Parabiotic Effect on the Cerebral Lesions in the Spontaneously Hypertensive Rats

Akinobu NAGAOKA, Hisashi IWATSUKA, Ziro SUZUOKI,
and Kozo OKAMOTO

Incidences of the cerebral lesions, hemorrhage and/or softening, in several sublines of SHR are significantly higher in A_3 than in C (Okamoto et al: In Spontaneous Hypertension, Igaku Shoin, Tokyo, 129, 1972). However, the pathogenesis of the lesions is still unclear. In this study parabiotic experiment was performed on A_3 and C to explore a participation of humoral factor(s) in the development of the cerebral lesions.

The SHR (A_3 and C) of F_{29-30} generation and normal Wistar/Kyoto rats (WK) were used at 50 to 60 days of age. Parabiosis was made by the method modified by Yamori (Jap Circulat J 35: 821, 1971) in the combinations of A_3 to C and A_3 to WK. Animals were maintained on a standard laboratory chow and tap water. Some pairs of A_3 -C were given 1% NaCl solution instead of tap water ad libitum from 10th day after the operation. Systolic blood pressure was measured before and every 1 or 2 weeks after the operation by a microphonic method under the unanesthetized condition.

Body weight and animal condition: All pairs of the SHR lost their body weight gradually during the first 2 weeks, and then they were restored from the injury. In the combination of A_3 -WK, 5 of 6 pairs showed histoincompatibility 7 to 8 weeks after the operation.

Blood pressure: At the start of experiment the average blood pressure was 174 for A_3 and 168 mmHg for C. Blood pressure change in 14 pairs of A_3 -C could be classified into 3 patterns: (a) In 5 pairs of this combination, the systolic blood pressure of A_3 rose rapidly to 260 mmHg during the first 4 weeks which was much higher than that of nonparabiotic A_3 , and in their partner C the pressure fell to 126 mmHg which was much lower than that of non parabiotic C. (b) In 7 pairs, either A_3 or C showed a similar blood pressure to that of respective nonparabiotic animals. (c) In 2 pairs, the blood pressure rose in C to about 220 mmHg and fell in A_3 to about 140 mmHg during the observation period.

When the blood pressure of A_3 was plotted to that of the partner C in all pairs, there was a negative correlation between A_3 and C ($r=0.934$, $P<0.01$)

From the Biological Research Laboratories, Central Research Division, Takeda Chemical Industries, Ltd, Osaka; and Department of Pathology, Faculty of Medicine, Kyoto University, Kyoto.

at 5th week ; $r=0.830$, $P<0.01$ at 7th week). From this phenomenon, it may be postulated that the blood pressure reducing factor(s), increasing compensatively with the advance of hypertension, is transferred to partners with lower blood pressure. However, in pairs of A_3 -WK there was not such a correlation: the blood pressure of WK was not affected by parabiosis with A_3 . The absence of the effect of SHR on Wistar rats was repeatedly confirmed by other investigators (Yamori: Jap Circulat J 35: 821, 1971; Ebihara: In Spontaneous Hypertension. Igaku Shoin, Tokyo, 214, 1972). In NaCl-loaded A_3 -C pairs, the blood pressure of A_3 rose more sharply than that of A_3 in the same pairs administered tap water. But NaCl-loading had no effect on the blood pressure of the partner C, which quite differed from the case of nonparabiotic C.

Cerebral lesions: In 5 pairs (pattern a), all of A_3 developed the cerebral lesions associated with severe hypertension. In 7 pairs (pattern b), only one A_3 showed the lesions although the blood pressure of A_3 was similar to that of nonparabiotic A_3 . In these combinations there was no lesion in all of C. The blood pressure in 2 pairs (pattern c) was higher in C than in A_3 , but the C-rats did not show any cerebral lesions until 20 weeks after the operation. When loaded NaCl-solution, 10 A_3 of 10 pairs of A_3 -C developed the cerebral lesions within 35 days after the loading, but the partner C did not show any changes in their brains.

These results suggest that it is not likely that humoral and transmissible factor(s) participate in the development of the cerebral lesions of the subline A_3 .