Mammalian differences in cholinoceptor control of coronary circulation

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How cholinoceptor activity normally controls coronary flow in man is unknown. Functional data from isolated tissues to whole mammals vary qualitatively and quantitatively. The most consistent data come from the dog where acetylcholine (ACh) dilates the right (R), circumflex (Cx) and anterior descending (AD) coronary beds. To compare *in vivo* cholinoceptor control between species, stimulus-response curves for cholinoceptor activation were described in sheep and compared simultaneously (pulsed Doppler flowmetry) in R, Cx and AD using brief right atrial infusions of ACh, and in the same sheep (isoflurane anaesthesia), electrical stimulation (ES) of the cut, peripheral end of the left vagus nerve. The heart was paced at 150 b/min. Infused ACh caused differential vasodilatation in the 3 beds. In the R, efficacy was 3-fold ($P<0.001$) with marginally greater potency ($P=0.05$) than in the left-sided beds, where efficacy in each was 2.5-fold ($P<0.05$). The responses were abolished by methscopolamine. ES of the vagus caused differential vasoconstriction as frequency rose in all coronary beds. Cx conductance fell to maximum of 83%, in AD to 88%, and in R to 91% (all $P<0.001$; *Pdiff between Cx and AD/R, 0.001*). Maximal vasoconstriction occurred at 10.5Hz in R, 12 Hz in Cx and 16 Hz in AD. The effects were blocked with methscopolamine. Thus while intravascular ACh causes in vivo vasodilatation in sheep coronary beds as in dogs, ES of vagus in sheep causes vasoconstriction i.e. the opposite effects to those in dogs. Our hypothesis is that survival is consistent with evolutionary differences in resting and reflex cholinoceptor control of coronary circulation across mammalian species.