



Quantification of the Effects of Age on the Dose Response on Variola major in Suckling Mice.



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Introduction

Stochastic epidemic models
 (SIR, SEIR, etc.)
 (Dose response, age dependency, etc.)
 (Probability of infection, etc.)

Mathematical Models

Stochastic epidemic models
 (SIR, SEIR, etc.)
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Age Group	Number of Mice	Number of Infections	Probability of Infection
0-10 days	10	1	0.1
11-20 days	10	2	0.2
21-30 days	10	3	0.3
31-40 days	10	4	0.4
41-50 days	10	5	0.5
51-60 days	10	6	0.6
61-70 days	10	7	0.7
71-80 days	10	8	0.8
81-90 days	10	9	0.9
91-100 days	10	10	1.0

1. The first 10 mice are infected by a single exposure.
2. The next 10 mice are infected by a single exposure.
3. The next 10 mice are infected by a single exposure.
4. The next 10 mice are infected by a single exposure.
5. The next 10 mice are infected by a single exposure.
6. The next 10 mice are infected by a single exposure.
7. The next 10 mice are infected by a single exposure.
8. The next 10 mice are infected by a single exposure.
9. The next 10 mice are infected by a single exposure.
10. The next 10 mice are infected by a single exposure.

Stochastic Models and Models

Dose Response Models (Dose-Response)

$$P(d) = 1 - e^{-\beta d}$$

$$P(d) = 1 - e^{-\beta d^\alpha}$$

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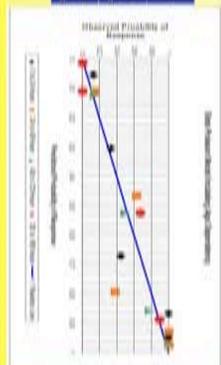


Figure 1: Observed probability response compared to observed probability of response.

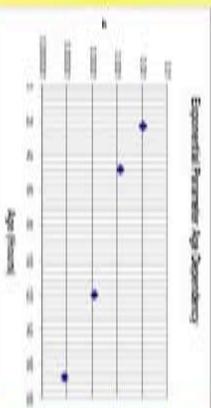


Figure 2: Exponential dose response model parameter age dependency model analysis.

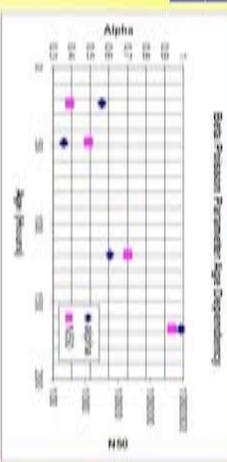


Figure 3: Beta Parameter dose response model parameter age dependency model analysis.

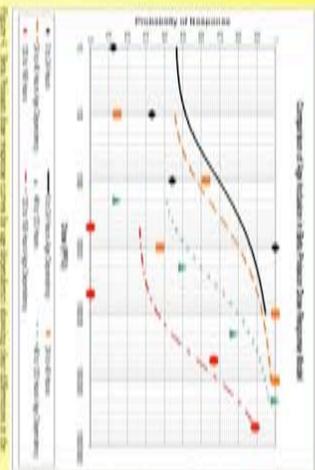


Figure 4: Beta Parameter dose response model parameter age dependency model analysis.

Conclusions

The model system of beta for beta parameter and exponential model (Table 3) showed an improvement in the fit to the data.

This represents the best quantitative representation of how age may influence dose response models.

This work shows the potential of the current dose response models to be adapted to the age-dependent and physiological systems.

Future work could include how actual demographic is to be used, allowing for matching how demographics influence the understanding of the dose response of this and other pathogens.

Acknowledgments

This project was funded through the Center for Advancing Molecular Risk Assessment (Center for Excellence in the Department of Biomedical Sciences, Systems and Molecular Sciences, Office of University Programs, Department of Education, System, Association in a Series of Research Field, Dr. Stanley S. Bernard, Drexel University).

