The effects of prenatal hypoxia on the α-subunits of G proteins in the heart of the Broiler chicken

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Background

• β-adrenoceptors (βARs) are essential for cardiac development and regulation.
• Chronic prenatal hypoxia increases βAR sensitivity to epinephrine in the embryo but Decreases it in the juvenile without changing receptor density in either.
• Others suggest that a shift in G-protein subtype expression favouring inhibitory ($G_{\alpha}i$) G-proteins could effect βAR sensitivity.
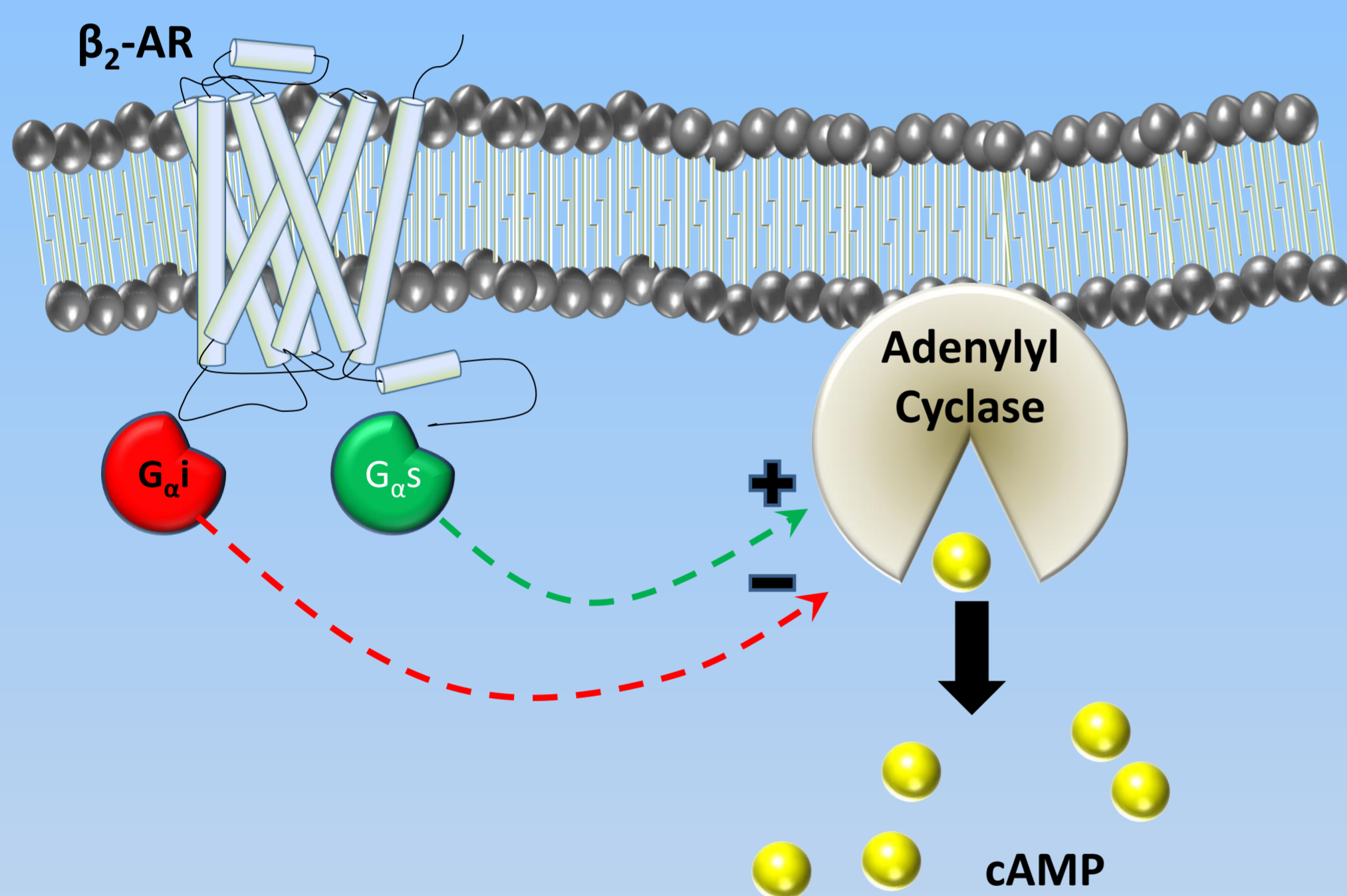
Objective

To evaluate if embryonic and juvenile cardiac $G_{\alpha}s/G_{\alpha}i$ expression is altered by prenatal hypoxia.

