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Mouse Killing Behaviour, Aggressiveness and the Influence of Sexual Hormones in Rats

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Abstract

"Mouse-killing behaviour" is the behaviour of an isolated adult rat towards an anesthetized mouse placed in its cage; some rats (natural killer) spontaneously kill the mouse, others do not show any kind of aggressiveness. This interspecific aggressiveness, addressed to individuals of different species, is generally motivated by the instinct of predation. It can be distinguished by the intraspecific aggression, which is addressed to individuals of the same species, can have different motivations (establishment of a hierarchy, copulation, defence of territory) and can express itself with threats or real attacks, and can result in a dominant behaviour or in escape or in submission.

Interspecific aggressivity in rat

The knowledge of interspecific aggressivity in rat has been achieved through the researches performed on mouse-killing behaviour, a particular kind of aggressive behaviour that can be manifested in adult rat (5-7 months) when an anaesthetized mouse is placed in its cage. Neonatal castration (within the 3rd day of life) of male rats reduces the percentage of animals reaching the adult age, compared with the not castrated brothers; also, the neonatal androgenization of female rats increases the percentage of adult killing-mouse animals, compared with the not androgenized sisters [1]. Nevertheless, also in the adult age, the presence of testosterone has a considerable importance; in fact, testosterone administration increases the percentage of killing-mouse animals, above all among those males who were castrated at birth, and the administration of ciproterone (an antiandrogen) reduces it in sound males and in female androgenized at birth [2]. It's interesting to notice that the most testosterone sensitive adult animals are those one castrated at birth, and that androgenized females and sound males are the most affected by the ciproterone acetate administration.

Intraspecific aggressivity in rat

One of the main aims of the aggressive behaviour study in rodents is to determine the neurobehavioral factors which are the basis of human behaviour as well. Intraspecific aggressivity can be evaluated mainly by the analysis of the behaviour of isolated males towards an intruder placed in their cage. In the study of intraspecific aggressivity is interesting to observe both the effects of testosterone on aggressive behaviour and the effects of interactions amongst animals on gonads function. Castration in males and androgenization in females, carried out during the neonatal period, lead to the same effects also for the intraspecific aggressivity (fighting), induced with electrical stimulation. However, electrical stimulation of an animal is a behavioural altering factor, as it makes the animal more aggressive in an unnatural way. An intraspecific aggressivity increase was obtained by using high doses of androgens chronically administered in sound adults male rats [3]. When two male rats are placed in the same cage, a hierarchy is soon established, because one of them tends to menace and attack the other, which constantly assumes a defence attitude. The dominant animal will always have supremacy attitudes compared with the other one: for instance, the first will always take the food. Nevertheless, if two animals which showed dominant attitude with other rats are placed in the same cage, it's possible that a hierarchy will not be established; in this case, both the animals will constantly try to become dominant; none of them will dare to take food first and together with the evident chronic stress condition this will lead the animals to lose weight until one of them dies. Hierarchies are formed when different animals are placed in-group as well; subordinate males could be distinguished by the dominants because they tend to assume constantly defence attitudes; moreover, their life length is shorter than the dominants. Compared to the isolated ones, animals in groups have a growth of the adrenal gland medullary and a reduction of thymus volume; these alterations are more evident in the subordinate; in them, moreover, testosterone weight and preputial glands dimensions are smaller than in the dominants and in controls. Endocrine situation is different as well: in subordinate animals lower testosterone and higher prolactin and corticosterone levels can be observed; moreover, free corticosterone is still higher, because corticosterone binding globulin levels are reduced [4]. Hierarchies established between male rats can be overturned simply by chronic administration of testosterone to the subordinates: animals that were observed losing in competitions are now winning; their testicles weight, in relation to body weight, is lower, as

expected. The dominance induced by testosterone administration is reversible, if animals which became dominant are given serotoninergic drugs, which reduce aggressivity, as we shall see further on.

Key Words

testosterone, mouse-killing behaviour, aggressiveness.

References

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