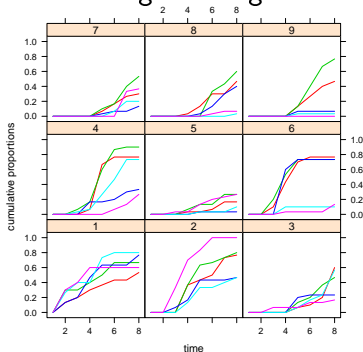


A random effects continuation-ratio model for replicated toxicological data

Biological control of *Heterotermes tenuis* termites using the fungus *Beauveria bassiana*.

Experiment :

- 142 isolates of the fungus
- 1 solution of each isolate applied to 5 groups of 30 insects
- Cumulative mortality measured during an 8-day period



Objective : Determination of effective isolates for use in the field by taking into account the replicated data structure.

The model : a random effect continuation-ratio model

- Model the number of deaths on a day conditional on the number at risk, i.e. those surviving up to that day
- Can be fitted using methods for binomial logit models merely by a rearrangement of the data
- Variability observed among the replicates \leftrightarrow Introduction of an additive random intercept

Estimation method : an EM-algorithm

- 1 **E-step : Likelihood approximation**
 - \leftrightarrow Two integration methods $\left\{ \begin{array}{l} - \text{Adaptive Gaussian quadrature} \\ - \text{Ordinary Gaussian quadrature} \end{array} \right.$
- 2 **M-step : Maximization step**
 - \leftrightarrow Weighted fitting

Final result

- Isolates grouped into 3 clusters : strongly, intermediate and weakly virulent.