Effects of Mechanical Stretch on G-proteins in Cultured Rat Aortic Smooth Muscle Cells from Spontaneously Hypertensive Rats and Wistar-Kyoto Rats.

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Mechanical stress and stretch induce hypertrophy and hyperplasia of vascular smooth muscle cells (VSMC) through a variety of signal transduction. The recent studies show G-proteins are a potential regulatory site in the transmembrane signaling cascade. However, there are no studies for effects of G-proteins in mechanical stress in VSMC. The objective of this study is to determine whether there are any differences in the effect of stretch on G-proteins in between SHR and WKY and to clarify whether G proteins are implicated in the pathogenesis of hypertension. The 4-5 week-olds male SHR and WKY rats were used. Systolic blood pressure of SHR was 118 ± 12 mmHg and WKY was 117 ± 3 mmHg. Cultured VSMC obtained from the rat aortic arteries were stretched by 0, 15, 30, 45, 60 minutes of cyclic strain of 20kPa (24% maximum strain) at 60 cycles/min. The amount of $G_i \alpha$ -1, 2, 3 and $G_s \alpha$ were determined by Western blotting. Basal $G_s \alpha$ was significantly ($P < 0.05$) reduced in SHR compared with that in WKY, but basal $G_i \alpha 2$ of SHR was similar to WKY. The degree of decreased $G_s \alpha$ by stretch in SHR was smaller than these in WKY. The level of $G_i \alpha 2$ had no changes by stretch. We could not detect the band using each antibody of $G_i \alpha$ 1, 3. Recent studies showed that cyclic strain induce a reduction in adenylate cyclase activity in cultured VSMC. These data match the results of present study. Since basal $G_s \alpha$ was reduced in SHR compared with WKY, the degree of decreased $G_s \alpha$ by stretch in SHR was smaller than those in WKY. No significant differences were seen in $G_i \alpha 2$ before and after stretch. These results suggest that $G_i \alpha 2$ have no roles in the transmembrane signaling cascade before hypertension.

In conclusion, there are differences in effects of mechanical stretch on $G_s \alpha$ between prehypertensive SHR and WKY. These data suggested these difference may be due to genetic factors.