testis as a control (6-OHDA experiments). Animals were weaned on day 25, and were sacrificed between days 42 and 70: After the testes had been weighed, they were fixed with Bouin's solution, embedded in paraffin, sliced and stained with hematoxylin and eosin for histological examination. Statistical analysis was performed by the t-test.

Results and discussion. The table shows the testicular weights and the incidence of growth retardation. Denervation caused a significant reduction in the right testicular weight as compared to the left except in the group operated on the 21st day of life. The incidence of rats with a right-testis weight which was less than 75% of the left testicular weight decreased with increasing age at the time of operation. From the gradual reduction in the incidence from 100% (operation at day 13) to 43% (operation at day 21), it may be speculated that there might be a critical time period up to the age of 15 days for the nervous system in promoting testicular growth. After the rats are 15 days old, the neural effect may be overridden by hormonal activities, since gonadotropins and testosterone levels in blood dramatically increase during days 15–20 after birth[8,9]. 6-OHDA, which destroys sympathetic nerve terminals, was injected into the right testis. This local chemical sympathectomy retarted testicular growth in treated rats (B1–B6), and there was also a gradual reduction in the incidence at the 75% criteria level. No compensatory hypertrophy was observed in the untreated (left) testes up to at least 42 days after birth in the operated group (A3, B1–B5); i.e., the weights of the left testes of the operated rats did not differ from those in control animals. Photographs of the histological preparations of the denervated or 6-OHDA-treated testes are shown in the figure. Seminiferous epithelial cells of denervated testes were degenerated and reduced, some portions of the seminiferous tubules were destroyed, digested, absorbed and displaced by fibrous tissue, and mature sperm was not seen in any tubules. Similar findings were seen in the preparation from 6-OHDA-injected testes, although there was less degeneration than in the surgically denervated testes. The interstitial tissue including Leydig cells appeared to be intact in the right testes of the above 2 groups. These results indicate that the sympathetic nervous system is most probably important for testicular growth, especially of seminiferous tubules. Gerendai et al.[10] have recently suggested the importance of adrenergic neural elements in ovarian compensatory hypertrophy, using local 6-OHDA administration, and Bercu et al.[11] have suggested a critical period for hormonal effects on testicular growth in neonatal rats using LH-RH antiserum.

Whether the role of the nervous system is through a direct effect on the testicular cell, through androgen secretion from Leydig cells, through the control of blood flow, or through other factors is currently under investigation.

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Central influence of vasopressin on baroreceptor reflex in normotensive rats and its lack in spontaneously hypertensive rats (SHR)

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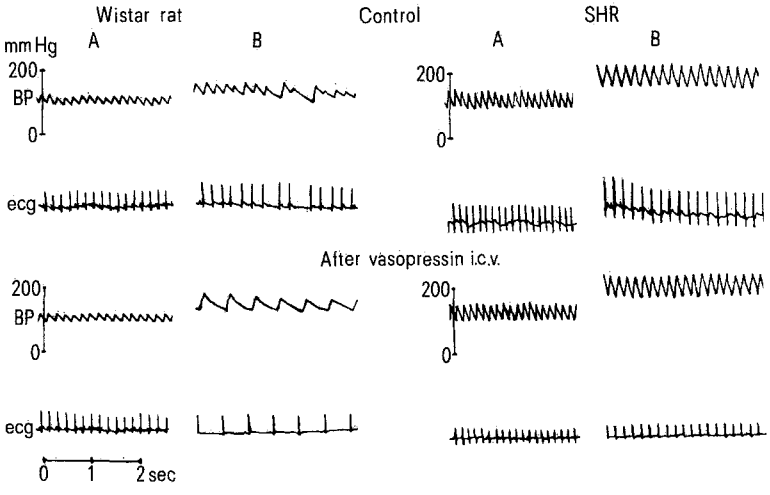
Summary. In normotensive Wistar rats intracerebroventricular (i.c.v.) injection of 30 mU of lysine[8]-vasopressin enhances significantly the cardiovagal reflex bradycardia induced by a blood pressure rise. This effect is absent in spontaneously hypertensive rats (SHR) of the Okamoto strain.

The pressor effect of vasopressin is very strongly buffered by the baroreceptor reflex[1–3]. An enhancement of the sensitivity to the pressor action of vasopressin follows baroreceptor denervation[3,4]. An increase in pressor response to vasopressin has been observed in SHR[5] and in New Zealand genetically hypertensive rats[6] as compared to normotensive rats. A decrease in cardiac output and heart rate in conscious dogs after vasopressin administration in a dose subthreshold for pressor effect has recently been observed. No such decrease occured after baroreceptor denervation, a finding suggesting that vasopressin facilitates the baroreflex response[4].

The present investigation was designed to determine the effects of a central application of vasopressin on the cardiovagal component of the baroreceptor reflex in SHR of Okamoto strain and in control normotensive rats of matched age.

