MICE REARED WITH RATS: AN INTERSTRAIN COMPARISON OF MOTHER AND "AUNT" EFFECTS

by

RICHARD E. PASCHKE 1) 2), VICTOR H. DENENBERG 3) and M. X. ZARROW 3)

(Departments of Psychology and Biological Sciences, Purdue University, Lafayette, Ind., U.S.A.)

(Rec. 10-VI-1970)

When mice are reared by rat mothers, or by mouse mothers in the company of adult nonlactating female rats (aunts), their adult behaviour is markedly different from the behaviour of mice reared by, and exclusively in the presence of, mice (DENENBERG, HUDGENS & ZARROW, 1964, 1966; DENENBERG, ROSENBERG, PASCHKE & ZARROW, 1969; DENENBERG, ROSENBERG & ZARROW, 1969; HUDGENS, DENENBERG & ZARROW, 1967, 1968; PASCHKE, 1969). The dependent measures employed in these experiments included open-field performance (activity, defecation, and latency to initiate movement), social preference, passive-avoidance learning, fighting, and plasma corticosterone levels. Thus far a cross-strain generalization has been established for only one of these endpoints, namely, open-field activity: a depression in the activity of the mouse is found following preweaning contact with a rat mother, whether the mice used are from the C57BL/10J strain or the Purdue Rockland Swiss-Albino strain.

In these experiments the mother appears to be the single most potent stimulus source within the early social environment (HUDGENS et al., 1968). In what way does she mediate the changes in the adult behaviour and physiology of her offspring? One possibility which has recently been eliminated is the biochemical difference between rat and mouse milk. Rat aunts living with Swiss-Albino mouse mothers and their young have produced the

1) This research was supported, in part, by Grant HD-02068 from the National Institute of Child Health and Human Development, National Institutes of Health.
2) NIMH predoctoral trainee supported by Training Grant MH-10267.
3) Present address: Department of Biobehavioral Sciences, University of Connecticut, Storrs, Connecticut 06268, U.S.A.
same effects upon the offspring's corticosterone levels and open field activity as have rat mothers (Denenberg, Rosenberg, Paschke & Zarrow, 1969; Denenberg, Rosenberg & Zarrow, 1966). Another set of variables which have been eliminated are the distance cues of olfaction, audition, and vision. Swiss-Albino mice exposed to an adult female rat from birth to weaning, but without direct physical contact, have plasma corticosterone levels identical to controls (Denenberg, Paschke, Zarrow & Rosenberg, 1969). These studies, taken together, suggest that the actual contact between the adult rat and the infant mouse is the critical variable mediating the changes in the mouse's behaviour and physiology. This hypothesis has been verified by direct experimental tests by Rosenberg, Denenberg & Zarrow (1970).

The experiments with the Swiss-Albino mice employed either rat mothers or rat aunts, but not both within the same experiment. In most cases rat aunts have produced results similar to those produced by rat mothers, but some failures to replicate have been noted, presumably because the aunt was not sufficiently maternal to interact with the pups. This has been corrected for by "priming" the rat aunts before pairing them with the Swiss-Albino mice (Denenberg, Rosenberg & Zarrow, 1969). However, the rat-aunt preparation has not been used with C57BL/10J mice. Thus, one purpose of the experiments reported here was to determine whether or not the reduction of aggressive behaviour found in rat-mother reared C57BL/10J males could also be obtained following exposure of C57BL/10J males to rat aunts during the preweaning period. A second purpose was to find out whether or not the results were strain specific by repeating the aggression experiment on Swiss-Albino mice. A third objective was to test for possible differences between rat-reared mice and mouse-reared mice in terms of their ability to inhibit responses, since Hugdencs (1965) has hypothesized that differential abilities to withhold responses are responsible for differences in fighting behaviour found between rat-reared and mouse-reared C57BL/10J mice. This hypothesis was tested using a passive-avoidance learning task.

Two experiments were carried out, one with C57BL/10J mice and the other with Swiss-Albino mice. The experiments followed identical procedures and so one Method section will be presented, followed by two Results sections.

METHOD

In each experiment pregnant female mice were randomly assigned to one of three treatment groups: control mice fostered to a mouse mother, experimental mice fostered to a rat mother, and experimental mice reared by their natural mother but with a rat aunt present in the maternity cage.