

Topic:
Statistical Methods for Analyzing Clustered
Discrete Data: Applications to Teratology Studies

Abstract

An important problem in the analysis of data from teratology studies is to determine if maternal exposure to a suspected toxicant has significant dose-related adverse effects on fetal development. In preclinical laboratory experiments, such studies usually involve pregnant rodents, and the toxicity endpoints that are evaluated include fetal malformation, death/resorption and low fetal weight. Thus the data points from such studies are clustered within litters. When there are no important litter specific covariates, or when litter specific covariates are random, it is reasonable to assume that outcomes within litters are exchangeable. In this talk, we give an overview of recent developments for analyzing such data: Specifically we describe

1. Procedures for generating parametric models using Laplace transforms
2. A Bayesian procedures implemented Markov Chain Monte Carlo,
3. A Nonparametric method for testing based on stochastic ordering.

For the illustrations and comparisons, we analyze some standard developmental toxicology data. These include the Shell Toxicology Laboratory data on the developmental effect of a chemical agent on banded Dutch rabbits and the National Center for Toxicological Research (NCTR, Food and Drug Administration) data on the developmental effect of the compound 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) on several strains of mice.