S-2) Effects of Maternal Administration of KCl and Hydralazine on Their Offspring's Growth

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Introduction

It has been previously reported that taurine has modulating effects on the sympathetic nervous system¹⁾. On the other hand, it was suggested that KCl attenuates sympathetic response to cold stress in stroke-prone spontaneously hypertensive rats (SHRSP)²⁾³⁾. The present study was carried out to investigate the effect of maternal KCl administration during pregnancy on offspring's growth. Hydralazine and NaCl administration served as experimental references. Also in the present study, effects of taurine on pregnancy were substantiated.

Materials and Methods

(I) Ten female SHRSP from 2 litters at the age of 4 months were divided into 2 groups under the consideration of a hereditary equivalence. Group A (n=5) was given 2% KCl in their drinking water during pregnancy, Group B (n=5) was given tap water as a control. Water and food intake and 24 hours urine volume, blood pressure (BP) (tail-pulse pickup method) and body weight (BW) were checked, before mating, on the 7th (just after implantation), 12th (complete placental formation), 18th (placental functional maturation) and 21st (just before delivery) days of pregnancy. Daily gain in BW of their offsprings was measured every two days until 45 days after birth.

(II) Four female SHRSP from the same litter aged 4 months were divided into 2 groups. Group C (n=2) was given 80 ppm Hydralazine in their drinking water at 1 month before mating to parturition. Group D (n=2) was given tap water as a control. Offspring's growth was investigated in these two groups.

(III) (a) Ten female SHRSP from the 2 litters aged 4 months were divided into 2 groups. One group (n=5) was given 3% taurine in their drinking water during pregnancy, the other group (n=5) was given tap water as a control. BW of their offsprings were measured every two days after birth. (b) Seven female SHRSP aged 4 months were given 1% NaCl during pregnancy, and were given tap water after delivery until weaning. Three of them were given 3% taurine after delivery until weaning. Daily growth of their offsprings was investigated in both groups until weaning.

Results

(I) Water intake and urine volume in Group A were significantly greater than those in Group B at the late stage of pregnancy ($p < 0.05$), although there were no differences in BP and food intake between the two groups. BW of male offsprings with a low birth weight in Group A (28.8 ± 1.8 g, $M \pm SD$) was heavier than that in Group B (26.2 ± 1.5) at the 19th day after birth and thereafter ($p < 0.01$). BW of female offsprings with a low birth weight in Group A (75.7 ± 6.6) was also greater than that in Group B (69.2 ± 6.9) at the 36th day of age and thereafter. There were no significant differences in the mean birth weight of male and female offsprings between Group A (4.42 ± 0.22 , 4.00 ± 0.28) and Group B (4.45 ± 0.20 , 4.21 ± 0.16). Male offspring's brain weight at 45 days of age in Group A was heavier than that in Group B (Table), but no such difference was noted in the female offsprings.

(II) Compared to pretreatment levels (169 ± 6 mmHg, $M \pm SE$), BP decreased significantly during Hydralazine treatment (112 ± 6), but it was elevated again after

treatment (175 ± 9) ($p < 0.05$). BW of male offspring of Group C was significantly lower from 9 to 15 days of age (9 days; 12.0 ± 0.9 g, $M \pm SD$, 15 days; 20.9 ± 1.4) as compared to Group D (9 days; 12.9 ± 0.7 , 15 days; 21.9 ± 1.1) ($p < 0.05$). There were no differences in birth weights of the offsprings of the two groups.

(III)(a) Taurine-treated mothers' offsprings with a low birth weight showed a significantly larger BW (23.6 ± 0.7 g, $M \pm SD$) than untreated mothers' offsprings (22.2 ± 0.7) at 2 weeks after birth and thereafter ($p < 0.05$). (b) Under NaCl loading, the developmental growth was markedly improved at 9 days of age in offsprings of taurine-treated group (male; 13.1 ± 0.9 g, $M \pm SD$, female; 12.3 ± 1.1) in comparison with that of control group (male; 13.3 ± 1.7 , female; 12.8 ± 1.3). Birth weight of offsprings of taurine-treated group (male; 4.76 ± 0.31 , female; 4.29 ± 0.35) was significantly lower than that of control group (male; 4.96 ± 0.38 , female; 4.66 ± 0.34) ($p < 0.05$).

Discussion

Beneficial effects of maternal administration of taurine on the growth of their offsprings were substantiated, while the normotensive states in SHRSP, induced by the antihypertensive treatment, did not improve their offspring's birth weights. Maternal KCl-administration during pregnancy resulted in a significantly better growth in male offsprings compared to controls, probably due to maternal sympathetic modulation. These results might partly explain that prenatal and neonatal administration of taurine, a sympathetic modulator has an advantageous role on the offspring's growth, particularly under the condition of excess salt intake which activates sympathetic nervous system in SHRSP.

Table. Effect of maternal KCl administration during pregnancy on their offsprings' brain weight (Brain weight at the age of 45 days, g, $M \pm SD$)

	control	KCl-administrated
Large birth weight	1.62 ± 0.03	$1.65 \pm 0.04^*$
Low birth weight	1.56 ± 0.03	$1.63 \pm 0.05^{**}$

*, **: significant differences from the values in controls ($p < 0.05, 0.01$)

References

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