temperature was more enduring and it was still appreciable in the 3rd month after treatment. The lowering due to shearing was only 0.2°C ($P<0.01$), but it was not necessary any increase in respiratory work to keep normal body temperature values, while controls suffered an increase in respiratory rate (+19%; $P<0.01$).

INTRODUCTION

To reduce the negative effect of high temperatures in rabbit breeding, research has been directed mainly to ambient conditioning both with technological or empirical systems. Research to reduce heat stress through a direct action on the animals was mainly based upon

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administration of chemicals (Sanz et al., 1973; Camps et al., 1985; Vaugon, 1985; Bonsembiante et al., 1989).

No reference has been found in literature about the possibility of lowering rabbit body temperature by wetting or shearing, except collateral observations about shearing Angora rabbits (Schlolaut, 1987) and empirical knowledges about spraying or dunking the animals in cold or tepid water (Reed, 1984; Camps et al., 1985; Lunde, 1985).

A previous trial to reduce acute heat stress by wetting the animals showed a quick effect in the first hours but the total duration was not determined (Finzi et al., 1991).

Shearing a stripe along the back of the animals gave no results in a preliminary trial (Finzi, 1989), but a wider body shearing with the only exception of head and paws showed an effect still measurable after two days (Finzi et al., 1991). How long the effect can endure is not yet determined.

It was then planned a new trial to define better the intensity and enduring of the effect produced by wetting or shearing for the periods not yet studied.

MATERIALS AND METHODS

In a climatic cell 20 N.Z.W. bucks were set in single cages and provided with feed and water ad libitum. The rabbits were homogeneous for age (16 weeks) and weight (kg 2.87 ± 0.16). The climatic cell was set at 22°C. After one day rectal temperature and respiratory rate were recorded and two groups comparable for these parameters were randomly formed. The ambient temperature was then raised to 32°C ± 1°C (R.H. 60% ± 10%).

Two hours later 10 animals of one group were wetted by immersion in water at 20°C. In the quick dunking it was favoured the water to penetrate the fur by hand movements. Also the head was roughly wetted. Body temperature was hourly recorded and respiratory rate was recorded after 3 and 5 hours from treatment.

In the second trial two homogeneous groups were also formed utilizing 27 weeks old bucks, taking into account body weight (Kg 3.32 ± 0.30), body temperature (39.1 ± 0.4°C) and respiratory rate (165 ± 20 breaths/min). One group of 10 animals was then sheared and a daily variable ambient temperature (5 hours at 30 ± 1°C and 19 hours to 22 ± 1°C ; R.H. 75% ± 10%) was programmed in the climatic cell. Body temperature and respiratory rate were recorded twice a week for 10 weeks at the end of the hot and of the cooler daily period.

Shearing was done with an automatic shaver for small animals veterinary surgery. Shearing operation left hair about 2 mm long; paws and head were not sheared.

In both trials lighting was programmed in the climatic cell to simulate summer conditions (16 hours light; 8 hours dark).

RESULTS AND DISCUSSION

The effect of wetting was immediate (fig. 1) and brought body temperature to normal levels. Only after 5 hours a moderate trend to increase was observed. In the controls body temperature continued to rise and a mean difference of 1.2°C ($P<0.01$) was observed between the two groups. The duration of the effect for more than 7 hours ensures that one treatment is sufficient to protect the animals for the whole day.

In fig. 2 it is shown how the controls suffer an increase in respiratory rate. This is a thermoregulatory response to avoid body temperature to increase over 41°C. On the contrary data indicate that wetting is sufficient to maintain a normal body temperature without asking for any complementary respiratory effort. The differences observed had a magnitude of about 25 breaths/min ($P<0.05$). No consequence on rabbit health was observed for a week after treatment.

Wetting is thus a very efficient system to nullify the effect of an acute heat stress. It is also very easy and quick since 3-4 animals can be wetted by minute. This method can be a very useful emergency technique to match sudden short hot periods which, from time to time, can create problems also in European countries of the Mediterranean area.

In fig. 3 the long term effect of shearing on body temperature has been described. The measurement effectuated at the end of the day warm periods showed a lower body temperature in the sheared animals (39.5°C vs 39.7°C). The difference was not very high (0.2°C) but it was statistically very significant ($P<0.01$) since constantly repeating all along the experimental period. The effect of shearing was still evident 7-10 weeks after the treatment, as to say for a period sufficient to reduce the negative summer effect in tropical countries. This can be explained by the fact that fur growth was still not appreciable at the end of the trial, apart some irregular fleece. Since follicle activity in the N.Z.W. has a cycle of 5-6 weeks (Stephan et al., 1979; Roca et al., 1980; Rougeot, 1986; Vrillon and Thébault, 1988) the experimental results indicate that shearing (may be also by an interaction with daily high temperatures) does not necessarily activate a new hair growth, as it happens in Angora rabbits, and this appears to be a very favourable condition in relationship to the peculiar aim of shearing.

