



# Poly(I:C) dose response and its effects on piglet sickness behaviors

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## Introduction

- Viral outbreaks in swine herds lead to extensive testing, isolation, and management costs.
- Polyinosinic-polycytidylic acid (Poly(I:C)) is a viral mimetic commonly used in pig and rodent models to analyze sickness responses (1).
- Greater understanding of the behavior response to Poly(I:C) dose is essential to curb viral outbreak management costs.

## Objective

To compare the effects on piglet behavior:

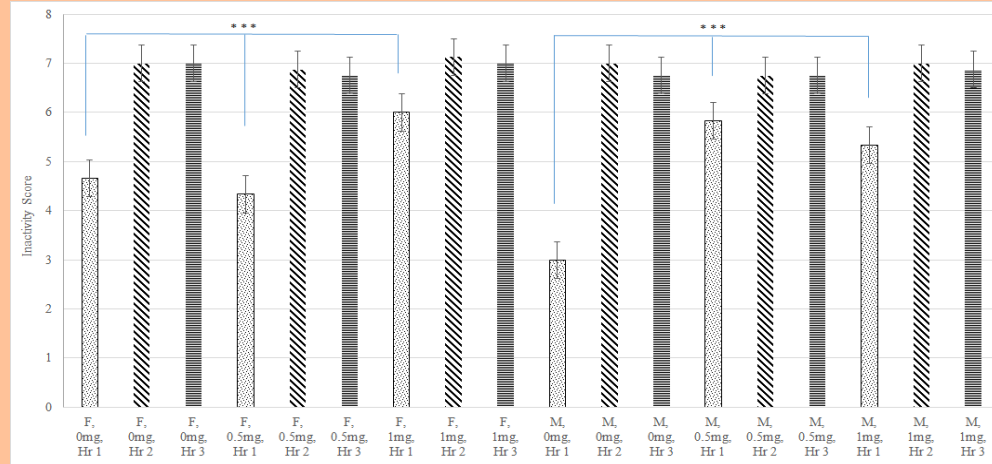
- of different Poly(I:C) doses,
- at different times post Poly(I:C) challenge,
- across sexes, and
- encompassing different types.

## Methods

- Ten female and male piglets from the University of Illinois swine herd, averaging 24.5 kg, were isolated at approximately 60 days of age
- Piglets were either given a Poly(I:C) dose of 0.5 mg/kg, or 1.0 mg/kg, or a comparable dose of Saline.
- Post injection, sickness behaviors and inactivity levels were recorded in 15-minute intervals by a trained experimenter blinded to treatment groups for three hours.
- Sickness behaviors included vomiting, diarrhea, or shivering.
- Inactivity was scored 1 through 8 with lower levels indicating running, medium levels indicating walking, and higher levels indicating laying behaviors
- The binary sickness behavior and discrete activity levels of 130 observations evenly distributed across sex were analyzed using a general mixed effect model using the statistical software SAS v 14.2 (2).
  - Effects included Poly(I:C) dose, hour, sex, and interactions
  - The model also included a repeated structure within piglet
- All animal care and experimental procedures followed the National Research Council Guide for the Care and Use of Laboratory Animals and were approved by the University of Illinois Institutional Animal Care and Use Committee.

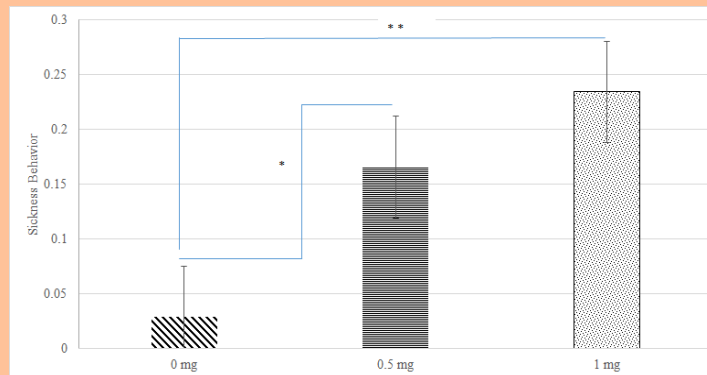
## Results

**Figure 1.** Inactivity score (estimate and standard error of the mean) by Poly(I:C) dose (0, 0.5, or 1 mg/kg of body weight), sex (F=female or M=male), and hour (Hr 1, 2, or 3) after injection.



\*\*\*: differences between Poly(I:C) doses within sex in hour 1 significant at P-value < 0.005

**Figure 2.** Probability of sickness behavior (estimate and standard error of the mean) by Poly(I:C) dose (0, 0.5, or 1 mg/kg of body weight).



\*\* and \*: Difference between Poly(I:C) doses significant at P-value < 0.005, and P-value < 0.05, respectively

## Results & Discussion

- Poly(I:C) had a significant effect on activity levels within one hour post injection, with Poly(I:C) injected piglets having lower activity levels (higher inactivity score) in males (P-value < 0.001) and females (P-value < 0.004).
- During the first hour post injection, all piglets administered the 1 mg/kg dose presented a higher inactivity score while only males presented a higher score for the 0.5 mg/kg dose.
- The previous findings are consistent with reports of decreased pen movement and increased lethargy in growing piglets challenged with Salmonella (3).
- A higher dose needed in females is also consistent with reports of female mice needing a higher Poly(I:C) dose to experience a consistent temperature difference between control and treated groups (1).
- Poly(I:C) treatment also had a significant effect on sickness behaviors in both the 0.5 mg/kg dose and the 1.0 mg/kg dose (P-value < 0.05, and P-value < 0.005 respectively).
- The probability of the sickness behavior was 0.03, 0.18, and 0.23 for piglets treated with Saline, 0.5mg/kg Poly(I:C), and 1.0 mg/kg Poly(I:C) respectively.
- These results are consistent with the inactivity scores with a 1 mg/kg dose having the highest probability, the 0.5 mg/kg dose being intermediate, and the saline dose being the lowest.
- The previous result is in agreement with previous studies of Poly(I:C) injected mice having a higher body temperature when compared to Saline injected (1, 4).

## Conclusions

Our results demonstrate that Poly(I:C) is an effective agent in the study of the behavioral responses to viral infections in piglets.

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