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EVALUATION OF THERMOTOLERANCE PARAMETERS FOR SELECTING THERMOTOLERANT RABBIT STRAINS

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INTRODUCTION

A previous study showed that body temperature, chosen as an index of thermotolerance in rabbit, is a not repeatible value when the animals are newly exposed to high environmental temperatures (Finzi et al., 1988). This is a very strong hindrance when the animals are compared with the aim of evaluating the heritability of thermotolerance or to select thermotolerant strains.

To overcome this hindrance it was advanced the hypothesis that the animals more resistant to high ambient temperatures could be placed anyway among the body temperature minusvariants (MV), whatever are the absolute values expressed in centigrades. As a consequence it was studied the possibility to identify the thermotolerant subjects utilizing a classification rank (as to say the position of the animals in a classification, according to body temperature) whatever are the thermal exposures which happened before the series of simultaneous controls utilized to classify the animals.

MATERIALS AND METHODS

Three groups of New Zealand White rabbits weighing kg 2 $\pm$ 0.2 have

been utilized in three different experiments, according to the experimental conditions described in previous works (Finzi et al., 1986; Finzi et al., 1988). The animals were classified according to increasing values (rank) of body temperature when they were exposed to 25, 30, 35°C of ambient temperature, both during a Test and during a Repetition performed, after a week, with the same subjects.

Correlation coefficients were then determined both among the resulting ranks at different ambient temperatures, respectively in the Test and in the Repetition, and between Test and Repetition ranks when the ambient temperature was the same.

The first comparison was performed with the aim of reducing the number of trials at different ambient temperatures for testing thermotolerance; the second comparison was performed to verify the rank repeatability when the animals were exposed to high environmental temperatures after a previous thermal experience.

The trials were repeated with different groups of animals in July (37 subjects), September (33 subjects) and January (28 subjects). In the first two cases the experimental conditions were: relative humidity, 90%; length of treatment, 90 minutes at each level of ambient temperature. In the last trial relative humidity was 70% and lenght of treatment was 60 minutes, after a pre-experimental period of a week at 18-20°C.

RESULTS AND DISCUSSION

The results of the trials are reported in table 1. High and very significant correlations ($P<0.001$) between the body temperatures classification ranks at the different ambient temperatures are evident. This happens both in Tests and in Repetitions. Thus, the data indicate that, inside any single trial, it is possible to identify the best thermotolerant rabbits (minusvariants) already at 25°C of ambient temperature.

When the comparison is made between the body temperature ranks in

Table 1. Correlation coefficients between body temperature ranks at different ambient temperatures respectively in the Test and in the Repetition, and between Test ranks and Repetition ranks, at each of the ambient thermal levels.

	Comparison		July 90 minutes	September 90 minutes	January 60 minutes
TEST	25-30°C	r=	0.62***	0.77***	0.77***
	30-35°C	r=	0.72***	0.86***	0.92***
	25-35°C	r=	0.44**	0.60***	0.82***
REPETIT.	25-30°C	r=	0.75***	0.87***	0.92***
	30-35°C	r=	0.66***	0.90***	0.73***
	25-35°C	r=	0.51**	0.75***	0.64***
25°C	TEST-REPETIT.	r=	0.71***	0.47**	0.11n.s.
30°C		r=	0.56***	0.60***	0.11n.s.
35°C		r=	0.41**	0.78***	-0.15n.s.

n.s., not significant; ** P<0.01; *** P<0.001

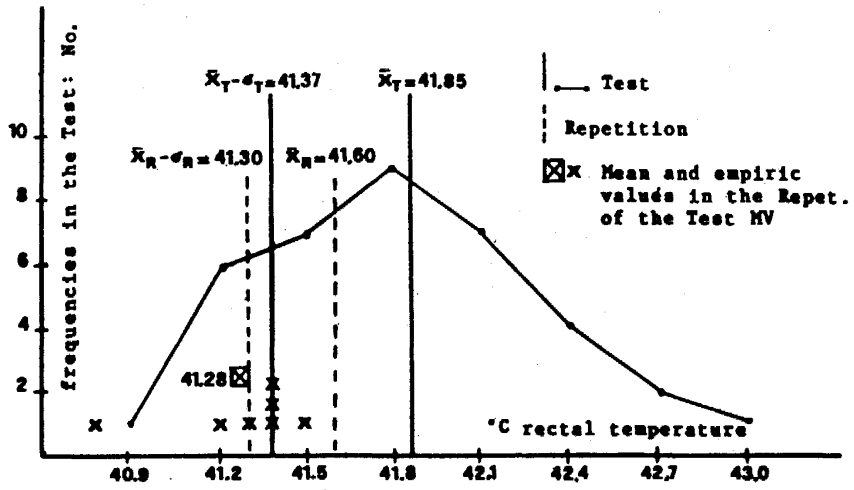

Fig.1. XX represents the distribution, in the Repetition, of the body temperatures of the subjects which were minusvariants (<41.37) in the Test (First trial; 35°C of ambient temperature).

the Test and in its Repetition, the coefficients of correlation are slightly reduced but still high and statistically significant at each experimental ambient temperature.

