24) The Relationship between the Sodium Metabolism and Urinary Excretion of Catecholamine, Aldosterone and Kallikrein in SHR at 4 and 12 weeks of age.

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There are some reports about the tendency of the sodium retention in young SHR (Beierwaltes, 1982. Shiigai et al, 1982). This sodium retention is thought to be related to the development of hypertension. However, the mechanism of this sodium retention in young SHR is obscure.

Experiments were performed on male SHR and WKY at 4 and 12 weeks of age. Each rat was individually housed in metabolic cage (Metabolica-ST), and was given standard chow and 1% NaCl solution for 6 days. Sodium and potassium concentrations of urine and feces were measured by flamephotometer. Urinary norepinephrine excretion (U_{NE}), aldosterone excretion (U_{Ald}), kallikrein excretion (U_{Kall}) and prostaglandin E excretion (U_{PGE}) were measured before and after sodium loading.

Results are summarized as follows;

Age (WKS)			SHR	WKY	
FENa (%)	4		66.7±15.3	93.5±13.6	++
	12		49.5±11.8	45.3±15.8	ns
U_{NE} (ng/day)	4	before	585±85	623±106	ns
		after	434±252	400±116**	ns
	12	before	1182±379	868±158	ns
		after	759±223	688±224**	ns
U_{Kall} (ng/min/day)	4	before	2385±561	2958±1556	ns
		after	2267±983	5792±2643**	+
	12	before	39868±15875	12692±1567	++
		after	36690±14424	15384±2996	++
U_{Ald} (ng/day)	4	before	56.4±7.1	56.7±10.6	ns
		after	57.6±16.2	42.7±13.8*	ns
	12	before	114.4±45.0	112.4±20.3	ns
		after	57.5±11.0**	63.9±19.5*	ns
U_{PGE} (ng/day)	4	before	28.34±8.59	21.34±8.84	ns
		after	16.87±8.42	13.28±4.44*	ns
	12	before	26.24±11.10	33.40±23.57	ns
		after	17.49±5.14	13.11±4.31	ns

FENa=(total Na excretion of urine and feces/total Na intake) × 100 (%)

Values are mean ± SD

Significance of differences between WKY and SHR at the same age +: p<0.05, ++: p<0.01

Significance of differences from the same rat before and after sodium loading *: p<0.05, **: p<0.01

At 4 weeks of age, when SHR are in borderline phase of hypertension, sodium retention occurred in SHR compared to WKY, whereas there are no differences at 12 weeks of age. At 4 weeks of WKY, U_{Ald} and U_{NE} were decreased and U_{Kall} was increased after sodium loading, but these responses were not observed in SHR at 4 weeks of age. The lack of these responses may related to the sodium retention in SHR. Furthermore, these abnormalities in endocrinological function may contribute to the expanded ECF observed in 12 days of SHR (Mullins, 1983).