Materials and methods. Eight 4-months old male SHR derived from the Okamoto strain and 9 normotensive male Wistar rats were selected at random and anesthetized with urethane (1.3 g/kg i.p.). The arterial blood pressure was measured from a catheter tied into the femoral artery using a Nicotron transducer. Heart rate and heart period were calculated from the ECG recording. I.v. administration of drugs was made by cannulation of the femoral vein. For intracerebroventricular (i.c.v.) injections rats were placed in a David Kopf stereotactic instrument and a trephine hole was drilled into the skull 1.0 mm lateral and 1.0 mm posterior to the bregma. 30 mU of lysine[8]-vasopressin was injected into the lateral ventricle in a 3 µl vol., with a cannula of 0.4 mm outer diameter introduced at a depth of 4–4.5 mm from the top of the skull. At the end of each experiment 3 µl of Evans blue dye was injected into the lateral ventricle, the animal was sacrificed, the brain sectioned and ventricular staining checked. To test the specificity of the observed central effect of vasopressin control experiments were carried out, in which a 3 µl vol. of artificial cerebrospinal fluid[7] was introduced into the lateral ventricle. No significant change



The effects of intracerebroventricular (i.c.v.) administration of vasopressin on the cardiovagal component of the baroreceptor reflex in Wistar rat (left side) and SHR (right side). Upper part; control before vasopressin injection. Lower part; 30 min after administration of vasopressin. BP, arterial blood pressure; ecg; electrocardiogram; *A*; resting conditions; *B*; blood pressure rise elicited by i.v. phenylephrine injection.

of the baroreceptor reflex sensitivity was observed after this procedure. The sensitivity of the baroreceptor reflex was calculated as the ratio of the maximal change in heart period, measured as R-R wave interval of ECG, to the maximal rise in systolic blood pressure induced either by i.v. administration of phenylephrine (24 µg/kg to SHR and 48 µg/kg to Wistar rats) in 0.07 ml of multielectrolyte solution or by the occlusion of the abdominal aorta above the branching of the coeliac artery. Atropine (0.1 mg/kg i.v.) abolished completly the reflex response of the heart rate to the rise of arterial blood pressure.

The urinary bladder was cannulated. No change in diuresis or arterial blood pressure was observed after i.c.v. vasopressin injection.

Results and discussion. SHR demonstrated significantly less sensitivity of the baroreflex, a finding in agreement with earlier observations[8–10]. In addition, a significantly greater pressor response to phenylephrine was observed in SHR, although the dose was only half of that given to Wistar rats. This may be explained by reduced baroreceptor buffering function in SHR[8–10], by adaptive and structural changes in the resistance vessels[11] and/or by increased reactivity of α-adrenergic receptors[12]. A significant difference in the central effect of lysine[8]-vasopressin on the cardiovagal component of baroreflex was observed between SHR and normotensive rats (fig.). There was a significant increase in the sensitivity of the baroreflex in normotensive rats and no change in SHR after i.c.v. injection of vasopressin (table). A decrease in heart rate after injection of vasopressin into the lateral and 4th ventricles was reported in normotensive dogs[13].

The central effect of vasopressin may suggest a possible vasopressinergic projection to the central relay neurons of the baroreceptor reflex. Such pathways to the nucleus tractus solitarii have been described recently[14]. They may possibly modulate and augment the baroreflex sensitivity. Thus one may speculate that hypothetical vasopressin receptor density and/or sensitivity in the brain stem are diminished in SHR and consequently their central responsiveness to vasopressin is reduced. Plasma levels of vasopressin have been reported to be 2 times higher in SHR as compared with normotensive rats[5]. This elevated vasopressin level, while possibly contributing to the sustained arterial hypertension, does not facilitate the baroreceptor reflex in SHR as the reflex cardiac response to the rise of the arterial pressure is significantly reduced in SHR as compared to normotensive rats. Prolonged increased concentration of vasopressin might reduce the sensitivity of the central hypothetical vasopressin receptor in SHR. Our finding, that vasopressin is lacking in any facilitatory effect on the baroreflex in SHR suggests that a reduced sensitivity of the baroreceptor reflex observed in hypertension is possibly due to an absence of the central vasopressinergic facilitatory mechanism.

Effect of vasopressin given i.c.v. on heart rate, arterial blood pressure and baroreflex sensitivity of Wistar rats and SHR

	Wistar rats n=9	SHR n=8
Control		
Systolic blood pressure (mmHg)	112.4 ± 4.06	150.7 ± 2.55[c]
Heart rate (beats/min)	401.5 ±12.9	408.1 ± 9.5
Baroreflex sensitivity (msec/mmHg)	2.32± 0.48	0.82± 0.17[b]
After vasopressin i.c.v.		
Systolic pressure (mmHg)	112.7 ± 6.3	156.9 ± 3.94[c]
Heart rate (beats/min)	397.8 ±20.2	420.8 ±11.6
Baroreflex sentivity (msec/mmHg)	4.42± 1.06[a]	0.55± 0.07[d]

Values are man ± SE. [a]Significantly different from control in the same group of rats ($p < 0.02$ Student's paired-test); [b]significantly different from Wistar rats ($p < 0.02$ -Student's t-test); [c]significantly different from Wistar rats ($p < 0.01$ -Student's t-test); [d]significantly different from Wistar rats ($p < 0.001$ -Student's t-test).

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