29) Studies on the ECG Field on the Body Surface of the Rats, SHR, WKY and Wistar ST Strains. Shiko Chichibu*, Chie Kitagawa*, Hiroyuki Ito** and Kozo Okamoto**. * Department of Physiology, ** Department of Pathology, Kinki University School of Medicine, Osaka-fu, 589.

Introduction: Cardiac dysfunctions associating with hypertension such as the hypertrophy of the left ventricle are resulted by an abnormal increase in the cardiac output in SHR. For the screening and the detection of the early signs of these failures, there are several reports which applied ECG and VCG methods for SHR (Yamori, Y. et al., Jpn Circ. J., 40, 1315, 1976; Kono, M. et al., Jpn Heart J., 22, 508, 1981.). These applications yielded good results for the above purpose, but there are still some ambiguities concerning on the basic understandings of the excitatory phenomena about rodent heart. In this preliminary report, we are intending to study the surface potential field caused by the cardiac electromotive force with relation to the ECG and the VCG.

Methods: Adult specimens belonging to WKY, SHRSP and Wistar ST strains were used. Electrical potentials recorded on the body wall as well as from the extremities were measured with a conventional amplifier system, and recorded with a kymograph camera and a data recorder for further analysis. Amplification was made with d-c systems, and the differentiation of the potential changes was performed according to the purposes. Potential changes were analyzed graphically and the results were illustrated by the contour map method. As for the standard for normalization of the data, the origin of the time for the ventricular excitation corresponding to the ventricular excitation complex was chosen at the one identical for the peak of the R-spike in the II limb lead. Anesthetics used were either pentobarbital sodium or urethane-chloralose solutions applied intraperitoneally.

Results: In rodent heart, the movement of the cardiac apex during the cardiac cycle is said to be less restricted than that in man. The higher heart rate and the ample freedom for the cardiac movement produced several different ECG patterns in rats. Distinct features appeared in the limb leads were as follows: Bimodal P-wave; frequent appearances of notches and slurs on the QRS complex extremely short ST segment; asymmetrical T, etc. The less-restricted movement of the heart also caused cyclic shift of the cardiac electrical axis associated with the respiratory movement. Electrical profil diagrams in SHRSP showed a typical ventricular hypertrophy showing a complex contour deformation than those of the average pattern of WKY and Wistar ST. Circular diagrams at the level of D2 showed the biggest differences between SHRSP and WKY about the ventricular excitation process. As the general pattern of the ECG potential showed a wide variety between specimens belonging to Wistar ST, it was difficult to classify the minor ECG changes associating with the ventricular hypertrophy solely by this method.

Discussions and Conclusions: The electrical contour map method gave more informations than those obtained by the ordinary ECG and VCG, especially about the changes of the electromotive force rotations according to the excitatory alterations caused by hypertensive cardiac failures. These findings relating to the cyclic change of electrical phenomena caused by the apex movement would explain the limitations of the ordinary ECG method in the rodent ECG studies.

The main feature of the SHRSP contour map is the elongation of the recovery after the ventricular excitation. This finding is equivalent to the abnormalities found by the precordial leads.