An ATP-sensitive K⁺ Channel in the Brain Plays a Role in Arterial Pressure Regulation During Cerebral Ischemia: Comparison between SHR and WKY rats. Masato Nishimura, Hakuo Takahashi, Masanori Sakamoto, Akira Nambu, Tadashi Nakanishi, and Manabu Yoshimura. Department of Clinical Laboratory and Medicine, Kyoto Prefectural University of Medicine, Kyoto 602, Kansai Medical College, Osaka 570.

An ATP-sensitive K⁺ channel is activated by decreased intracellular ATP content during ischemia. We investigated the roles of the ATP-sensitive K⁺ channel in arterial pressure regulation during the acute phase of cerebral ischemia using spontaneously hypertensive rats (SHR) and Wistar-Kyoto rats (WKY).

13-week-old SHR or WKY were anesthetized with urethane, and arterial pressure and heart rate were recorded under artificial respiration. Glibenclamide, a specific antagonist of the ATP-sensitive K⁺ channel, was administered into the cerebral lateral ventricle; the carotid arteries were either occluded or intact bilaterally. To assess the mechanisms of arterial pressure response, pretreatment with an arginine-vasopressin V₁ antagonist (OPC-21268, 5 mg/kg) was administered intravenously. In addition, pinacidil, a stimulator of ATP-sensitive K⁺ channel, was administered intracerebroventricularly (ICV).

In rats with bilaterally occluded carotid arteries, ICV injection of glibenclamide elicited a dose-dependent increase in arterial pressure in WKY; the pressor effect of glibenclamide was smaller in SHR than in WKY. Heart rate did not change in WKY, however, it decreased in SHR, compared with vehicle (0.9 % saline) injection. There were no significant changes in arterial pressure or heart rate during ICV administration of glibenclamide to both SHR and WKY with intact carotid arteries. Intravenous pretreatment with the V₁ antagonist abolished the pressor response of ICV injection of glibenclamide in WKY; in SHR, it showed a tendency to inhibit the pressor response of ICV injection of glibenclamide. ICV administration of pinacidil caused almost the same degree of vasodepressor effects in SHR and WKY with intact carotid arteries; in rats with bilaterally occluded carotid arteries, however, ICV injection of pinacidil elicited a greater vasodepression in WKY, but not in SHR.

During the acute phase of cerebral ischemia, the ATP-sensitive K⁺ channel is thought to be activated in the brain and may prevent excess hypertension by inhibiting vasopressin release. SHR might have a problem in the stimulatory mechanism of ATP-sensitive K⁺ channel in the brain.