The data on respiratory rate recorded at 30°C of ambient temperature (fig.4) indicate that sheared animals maintained almost normal values (about 180 breaths/min) while the controls had a respiratory rate 40 breaths/min higher (+19%; $P<0.01$). This means that shearing permitted the animals to keep a lower body temperature and also no mechanical work of breathing was requested all along the 10 weeks experimental period. This method is thus useful to protect rabbits from heat stress for all the hot period when it has a seasonal length, as in tropical and subtropical countries.

A very unexpected result was observed about body temperature at the end of the day cooler period (16 hours after the daily reduction of ambient temperature to 22°C). As it can be seen in fig. 3, at that time body temperature had lessened to normal values in both groups, but the sheared animals presented constantly a higher mean rectal temperature in

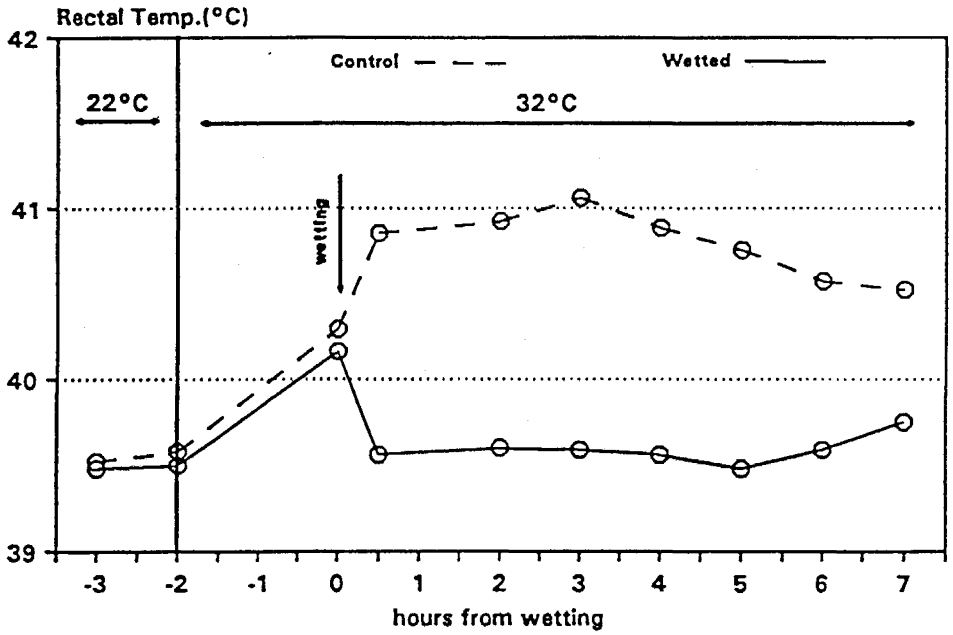

Fig. 1. Effect of wetting on body temperature.

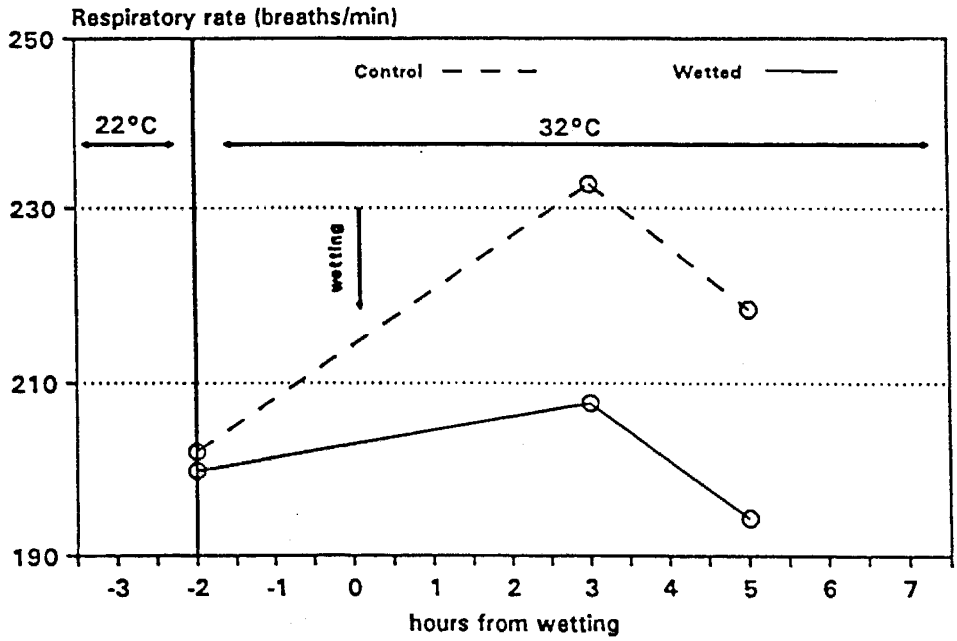

Fig. 2. Effect of wetting on respiratory rate.

