29) Increased Synthesis and Secretion of Atrial Natriuretic Polypeptide (ANP) in the Left Atrium of Spontaneously Hypertensive Rats (SHR) — Simultaneous Measurement of ANP Messenger RNA and ANP — Hiroshi Arai, Kazuwa Nakao, Yoshihiko Saito, Narito Morii, Akira Sugawara, Takayuki Yamada, Hiroshi Itoh, Masashi Mukoyama, Kiminori Hosoda, and Hiroo Imura. Second Division, Department of Medicine, Kyoto University School of Medicine, Kyoto 606.

Using a specific radioimmunoassay (RIA) for α -ANP (Biochem Biophys Res Commun 124:815, 1984), we reported that α -ANP is secreted through the coronary sinus from the heart and circulates in the body as a hormone (Biochem Biophys Res Commun 129:439, 1985; Hypertension 8(Suppl 1):I-151, 1986; Can J Physiol Pharmacol 65:1756, 1987). We and others also showed that the plasma ANP level is increased in patients with essential hypertension (Lancet ii:1426, 1985) and in SHR and SHR-stroke prone (Biochem Biophys Res Commun 135:74, 1986). In SHR, however, the tissue ANP level in the atrium was decreased, especially in the left atrium. In addition, salt loading in SHR resulted in a further decrease of the ANP level in the left atrium (J Hypertension 4(Suppl 3):S317, 1986). From these findings, we speculate that the decreased ANP level in the left atrium in SHR reflects the increased ANP secretion from the left atrium.

In order to further assess the biosynthesis, storage and secretion of ANP in the atrium, we measured tissue ANPmRNA and ANP levels in the atrium using the Northern blot hybridization technique and RIA for ANP (Biochem Biophys Res Commun 148:239, 1987; Biochem Biophys Res Commun 148:211, 1987; Circulation 76:115, 1987; Circ Res. in press). Male SHR at the age of 27 weeks (n=5) and its age-matched control, WKY, (n=5) were studied. Atria were removed from decapitated rats, immediately dissected into right and left atria on ice. Tissues were weighed, frozen in liquid nitrogen and stored at -70°C until use.

In SHR with the elevated plasma ANP level, the ANPmRNA level in the left atrium was substantially increased (Table I). The left/right ratio of atrial ANPmRNA level in SHR (150 %) was higher than that in WKY (90 %). In contrast, the left/right ratio of atrial ANP concentration was decreased in SHR (44 %) compared with that in WKY (84 %). The ratio of ANP to ANPmRNA levels in the left atrium of SHR was about three times smaller than that in the right atrium of SHR, and those in bilateral atria of WKY.

These results indicate that the biosynthesis and secretion of ANP from the left atrium is preferentially increased in SHR. Thus, simultaneous determination of ANPmRNA and ANP levels is a refined strategy of investigation for the biosynthesis, storage and secretion of ANP.

Table I. Atrial levels of ANPmRNA and ANP in WKY and SHR

	WKY	SHR
Body weight (g)	391 $\pm$ 11	436 $\pm$ 9
Systolic blood pressure (mmHg)	147 $\pm$ 2	234 $\pm$ 4
ANPmRNA level (unit/g tissue)		
Right atrium	450	410
Left atrium	410	610
Left/Right ratio (%)	90	150
ANP level ($\mu\text{g/g}$ tissue)		
Right atrium	75.9 $\pm$ 5.8	85.5 $\pm$ 17.9
Left atrium	63.9 $\pm$ 12.8	37.6 $\pm$ 9.1
Left/Right ratio (%)	84 $\pm$ 5	44 $\pm$ 3
ANP/ANPmRNA (ng/unit)		
Right atrium	170	210
Left atrium	160	62