Peculiar response of Brattleboro rats to selenite

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Summary. Brattleboro rats were given, on the 10th day of life, a single high dose of sodium selenite. 90% of Brattleboro heterozygotes responded to the treatment by the formation of cataract whereas homozygotes with diabetes insipidus exhibited no cataract.

In contrast to adult animals, the administration of a single dose of selenite to young Wistar rats causes cataract[1]. One of the initial phases of cataract formation is known to be the permeation of water into the lens due to disturbance of the permeability of eye epithelium membranes[2]. In this context we studied the possibility of evoking a selenium cataract in Brattlebroro rats, especially in individuals with an inborn defect in water metabolism resulting from a complete lack of vasopressin synthesis in the hypothalamus[3].

Materials and methods. A group of Brattleboro rats (49 sucklings) was housed in 5 litters with their mothers till the 30th day of life. On the 10th day of life all rats were given a single dose of 0.02 M Na_2SeO_3 solution s.c. (30 µmoles/kg b.wt). Daily water intake was measured at the age of 40 days. Rats consuming more than 50% of their body weight were considered to be homozygotes (i.e. animals with diabetes insipidus). The occurrence of cataract was evaluated in situ when the rats were 2 months old. All animals were kept under standard laboratory conditions and fed a standard laboratory diet with water ad libitum.

Results and discussion. The group of heterozygotes in our experiments exhibited cataract in 90% of males and 92% of females - a result comparable to that obtained in Wistar rats[1], whereas rats with diabetes insipidus evinced no cataract (table).

Similarly to the situation in Wistar rats[4], the antidiuretic activity cannot be determined in the plasma of either homozygous or heterozygous Brattleboro rats in the 1st 2 weeks of postnatal life. Nevertheless significant differences between the 2 genotypes can be observed in this period: 1. In contrast to homozygotes, antidiuretic activity can be detected in the hypothalamus and neurohypophysis of heterozygotes (analogously to Wistar rats[5]); 2. 14-day-old homozygotes have a higher haematocrit value and plasma osmolarity[6]. 3. Homozygotes have a lower body weight[7].

The data do not permit an unambiquous explanation of why young rats with diabetes insipidus do not respond to selenite administration by cataract formation. The presence of vasopressin in the CNS of young rats may be a necessary condition for evoking selenium cataract. However, we cannot exclude the possibility that rats with a defect of vasopressin synthesis suffer from additional disturbances[8] which affect their response to selenite administration.

Incidence of selenium-induced cataracts in Brattleboro rats

Postnatal day	Number of rats	Weight (g) 40	Water intake (ml/rat/day) 40	Number of cataracts 60
Rats: Heterozygotes				
Males	10	156.3 ± 6.1	23 ± 1	9
Females	12	132.7 ± 3.8	22 ± 1	11
Homozygotes				
Males	17	140.1 ± 4.1	112 ± 4	0
Females	10	125.2 ± 4.0	94 ± 5	0

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Digoxin distribution between plasma and myocardium in hypoxic and non-hypoxic dogs

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Summary. The relationship between plasma and myocardial digoxin concentrations was investigated in hypoxic and non-hypoxic dogs. The results indicate that hypoxic dogs have lower plasma levels, higher myocardial levels, and an altered myocardial distribution when compared to non-hypoxic dogs.

Numerous authors have reported positive correlation between digoxin serum concentrations, myocardial concentrations and therapeutic effect[1-3]. However, others have found that the haemodynamic effects of {^{3}H} digoxin in dogs lagged behind myocardial {^{3}H} levels[4] and that there is heterogeneous distribution of digoxin in the myocardium in acute myocardial infarction[5]. These reports, together with the fact that hypoxia associated with cardiac failure is a contributory factor to digoxin toxicity[6] indicate a need for further investigation into the plasma and myocardial distribution of digoxin during hypoxia.

Materials and methods. 14 greyhounds of both sexes were anesthetized with sodium pentobarbitone (30 mg/kg, i.v.). Following insertion of an endotracheal tube 6 dogs of