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A protective role of TRPV1 in hypertension induced by Angiotensin II

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Transient receptor potential vanilloid 1 (TRPV1) is a non-selective cation channel that can be activated by a range of stimuli, such as capsaicin, heat (>43ºC), protons (pH<6) and certain mediators. Traditionally TRPV1 is associated with pain and also the release of vasodilator neuropeptides that can have protective roles in cardiovascular disease. However, there are suggestions that TRPV1 channels are present on vascular tissue, where they may mediate vasoconstriction (Kark et al., 2008). The purpose of this study was to investigate the role of TRPV1 in the development of hypertension induced by angiotensin II (AngII).

TRPV1 wild type (WT) and TRPV1 knockout (KO) mice (3-4 month olds, male) were treated with AngII (1.1 mg/kg/day) or vehicle (saline), infused for 14 days via pre-implanted osmotic mini-pumps according to UK law and local ethics guidelines (Liang et al., 2009). Blood pressure was monitored by two different methods (tail cuff plethysmogrphy and telemetry) and vascular hypertrophy was assessed by histology. Tail cuff data suggested that the blood pressure was significantly increased in the WT mice after 14 days infusion of AngII (126.6±0.5 mmHg, n=3) when compared with saline-treated WT (103±2.7, n=3, $p<0.001$ mmHg, 2-way ANOVA with Bonferroni's post test) mice. This increase was not observed in KO mice (108.7±3.0, n=4 for AngII-treated mice compared to 105.5±3.3, n=3 for saline-treated mice). Moreover, telemetry data showed the same trend in blood pressure results as tail cuff data (WT-vehicle 107.7±2.2; WT AngII 149.4±7.0, $p<0.01$, n=3; TRPV1KO-vehicle 105.3±1.9 and TRPV1KO-vehicle 124.1±9 n=3. Furthermore analysis of mouse aorta by histology (Massons Trichrome) revealed an increased thickness of the smooth muscle layer in WT AngII-treated mice compared with WT saline-treated mice. Again no difference was seen in the TRPV1 KO mice.

It is concluded that TRPV1KO mice are, perhaps surprisingly, protected against hypertension and vascular hypertrophy induced by AngII. This in turn indicates an involvement of TRPV1 in mediating AngII-induced hypertension but the precise mechanisms are unclear.