50) Effect of NaCl on Cerebral Stroke and Cerebrovascular Atherogenesis in Rats. Ryoichi Horie*, Yukio Yamori°, Yasuo Nara°, Michiya Ohtaka°, Akira Ooshima° and Hajime Handa*. Japan Stroke Prevention Center, Department of Pathology, Shimane Medical University°, Izumo 693 and Department of Neurosurgery*, Faculty of Medicine, Kyoto University, Kyoto 606.

INTRODUCTION Cerebral stroke and cerebrovascular atherogenesis in rats have the initiation mechanism in common (HORIE, R.: Arch. Jap. Chir., 46:191, 1977), i.e., repetition of vasoconstriction and vasodilatation, due to neural control, causes an increase in cerebrovascular permeability, resulting in fat deposition or the infiltration of plasma which accelerates the degeneration of the arterial wall and further increases the permeability. The final result is the development of marked cerebrovascular atherogenesis or cerebrovascular arterionecrosis. In this process, hypertension was proven to be one of the most important factors influencing the development of cerebral stroke and cerebral arterionecrosis. For cerebral stroke, the linear correlation between the incidence of stroke and the development of severe hypertension at the younger age was reported by YAMORI in 1974, and the importance of hypertension was also proven by the prophylactic experiment using antihypertensive agent-treated stroke-prone SHR (SHRSP), i.e., treated SHRSP developed no stroke (YAMORI, Y. and HORIE, R.: Jap. Circ. J., 39: 616). Concerning cerebrovascular atherogenesis, the linear correlation between hypertension and number of sudanophilic rings detected by Barium Contrasted Sudan Staining method (BCSS method) was reported (YAMORI, Y., HORIE, R., SATO, M. and FUKASE, M.: Stroke 7:120, 1976). On the other hand, it was clarified that NaCl loading accelerated the development of severe hypertension in spontaneously hypertensive rats (SHR), and in our studies on cerebrovascular atherogenesis SHR, SHRSP, hypertensive arteriolipidosis-prone rats (ALR) (YAMORI, Y.: Jap. Heart J., 18:602, 1977) and normotensive atherogenic rats (NAR) (HORIE, R. and YAMORI, Y.: Jap. Heart J., 19:627, 1978) were fed on a high fat-cholesterol (HFC) diet (including 20% suet, 5% cholesterol and 2% cholic acid) with 1% NaCl in the drinking water. In the present study, the direct effect of NaCl on cerebral stroke and cerebrovascular atherogenesis was analyzed.

MATERIALS AND METHODS Used SHRSP and SHRSR were the F₄₀₋₅₀ generation of SHR maintained at Japan Stroke Prevention Center (Izumo, Japan). (1)25 male SHRSP (A₁-sb strain), were fed on a HFC diet with or without 1% NaCl in the drinking water from the age of 60 days for 3 months. After measuring blood pressure, gain in body weight (as a rough indicator of food intake) and serum cholesterol level (the enzymatic method), Barium Contrasted Sudan Staining method (BCSS method) (YAMORI, Y., HORIE, R.: Jap. Heart J., 16:332, 1975) was applied to these rats for the detection of cerebrovascular atherogenesis. (2) In 25 female SHRSP (A₃ strain), blood pressures were controlled by the antihypertensive therapy (Ecarnazine hydrochloride: 10mg/kg/day, p.o.) at the age of 40 days and thereafter and above-mentioned procedures were applied to them. Fat deposition in the mesenteric arteries was also investigated by Sudan staining after they were extirpated. (3) Effect of NaCl on the vascular atherogenesis was also examined in 21 male SHRSP (A₁-sb strain) by the same procedures as mentioned above. (4) 151 rats (including male and female SHRSP (A₁-sb and A₃ strain), male and female SHRSR (B₁-strain), experimental hypertensive rats (EHR: DOCA hypertensive rats and renal infarction hypertensive rats) and male Wistar-Kyoto rats (WK) were used for the analysis of relationship between blood pressure and serum cholesterol level. (5) The experimental system of YAMORI'S PREPARATION-II (YAMORI, Y., HORIE, R., SATO, M.: Stroke 7:385, 1976) was applied to 32 rats (male:14 rats, female:18) of WK.

RESULTS (1) Ringlike fat deposition was detected in all SHRSP but the grade of atherogenesis indicated by the mean number of sudanophilic rings in NaCl-loaded SHRSP was significantly higher than in control group. However, in NaCl-loaded SHRSP also showed significantly higher level of both blood pressure and serum cholesterol. (2) In the mesenteric arteries, all NaCl-loaded SHRSP developed ringlike fat deposition, while control group showed no fat deposition. For the cerebral arteries, no fat deposition was observed in both groups. No signifi-

cant difference in both blood pressure and serum cholesterol level observed between the two groups. (3)No fat deposition was detected in the cerebral arteries. NaCl-loaded SHRSP showed slightly higher susceptibility to fat deposition than the control group in the mesenteric arteries. Blood pressure and serum cholesterol level had no significant differences between them. (4)Accurate relationship could not be obtained between blood pressure and serum cholesterol levels, probably due to strain differences of rats. (5)NaCl-loaded group showed significantly higher susceptibility as compared with the control group. Serum cholesterol level and blood pressure had no significant differences between them. (Table)

NaCl	No. of Rats	Fat Deposition (%)	No. of Sudanophilic Rings (M±SE)	Blood Pressure (mmHg:M±SE)	Serum Cholesterol Level (mg/dl:M±SE)	Gain in Body Weight (gm:M±SE)
+	17	75.8*	10.1±0.5*	135±8	359.5±19.6	42±9
-	20	27.4	2.8±0.2	129±7	324.2±24.5	53±8

1)*: Significant difference from NaCl ⊖ group (p<0.01)

2)All rats were fed on a HFC diet from the age of 45 days for 7 weeks

SUMMARY AND DISCUSSION From these results, it might be speculated that NaCl directly affect vascular permeability, indifferent to hypertension, suggesting the possible involvement of the nervous system and vascular wall alteration (for example, water logging). However, relationship between blood pressure and serum cholesterol level, and also relationship between NaCl and the nervous system should be further investigated in such models as normotensive atherogenic rats (NAR).