67) Effect of Dietary NaCl and Calcium Balance on Bone Mass in SHRSP as a Model of Spontaneous Osteoporosis. Satoru Tsuchikura, Satoshi Fukuda, Katsumi Ikeda*, Yasuo Nara**, Ryoichi Horie** and Yukio Yamori**. Division of Comparative Radiotoxicology, National Institute of Radiological Sciences, Chiba, *Shimane Institute of Health Sciences, **Dept. of Pathology, Shimane Medical University, Izumo, Japan.

We reported that SHRSP developed spontaneously osteoporosis and would be possibly utilized as a model animal for osteoporotic bone disorders in human at the 6th International Symposium on SHR and Related Studies in 1989 (Clin. Exp. Hypertension 13 (Suppl.), 1991, in press). This study was performed to investigate the effects of NaCl intake inducing hypertension and promoting urinary excretion on bone mass and the preventive effect of calcium intake on it in SHRSP.

MATERIALS AND METHODS: Fifty female SHRSP and 50 WKY at 3 months of age were used. A half of each group of SHRSP and WKY were ovariectomized to promote osteoporotic states (OVX), and the other half remained intact. They were divided into 5 groups and given following diets for 8 weeks. (1) control (NaCl: 1%, Ca: 0.75%), (2) high NaCl (4%) and high Ca (4.7%), (3) high NaCl (4%) and low Ca (0.04%), (4) low NaCl (0.2%) and high Ca (4.0%), (5) low NaCl (0.2%) and low Ca (0.04%). Casein, as a protein, was used to attenuate the increase of blood pressure. Prior to sacrifices, all animals were received tetracycline and calcein injections with an interval of 1 week for double bone labeling to observe bone histologic dynamics. Bone strength and mineral contents of the femur were measured and the tibia was histomorphometrically investigated.

RESULTS: In the histomorphometry, the values of bone volumes were high in the order of (4)>(2)>(1), (3), (5) in both OVX and intact SHRSP. In the group (4) the value was higher in SHRSP than in WKY. Those of osteoid volume were high in the order of (3), (5)>(1)>(2), (4). The apposition rates were greater in the order of (3), (2)>(1) in intact SHRSP, (3)>(2), (1) in OVX-SHRSP, and also (3)>(2), (5)>(4) in both OVX and intact WKY. The values of mechanical strength and calcium content in the femur were greater in the order of (1), (2), (4)>(3), (5). Serum biochemical examinations on total and ionized calciums, Na, Cl ions showed no significant differences except that the total and ionized calcium were lower in intact WKY than OVX-WKY in (2). Blood pressure were not significantly altered in all groups during the experimental period of 8 weeks.

DISCUSSION AND CONCLUSION: Our previous studies suggest that intact SHRSP and OVX-SHRSP can be utilized as models for senile osteoporosis and postmenopause osteoporosis, respectively. The present study showed that NaCl intake might be one of factors to induce bone mass loss by accelerating urinary calcium excretion, and also suggested that sufficient calcium supplementation not only prevented bone mass loss but increased the bone mass in both experimental models for senile and postmenopause osteoporosis, regardless of blood pressure changes. In conclusion, balanced diets, low NaCl and high calcium, appear to be important in the prevention and treatment of osteoporotic bone disorders in humans.