VASOACTIVITY OF THE GASOTRANSMITTERS HYDROGEN SULFIDE AND CARBON MONOXIDE IN THE CHICKEN DUCTUS ARTERIOSUS

S. van der Sterren, P. Kleikers, L.J. Zimmermann, E. Villamor

Pediatrics, Maastricht University Medical Center (MUMC+), GROW School, Maastricht, The Netherlands

Background: Besides nitric oxide (NO) and carbon monoxide (CO), hydrogen sulfide (H₂S) is a third gaseous messenger which may play a role in controlling vascular tone and has been proposed to serve as an O₂ sensor. We aimed to investigate whether exogenous H₂S and CO are vasoactive in the chicken DA and play a role in ductal O₂ sensing.

Methods: We investigated, using wire myography, the mechanical responses induced by the H₂S donor Na₂S (1 μM-1mM) and by authentic CO (0.1 μM-0.1mM) in DA rings from 19-d chicken embryos. We also evaluated the effects on ductal reactivity of the precursors and inhibitors of the endogenous synthesis of H₂S and CO.

Results: Na₂S elicited a 100% relaxation (pD₂ 4.02) of O₂-contracted and a 50.3% relaxation of KCl-contracted DA rings. This relaxation was not affected by the NO synthase inhibitor L-NAME, the soluble guanylate cyclase (sGC) inhibitor ODQ, or the K⁺ channel inhibitors TEA (non selective), 4-AP (K_V), glibenclamide (K_{ATP}), iberiotoxin (BK_{Ca}), TRAM-34 (IK_{Ca}), and apamin (SK_{Ca}). CO also relaxed O₂-contracted (60.8% relaxation) and KCl-contracted (18.6% relaxation) DAs. This relaxation was impaired by ODQ, TEA, and 4-AP, suggesting the involvement of sGC and K_V channel stimulation. The presence of inhibitors/precursors of H₂S or CO synthesis did not significantly affect the response of the DA to O₂.

Conclusions: Our results indicate that the gasotransmitters H₂S and CO are vasoactive in the chicken DA but they do not suggest an important role for endogenous H₂S or CO in the control of chicken ductal reactivity.