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ACCLIMATATION AND REPEATABILITY OF THERMOTOLERANCE PARAMETERS IN RABBIT

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INTRODUCTION

The study of rabbit resistance to hot temperatures permitted to notice a great variability of some physiological parameters (body temperature, respiratory rate, ear skin temperature) utilized as indexes of the thermotolerance level (Gonzalez et al., 1971, 1974; Nichelmann, 1972; Nichelmann et al., 1973a, 1973b; McEwen and Heath 1973; Finzi et al., 1985; Finzi et al., 1986).

Since the aim of this research line is the selection of thermotolerant strains, to favour rabbit breeding development in hot climate countries (from the mediterranean to the tropical ones), it has been necessary to study, previously, the repeatability of the observed data to be sure of their practical reliance.

Body temperature has been chosen, among the three parameters under study, because it is a measure of the real thermal conditions of the body, while the other parameters appear mostly as an expression of physiological mechanisms that animals utilize to get rid of exceeding heat.

A trial of exposure of rabbits to high environmental increasing temperatures was then planned, with a subsequent repetition of the experimental treatments on the same subjects.

MATERIALS AND METHODS

Three randomized groups of New Zealand White rabbits were used in this study. They were ten weeks old and weighed Kg 2 ± 0.2.

The first sample, made up of 33 animals, the second one of 37, the third one of 28, were tested respectively in July, September and January.The subjects tested in January were acclimatized for a week at 20°C of ambient temperature. The other ones came from an environment of about 25°C.

The animals were housed in separate cages, inside a climatic chamber, at 25, 30, 35°C of ambient temperature. In the first two groups the relative humidity was about 90% and the passage to progressively higher temperatures took place in about ten minutes, while the exposure to each thermal level lasted 90 minutes. In the third group the relative humidiy was 70% while the exposure to each thermal level lasted 60 minutes. Taking of body temperature has been described in a previous paper (Finzi et al., 1986).

To evaluate the repeatability of data obtained in the first trial, this one was repeated after a week with the same animals and the same experimental conditions.

RESULTS AND DISCUSSION

Figure 1 illustrates how the variation of ambient temperature influences the body one. The latter shows a moderate increase between 25 and 30°C of ambient temperature and a higher one between 30 and 35°C.

In each curve the difference among the body temperature means, at the three ambient temperatures progressively increasing, is statistically significant ($P<0.01$), confirming the results obtained before (Finzi et al., 1986) and the indications, though not statistically analyzed, from other Authors (Gonzalez et al., 1971, 1974; Nichelmann, 1972; Nichelmann et al., 1973a, 1973b).

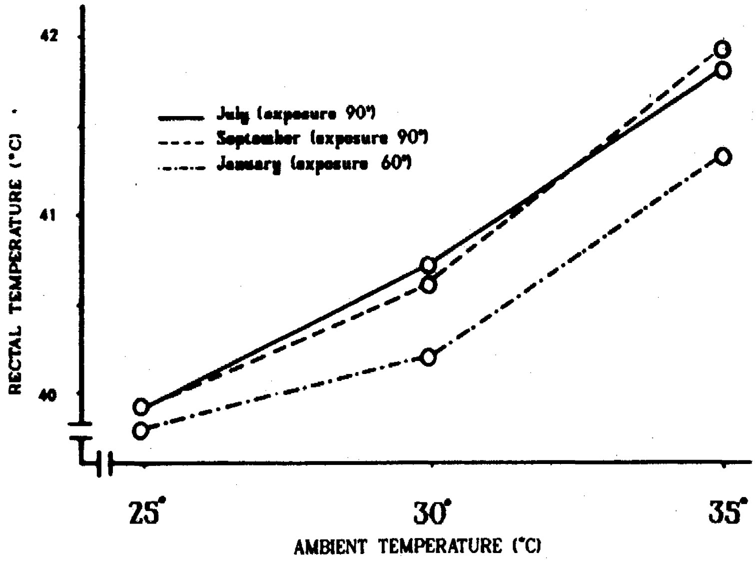

Fig. 1 - Effect of exposure to different ambient temperatures on rabbit rectal temperature.

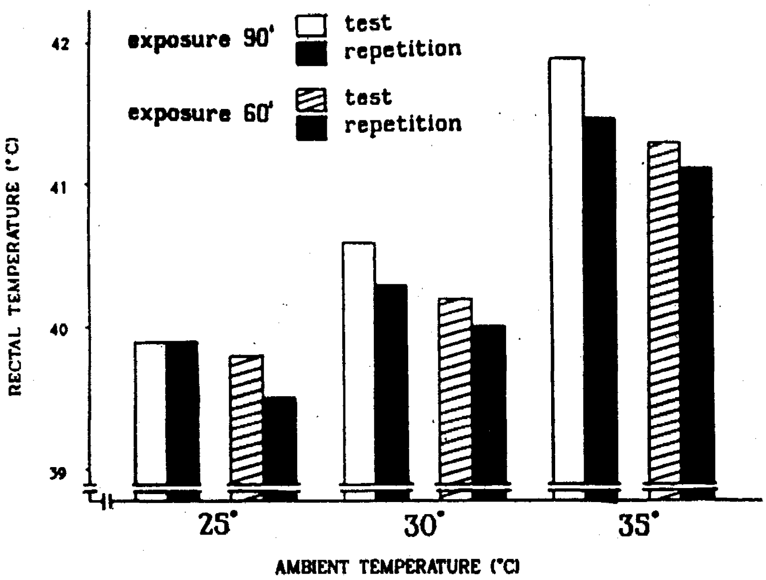

Fig. 2 - Variation of rectal temperature as an effect of repetition, after a week, of exposure of animals to different, ambient temperatures.

