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Pre-mating and Pregnancy Stress in Rats affects Behaviour of Grandpups

EXPERIMENTAL manipulations of female rats have significantly influenced the open field behaviour of their grandpups. This phenomenon has been called "non-genetic transmission of information"[1]. Whereas the experimental manipulations of the grandmothers reported in ref. 1 consisted of pre-weaning infantile "handling", we have investigated whether stress of the grandmother rat before and during pregnancy affected the open field behaviour of the offspring of the foetuses carried during or immediately after the periods of stress.

Our data indicate that the grandpups of female albino rats which had been subjected to avoidance conditioning before mating, as well as the grandpups of females subjected both to pre-mating avoidance conditioning and to conditioned stress during pregnancy (see ref. 2 for procedural details), were more active in the common open field test than were descendants of non-disturbed control grandmothers ($P = 0{\cdot}05$). Further, the mean latency before the initiation of ambulation in the open field was considerably smaller for the grandpups of females receiving both pre-mating avoidance conditioning and pregnancy stress (52·3 s) than for grandpups of the other two groups of grandmothers (102·9 s for grandpups of females exposed to pre-mating avoidance conditioning alone, and 121·2 s for grandpups of control females). Because of the large standard deviations within groups, however, these large absolute differences in latency are not statistically significant.

The apparent increase in exploratory behaviour of the grandpups of the experimentally manipulated females is consistent with the increase of open field exploration which is typically found in the pups of female albino rats subjected to similar pre-mating avoidance conditioning and pregnancy stress. These data tend to support and extend those of ref. 1 in that stress before or during pregnancy, like infantile handling, can influence the behaviour of future generations, beyond the immediate offspring of the manipulated females.

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Modes of Transmission of Whirling Disease of Trout

A REVIEW of the circumstances surrounding numerous whirling disease epizootics suggests that the pathogen (*Myxosoma cerebralis*) is most commonly transmitted through transplacement of infected fish[1]. Alternatively, it has been demonstrated that the spore phase of the parasite can be spread by currents throughout a water system. It is also widely accepted that equipment used in the propagation of infected trout is likely to become contaminated and the subsequent transplacement results in transmission of the disease.

Apart from these widely recognized modes of transmission, no other possibilities have been considered seriously[1]. But Schäperclaus[2] found myxosporidian spores in the faeces of kingfishers at an infected hatchery and believed that the disease could be spread in this manner. His observations are especially relevant in view of the recent appearance of the disease in northern Scotland[3]. He did not conduct further tests of this hypothesis and its validity remains in question. The ability to locate spores in the faeces and demonstrate their viability was imperative in our evaluation of the hypothesis.

For this purpose a spore isolation technique was developed. Isolation was accomplished by macerating the materials to be examined and subsequently passing them through a sintered glass filter with a porosity of 30–60 μm. This allowed the spore (10 μm) to pass through but cleared the macerate of much of the other material (broken cartilage and so on). The spores in the filtrate were further concentrated by centrifugation; they settled as the precipitate at low speeds (10,000*g*). We have used this technique to locate a few spores in large volumes of materials. As well as making possible faecal analysis, the spore isolation technique provides a more efficient means of diagnosing the disease in mildly infected fish (Fig. 1).

The great blue heron (*Ardea herodias*) was selected as the test avian species because of its predatory habits, the range of size of its fish prey, the volume of fish eaten per day, and its local and migratory range. Four great blue herons were collected and maintained under the authorization of state and federal scientific collecting permits.

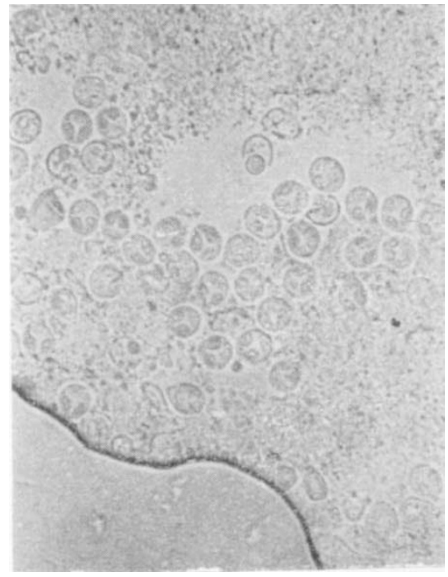

Fig. 1. Spores of *Myxosoma cerebralis* in the precipitate phase of the spore isolation technique. Wet mount by phase contrast microscopy (×400).