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Red Bull: Effects on cardiovascular function and development in the chick embryo

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RED BULL: EFFECTS ON CARDIOVASCULAR FUNCTION AND DEVELOPMENT IN THE CHICK EMBRYO

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An MDSC 402 Project by:
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BACKGROUND AND RATIONALE:

Consumption of the popular energy drink "Red Bull" is not recommended for pregnant women due to its high caffeine content. However, few studies have explored the potential developmental risks associated with its consumption. Here we investigate the morphological and physiological effects of two key ingredients in Red Bull, caffeine and taurine, on the cardiovascular system of developing chick embryos.

HYPOTHESIS:

Taurine alleviates the negative effects of caffeine on cardiovascular function and development

SPECIFIC AIM 1:

To examine the effect of caffeine, taurine, and their combination on embryonic cardiac function

SPECIFIC AIM 2:

To determine whether the presence of taurine diminishes gross abnormalities in the embryonic heart induced by caffeine

METHODS:

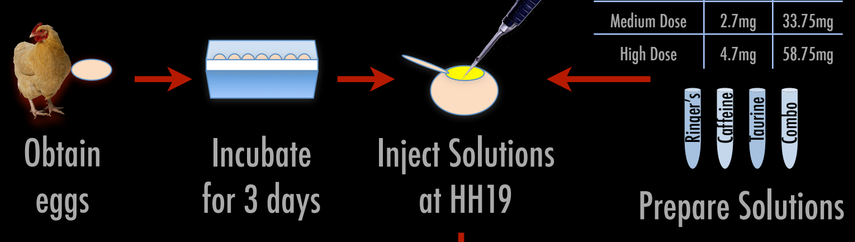


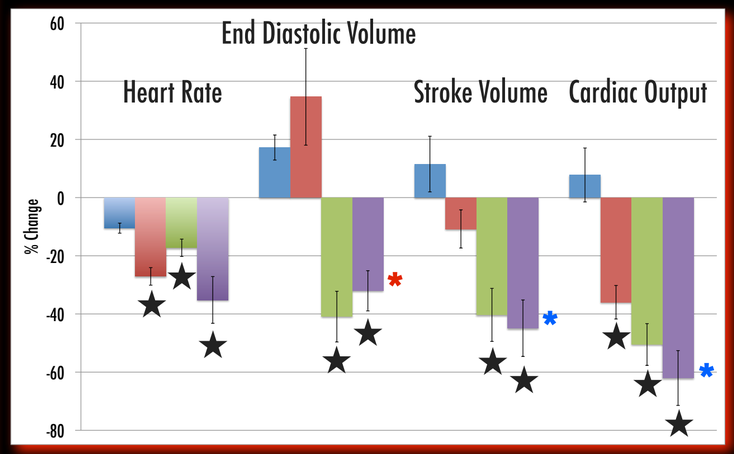
Image Capture and Data Analysis. Calculated Heart Rate, End Diastolic Volume, Stroke Volume, Cardiac Output and Ejection Fraction before and 10, 30, 60 minutes, 2 and 3 hours after injection.

Incubate for additional 6 days. Harvest, cryostat and process hearts and analyze for defects.

RESULTS - SPECIFIC AIM 1:

Legend:

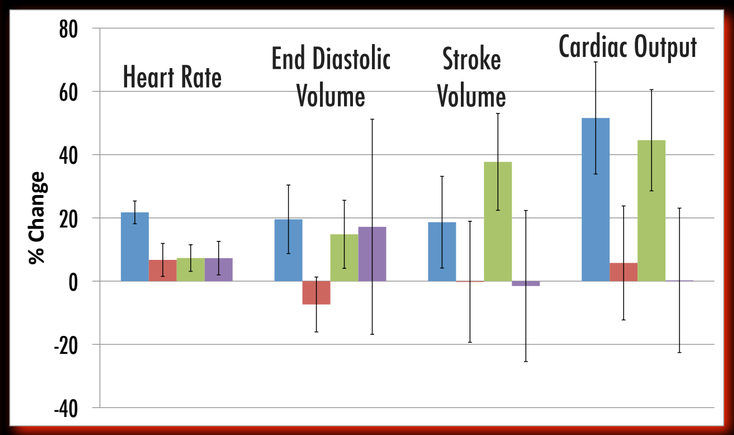
Ringer's Solution (Control) n=33 | Caffeine n=12 | Taurine n=12 | Combination n=13



ACUTE (10 Minute) Effects of High Doses of Caffeine and Taurine on Cardiac Parameters
(% Change relative to pre-measurement values)

* - A possible protective effect in the combination solution.

* - A possible additive effect in the combination solution. This decrease is significantly different than the decrease caused by caffeine alone.

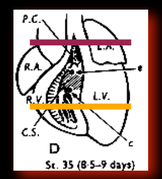


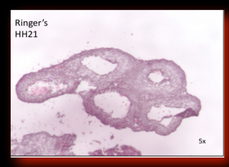
CHRONIC (3 hour) Effects High Doses of Caffeine and Taurine on Cardiac Parameters
(% Change relative to pre-measurement values)

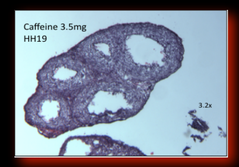
★ = $p < 0.05$ relative to Ringer's Solution (unpaired samples t-test)

RESULTS - SPECIFIC AIM 2:

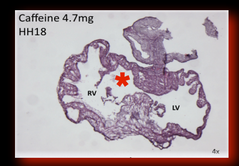
Ringer's Solution (Control) | Caffeine (High Dose)







There was no observed difference in the upper heart.



* - A ventricular septal defect.

The observed LD_{50} for caffeine was 0.24mg. No embryos treated with taurine survived.

SUMMARY:

- Treatments showed significant acute negative effects on heart function.
- Taurine demonstrated possible additive and protective effects when combined with caffeine.
- Acute effects diminished after 3 hours.
- After 9 days, no embryos treated with taurine or combination survived.
- Observed a ventricular septal defect in an embryo treated with high dose of caffeine.

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