Hypothesis

Because the β_2AR subtype is known to signal through both stimulatory and inhibitory G-proteins, the hypothesis is that $G_{\alpha}s$ would increase in the hypoxic embryos, while $G_{\alpha}i$ would increase in the prenatally hypoxic juveniles.

Methods

• Broiler chicken eggs were incubated in 21% Oxygen (control) and 14% Oxygen (hypoxia).
• Embryonic samples were taken at 19 days of incubation. n= 16.
• Juvenile samples were taken at 35 days post hatching. n= 20.
• Samples were separated by SDS-PAGE and transferred onto PVDF membranes.
• Membranes were probed with either anti-$G_{\alpha}s$ or anti-$G_{\alpha}i$ antibodies.

Results

• Hypoxia increased $G_{\alpha}s$, but not $G_{\alpha}i$ in the juveniles.

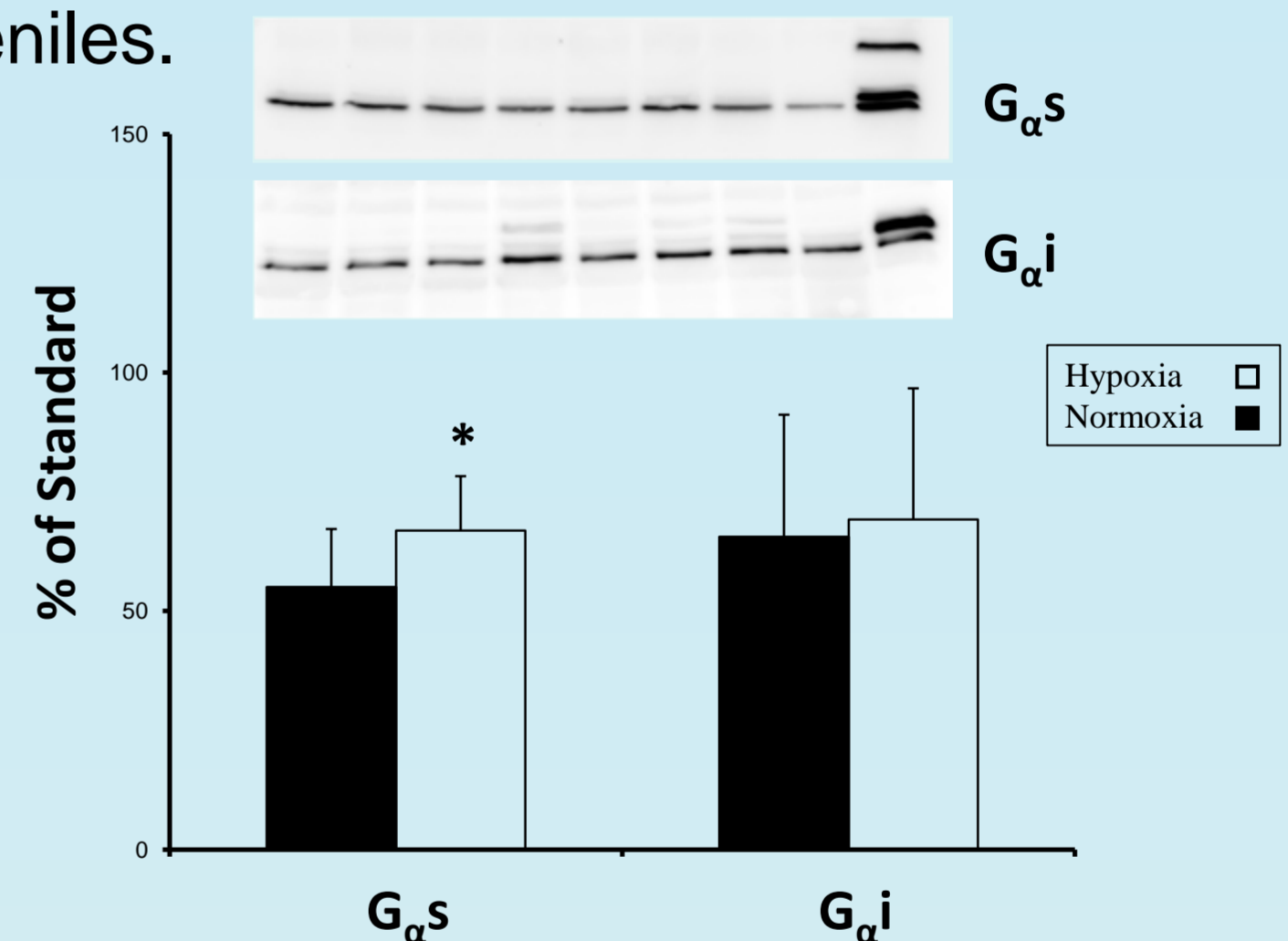• Hypoxia increased $G_{\alpha}i$, but not $G_{\alpha}s$ in the embryo.