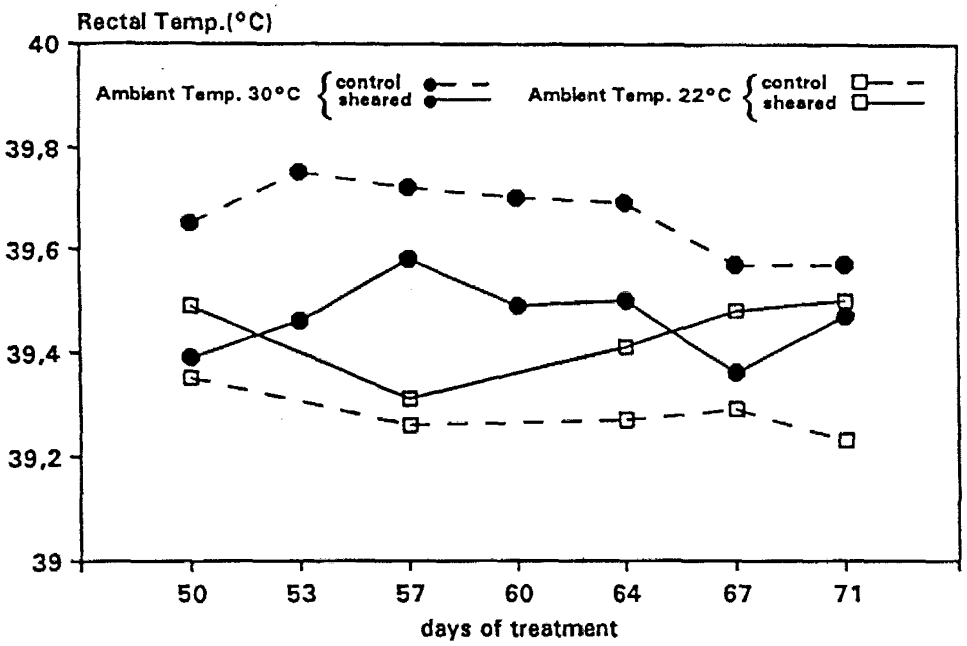

Fig. 3. Effect of shearing on body temperature 7-10 weeks after treatment.

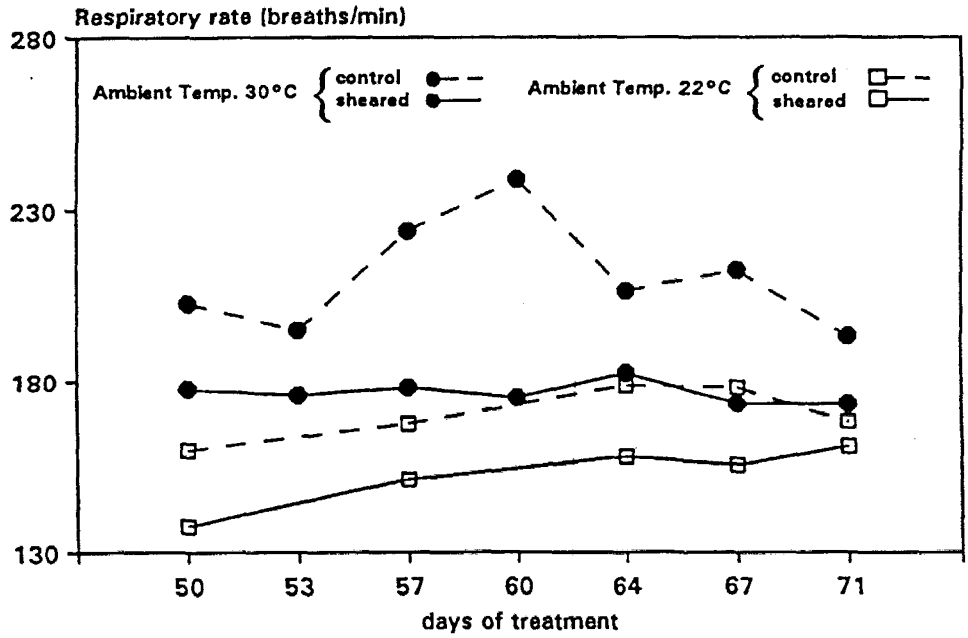

Fig. 4. Effect of shearing on respiratory rate 7-10 weeks after treatment.

comparison to the controls (39.44 vs 39.30; $P<0.05$) remaining lower (fig. 4) the respiratory rate (152 vs 170; $P<0.01$). In Angora rabbits at 28°C of ambient temperature it was measured an increase in heat metabolic production after wool plucking and only below 15°C the balance of body temperature became negative (Vermorel et al., 1988). In the observed case it can be supposed that the exposure to an ambient temperature of 22°C produced a cool sensation at the level of the cutaneous thermoreceptors of the sheared animals and the consequent increase in heat production could result in a positive balance in body temperature.

In conclusion wetting the rabbits appears to be a very efficient system to overcome sudden situations of heat stress and it could be advised for European Mediterranean countries or in areas with similar climatic conditions.

Shearing is a less efficient but more enduring system that could be advised as a constant practice at the beginning of summer in tropical or subtropical countries.

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