

**INDIVIDUAL DIFFERENCES OF DOMINANCE RELATIONSHIPS IN SEMI-NATURAL COLONIES OF ALBINO RATS USING THE RESIDENT-INTRUDER PARADIGM**

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**Abstract.** The ethological approach to aggression stressed the importance of the resident-intruder model to investigate agonistic behavior in the albino rat. But established colonies of domestic rats can either ignore or accept peacefully a male intruder. Sometimes intruders may also submit resident males. In the domestic rat population (Wistar strain), the existence of 3 types of dominant males is described. The preference for moderate males when using the resident-intruder model is upheld.

**Key words:** aggression, resident-intruder model, colony, individual differences, dominance, ethology, albino rat.

**DIFERENÇAS INDIVIDUAIS NAS RELAÇÕES DE DOMINÂNCIA, EM COLÔNIAS SEMI-NATURAIS DE RATOS ALBINOS, USANDO O PARADIGMA INTRUSO-RESIDENTE.**

**Sumário.** A abordagem etológica da agressão ressaltou a importância do modelo residente-intruso, na investigação do comportamento agonístico do rato albino. Todavia, colônias estabelecidas de ratos domésticos podem tanto ignorar quanto aceitar pacificamente um macho intruso e, algumas vezes, os intrusos podem mesmo submeter machos residentes. Na população de ratos domésticos (linhagem Wistar), foi descrita a existência de 3 tipos de ratos dominantes. É justificada a preferência por machos moderados quando do uso do modelo residente-intruso.

**Unitermos:** agressão, modelo residente-intruso, colônia, diferenças individuais, dominância, etologia, rato albino.

The ethological approach to aggression has focused on biologically relevant situations and detailed behavior patterns like the resident x intruder paradigm, which provides validated measures of aggression (Blanchard et al., 1987). Then, the resident x intruder model, based upon the intraspecific conflict, has been developed in order to investigate agonistic behavior, in the laboratory rat. This procedure reliably elicits the full repertoire of agonistic behaviors available to the species (Adams, 1979). But in the pertinent

literature the use of the technique generated much controversy because established colonies of laboratory rats can either ignore or accept peacefully a male intruder and sometimes the intruder may also attack and even submit resident males (see Lore et al., 1984, for a review). The distinct results from studies using the same model point out to the complex nature of aggression in rats since it is not a single unitary behavioral entity. Aggression depends on several factors of genetic, endocrine, instinctive, learning and social order. Taking in view the complex variables that influence the colony-intruder aggressiveness and the fact that biological adaptation eventually rests upon a delicate balance between the organism's constitution and the environment, we decided to investigate individual differences in albino rat dominance relationships in seminatural colonies.

Nineteen colonies consisting of 3 adult rats of the Wistar strain (one dominant male, D, 350 g, 150 days of age; one subordinate male, S, 320 g, 90 days of age; one female, F, 200 g, 90 days of age and with tied oviducts), were established. These animals were socially reared in like-sexed groups of 6, from weaning until their random assignment to colony groups. The experimental animals were housed in wooden cages, with front and top clear walls (60x70x35cm), with water and food freely available, reversed 10:14 hr light/dark cycle and room temperature 20-25°C. At colony formation, the older male and one female were firstly placed into a colony enclosure. Two days after, one younger male was put together with the two resident rats. The delay to place the younger rat into the enclosure was determinant for the bursting out of an intense social activity, mainly of an agonistic order. It was expected that the irruption of the intraspecific conflict should develop a dominance-subordination relationship that should establish the older and resident male as a dominant and the younger and strange male as a subordinate. Cohabiting trios of rats, socially interacting in a spontaneous way, after the development of a dominance relationship, with a normal estrous female, constituted a reproductive unity called "colony". Interactions between D and S males were recorded from the third day on, during 7 days (10 min/day/colony). From the tenth day on, intruder males (i 300 g, 90 days of age), always a different one, were intro-



duced during 10 min/day/colony.

Qualitative analysis based upon these data suggests the existence of three different types of D males: 1) "killers" (3 out of 19) with a high rate of offensive behaviors directed to S which were maintained over time and always imposing death to S (death latency between 5 to 15 days) and also with a high rate of biting attacks to I, assessed by the number and length of wounds and finally, near 5% of body weight loss; 2) "moderate" (14 out of 19), with a high rate of offensive behavior directed to S and I, that decline from the second day on, after colony formation (for S subjects), with rare biting attacks to S and I and 3) "indulgent" (2 out of 19) whose aggressive pattern to S and I was inconsistent showing a low rate of fragmentary offensive behavior paralleled with an increasing social exploration and sharing of estrous females with S and I. There was also an inversion in dominance expectation in one colony, when the presumed subordinate rat submitted the resident male and became the dominant. Moreover, dominance in moderate males was characterized by: a) high rate of offensive (consummatory counterbalanced with exhibitory) behavior toward other males; b) priority of access and high rate of sexual behavior directed to estrous females; c) spatial localization independent on the position of other animals and d) higher weight, greater size and older age.

In our domestic rat population we could find 3 different types of dominant males whose behavioral profiles are comparable to those described in the literature. The proper use of the resident x intruder confrontation is a matter of an adequate choice for moderate males. These moderate males show a greater distribution in our domestic rat population where prevails the performance of a complex species-characteristic pattern like the full range of agonistic behaviors. These results, apart from individual differences also support other ethological data which show that dominance is also maintained by exhibitory rather than consummatory behaviors, 1980). On the other hand, these 3 types of dominants may presumably be due to individual differences attached to the albino gene because the comfortable life in the laboratory has probably removed the selection pressures bearing down on free-living rodents as stated by Silverman (1978). Thus the existence of albino "killer" and "indulgent" rats

could be adaptations to different (not absent) pressures of a novel environment-the laboratory. We are now investigating moderate male behavior with a quantitative ethological approach to outline sensitive and reliable resident-intruder interactions for the study of aggression.

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