Conclusions

• Unexpectedly hypoxia increased $G_{\alpha}i$ in the embryo, while having no effect on $G_{\alpha}s$.
• Chronic prenatal hypoxia increased $G_{\alpha}s$ in juvenile chickens, with no change in $G_{\alpha}i$.
• This suggests the effects of hypoxia are downstream of the G proteins in the signalling cascade.
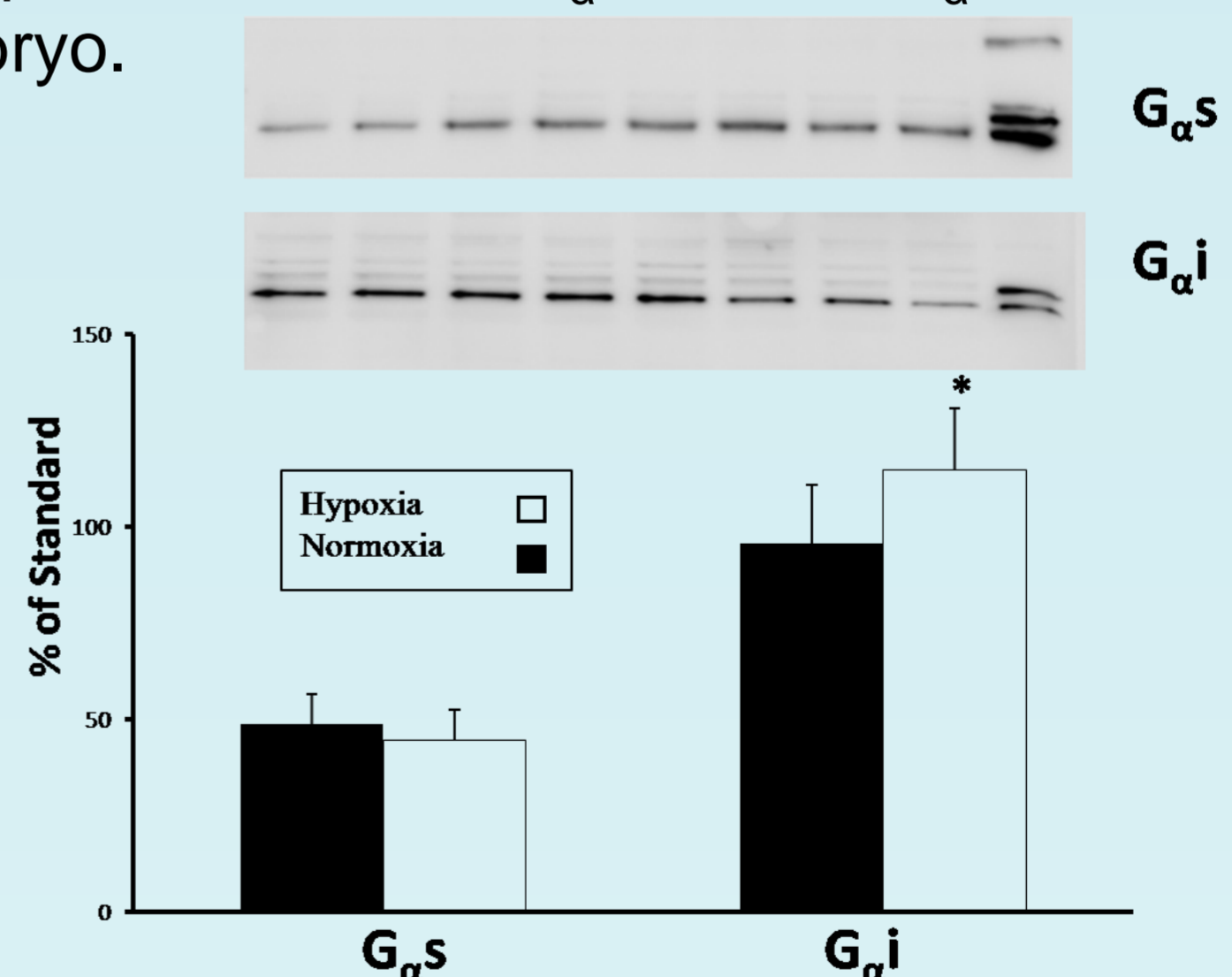
Perspective

• Others suggest that AC isoforms vary in their susceptibility to inhibition by $G_{\alpha}i$, and their sensitivity to $G_{\alpha}s$. And changes AC isoforms levels could have an effect on βAR sensitivity.

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