Prof. Ricky Y.K. Man has spent more than 30 years in cardiovascular research, and his work has provided understanding ranging from the pathogenesis of cardiovascular disorders to the pharmacological approaches to modulate vascular reactivities. Recently, he has focused on investigating the non-genomic effects of gonadal sex hormones in the vascular systems

Key Research Programme

Gender differences exist in the severity of endothelial dysfunction, which occurs as arteries age or undergo chronic hypertensive stress. Endothelial dysfunction is characterized by an imbalance between the release of endothelium-derived relaxing and contracting factors. It is precipitated by aging, western diet, obesity, diabetes and hypertension and thus becomes an increasing problem in societies like Hong Kong, facing the aging of the population combined with increasing access to western food. An aging population also implies an increased number of female at post-menopausal states, a condition known to be associated with an increased risk of vascular diseases.

Accumulating evidence suggests that estrogen can act directly on the vasculature thus contributing to the cardiovascular protective phenomenon observed in premenopausal women. With the use of the classical organ bath technique, the female sex hormones, 17β-estradiol and progesterone, as well as the male sex hormone, testosterone, cause vascular relaxation in isolated porcine coronary artery. Hormone-induced vasodilation involves both endothelium-dependent and endothelium-independent components. However, these acute favourable vascular actions of gonadal hormones only occur at pharmacological concentrations (micromolar range).

At physiological concentrations (nanomolar range), 17β-estradiol enhances relaxation of vascular smooth muscle, whereas progesterone and testosterone reduce vascular responses to endothelium-dependent relaxing agents. The modulatory effect of estrogen on vascular responses in porcine coronary artery is mediated via the cyclic AMP pathway. To relate the non-genomic actions of 17β-estradiol to gender differences, relaxations to acetylcholine were studied in mesenteric arteries isolated from male and female rats. A better relaxation profile to the nitric oxide component, but not the endothelium-derived hyperpolarizing factor component, of acetylcholine-induced relaxation is observed in female mesenteric arteries only. 17β-estradiol acutely improves nitric oxide-mediated relaxations to acetylcholine in arteries from male rats to a level approaching that in arteries from female rats, thus indicating that 17β-estradiol exerts a non-genomic effect on the vasculature that is responsible for the gender differences in vascular responses.

Representative Publications

Teoh H, Leung SWS, Man RYK. Short-term exposure to physiological leels of 17β-estradiol enhances endothelium-independent relaxation in porcine coronary artery. Cardiovas Res 1999; 42: 224-231.

Teoh H, Man RYK. Enhanced relaxation of porcine coronary arteries after acute exposure to a physiological level of 17β-estradiol involves non-genomic mechanisms and the cyclic AMP cascade. Br J Pharmacol 2000; 129: 1739-47.

Keung W, Vanhoutte PM, Man RYK. Non-genomic responses to 17β-estradiol in male rat mesenteric arteries abolish intrinsic gender differences in vascular responses. Br J Pharmacol 2005; 146: 1148-1155.