This is true only in the first two trials ($P<0.01$ or less), thus indicating that the experimental conditions of relative humidity and lenght of treatment are important to identify the true rank of rabbit body temperature, as to say the thermotolerance rank independent from previous thermal experiences. It seems, in fact, than, when the relative humidity is only 70% and the time of treatment is 60 minutes long, as in the third trial, the experimental conditions are not enough stressing to determine a correlated response in the Repetition.

In figure 1 is reported the distribution of body temperatures at 35°C of ambient temperature in the Test of the first trial. The mean (41.85°C) and the same value minus the standard deviation (41.37°C) are indicated.

The animals with body temperature below the latter value (MV) got a body temperature in the Repetition indicated also in the figure. As it can be seen, all the values are MV with respect to the mean of the Repetition (41.60°C) and the mean of such value (41.28°C) remains below the value of 41.30 °C, which represents the mean minus the standard deviation in the Repetition.

The figure is similar to those obtained also at different temperatures in the first two trials and shows how the rank correlations, illustrated in table 1, are originated.

CONCLUSIONS

It can be concluded that, at 90% of relative humidity and with a lenght of treatment of 90 minutes at each level of ambient temperature, the thermotolerant subjects can be identified using a criterion of body temperature rank classification. In fact the preceding experiences (Finzi et al., 1988) had shown that exposition to previous high environmental

temperatures can change the level of body temperature so that absolute values in centigrades can't be utilized, but this trial shows that, on the contrary, rank classification is not strongly influenced.

This result permits to choose the MV subjects to develop projects to select thermotolerant rabbit strains, overcoming the hindrance determined by the difference in body temperature shown by the same animals as an effect of previous thermal experiences not identifiable in field conditions.

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SUMMARY

Since the body temperature of rabbits changes according to previous experiences of exposure of the animals to hot environmental temperatures, a statistical elaboration of data was performed to study whether, after repeating the experimental treatments on the same subjects, the most resistant animals remain among the best ones though showing a changed body temperature.

Data show that the rank of the animal classification tends to remain significantly constant ($P < 0.01$ or less). Thus a rank classification based on body temperature can be utilized instead of the measurement in centigrades as a parameter to evaluate hereditability and to select thermotolerant strains.

The best experimental result was obtained exposing the animal for the

longer period (90 minutes) at an ambient temperature from 25 to 35°C and at a relative humidity of 90%.

RIASSUNTO

Poichè la temperatura corporea del coniglio cambia in relazione alle precedenti esperienze di esposizione degli animali alle elevate temperature ambientali, è stata effettuata una elaborazione statistica dei dati per studiare se, dopo la ripetizione dei trattamenti sperimentali sugli stessi soggetti, gli animali più resistenti rimangono tra i migliori anche se mostrano una temperatura corporea modificata.

I dati indicano che la classificazione per rango degli animali tende a rimanere significativamente costante ($P<0.01$ o minore). Per questo una classificazione basata sul rango della temperatura corporea può essere assunta come indice, al posto della misura in gradi centigradi, per studiare l'ereditabilità del carattere e per selezionare ceppi termotolleranti.

I risultati migliori sono stati ottenuti esponendo gli animali per il periodo più lungo (90 minuti) a temperature ambientali variabili da 25 a 35°C e ad una umidità relativa del 90%.

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Since the body temperature of rabbits changes according to previous experiences of exposure of the animals to hot environmental temperatures, a statistical elaboration of data has been performed to study whether, after repeating the experimental treatments, the most resistant animals remain among the best ones though showing a changed body temperature.

Data show that the rank of the animal classification tends to remain significantly constant ($P<0,01$). Thus a rank classification based on body temperature can be utilized instead of the measurement in centigrades as a parameter to select thermotolerant strains.

The best experimental result was obtained exposing the animal for the longer period (90 minutes).

SOMMARIO

Poichè la temperatura corporea del coniglio cambia in relazione alle precedenti esperienze di esposizione degli animali alle elevate temperature ambientali, è stata effettuata una elaborazione statistica dei dati per studiare se, dopo la ripetizione dei trattamenti sperimentali sugli stessi soggetti, gli animali più resistenti rimangono tra i migliori anche se mostrano una temperatura corporea diversa.

I dati indicano che la classificazione per rango degli animali tende a rimanere significativamente costante ($P<0,01$).

Per questo una classificazione basata sul rango della temperatura corporea può essere utilizzata al posto della misura in gradi centigradi per selezionare ceppi termotolleranti.

I risultati migliori sono stati ottenuti esponendo gli animali a temperature ambientali elevate per il periodo più lungo (90 minuti).