36) Fat tissue of SHR, especially the biological observation of brown fat tissue. Hajime Sugihara, Nobuhisa Yonemitsu, Kenji Kitahara.
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We have studied the fat tissue of SHR with reference to the blood pressure and body weight. In this study, the characteristic feature of brown fat tissue was observed in young SHR.

Brown fat tissue is a specifically differentiated fat tissue of lipid metabolism serving as the thermogenetic organ at awaking after hibernation or at newborn stage in some mammals including rats and humans. The lipolytic process is carried by norepinephrine or other lipolytic hormones accompanying with above-mentioned thermogenesis. The lipogenesis through which the brown fat tissue change to white fat tissue is performed by insulin.

We found more tissue volume of the brown fat tissue in SHR aged from newborn to 4-5 weeks than that of WKY. In another word, the brown fat tissue of SHR did not easily change to white fat tissue. Radioreceptor assay of insulin was done with whole cell method on the brown fat tissue of SHR and WKY, and no significant difference was seen between them. Therefore, we supposed that more tissue volume of the brown fat tissue in SHR was compatible with relatively high serum level of norepinephrine in young SHR. In order to confirm this supposition, norepinephrine was administered to 4 week-old WKY for 2 weeks with osmotic pressure mini-pump, and the change of the brown fat tissue to white fat tissue was inhibited to a certain degree by this treatment. Next, body temperature of SHR and WKY was examined by thermometer (Thermister) and thermography. Rectal temperature of SHR was higher than that of WKY about by 1°C. Especially in SHR, the temperature at interscapular region of the skin in the back was higher than other region of the skin by the examination of thermography. In order to elucidate the relationship between the body temperature and the brown fat tissue, the interscapular brown fat tissue of 4 week-old WKY was operatively removed, and the body temperature, blood pressure and body weight were checked. As the result of the removal, the body temperature of the treated WKY fell in value of 0.3 - 0.4°C during the postoperative state of 2 - 3 weeks. The blood pressure and body weight did not change significantly.

Tissue culture of the brown fat cells was performed to examine the cellular behavior in vitro of these cells of SHR and WKY. Interscapular brown fat tissue was taken from 2 day-old newborns of SHR and WKY, and after digestion with collagenase, isolated cells were cultured into medium of Ham F-12 and 10% fetal calf serum. The brown fat cells in monolayer culture were polygonal with many fine lipid droplets in the cytoplasm. During the course of the culture, fine lipid droplets grew larger and fused into multiple droplets in some cells. These fat cells are similar to white fat cells in monolayer culture. The count of these cells was 25% of the total cells in the case of WKY and 15 - 20% in the case of SHR.

In summary, SHR had more tissue volume of the brown fat tissue, which reflected the environment in vivo in SHR, and also the brown fat cell itself of SHR seems to have some difference in the lipogenesis in comparison with that of WKY.