The curve of the group tested in Winter, even similar to the other two, shows lower average rectal temperatures ($P<0.01$ at 30 and 35°C of ambient temperature). This is due to a shorter time of exposure of the animals to heat, and not to a seasonal effect as it will be discussed successively.

At 25°C of ambient temperature, the rectal temperatures of the examined groups were very close and the differences were not statistically significant. Evidently this environmental temperature is not particularly stressing for the animals and they are not compelled to use their full active thermoregulation mechanisms.

The repetition after a week of the experimental treatments on the same subjects (fig. 2), pointed out a trend of the phenomenon which can be compared to that observed in the first treatment. Data referring to the animals tested for 90 minutes to each thermal level, being very similar, have been unified in the graph 2.

As it can be seen, above 25°C, the mean rectal temperatures in the repetition were constantly and significantly lower ($P<0.01$) when the treatment lasted 90 minutes.The decrease in body temperature was of 0.3°C (7%) at 30°C; the same result was obtained at 35°C. When the treatment lasted 60 minutes the observed decrease was of 0.2°C (5%) but it was not statistically significant.

The experiment clearly indicates that there is an effect of acclimatation, and because of it the animals, when exposed to high environmental temperatures after a previous experience, can better control their body temperature so that it reaches a lower level than the one recorded during the first test.

The lower temperatures and the not significant differences recorded in the trial (test and repetition) of January must be ascribed to the shorter time of exposition of the animals to heat (60 minutes) and to the lower relative humidity which determined less stressing conditions. In fact in winter time a seasonal interference should be excluded, considering the impossibility of a previous casual exposition of the animals to high temperatures.

No references to the phenomenon of acclimatation in rabbit has been found in literature but it appears of a certain interest for animals bred in thermally unfavorable countries. The experimental technique here described, is proper to give objective data to this purpose.

This trial was planned to study the repeatability of body temperature as an index of thermotolerance, but it put in light an important interference caused by acclimatation.

As a consequence body temperature of animals must be considered a function both of the actual environmental temperature and of the previous, hardly determinable, thermal experiences.

CONCLUSIONS

The trial indicates that the exposition of rabbits to heat induces an effect of acclimatation that makes the animals to assume different body temperatures depending on both actual and previous thermal experiences. The effect becomes remarkable (7%) and statistically significant when the ambient temperature rises at least to 30°C, humidity rises to 90% and the lenght of treatment lasts 90 minutes.

The effect of previous thermal experiences is difficult to be determined in field conditions and this disturbs the identification of body temperature minusvariants with the aim of selecting thermotolerant rabbit strains.

REFERENCES

VALENTINI A., GUALTERIO L., MORERA P., FINZI A., 1985.
Valutazione del coefficiente di tolleranza al calore nel coniglio. Riv. di Coniglicoltura, 22 (6) 53-54.

FINZI A., KUZMINSKY G., MORERA P., AMICI A., 1986.
Alcuni aspetti della termotolleranza nel coniglio. Riv. di Coniglicoltura, 23 (12) 51-55.

GONZALEZ R.R., KLUGER M.J., HARDY J.D., 1971.
Partitional calorimetry of the N.Z.W. rabbit at temperatures 5-35°C. J. Appl. Physiol. 31 (5) 728-734.

GONZALEZ R.R., KLUGER M.J., STOLWIJK J.A., 1974.
Thermoregulatory responses to thermal transients in the rabbit. Am. J. Physiol., 227 (6) 1292-1298.

MCEWEN J.N., HEATH J.E., 1973.
Resting metabolism and thermoregulation in the unrestrained rabbit. J. Appl. Physiol. 35 (6) 884-886.

NICHELMANN M., 1972.
Besonderheiten der physikalischen Temperaturregulation beim Kaninchen. Monatsh. für Veterinärmed. 27 (20) 782-789.

NICHELMANN M., ROHLING H., ROTT M., 1973.
Der Einfluss der Umgebungstemperatur auf die Höhe des Energieumsatzes erwachsener Kaninchen. Archiv. für Exp.Veterinärmed. 28 (3) 500-505.

NICHELMANN M., ROHLING H., ROTT M., 1973b.
Der Einfluss der Umgebungstemperatur auf den Wärmehaushalt des Broilerkaninchens. Monatsh. für Veterinärmed. 28 (19) 744-749.

SUMMARY

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SUMMARY

The repetition of exposure of rabbits to high environmental temperatures shows a decrease of body temperature of the animals. The decrease was -0.7% and -0.5% after exposure to 30°C respectively for 90 and 60 minutes; the same result was observed after a subsequent exposure to 35°C for other 90 or 60 minutes.

This shows that exposure of rabbits to an hot environment induces an effect of acclimatation that hinders the identification of minusvariants with the aim of selecting thermotolerant rabbit strains.

RIASSUNTO

La ripetizione dell'esposizione di conigli ad elevate temperature ambientali mostra costantemente una diminuzione della temperatura corporea degli animali pari a -0,7% e -0,5% dopo l'esposizione a 30°C rispettivamente per 90 e 60 minuti; lo stesso risultato è stato ottenuto dopo una successiva esposizione a 35°C rispettivamente per altri 90 o 60 minuti.

Ciò indica che l'esposizione di conigli ad un ambiente caldo provoca negli animali un effetto di acclimatazione che ostacola l'identificazione dei minusvarianti per la selezione di ceppi di conigli resistenti al calore.

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