

**Toxicological Modeling: Uncertainty and Techniques**  
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**Introduction:**

In this problem set you will explore uncertainty in the context of toxicological modeling. You are encouraged to work as a group, but each student should submit a separate and clearly original solution set. All descriptions and explanations should be in your own words, since you need to show that you understand what the question is asking.

**Deliverables:**

Please submit your problem set at or before the start of class, but keep a copy for your own reference. You are welcome to submit materials electronically. Please refer to the handout "Guidelines for Submitting Risk Analysis Problem Sets."

**One:**

In lecture, I present a "typology" of uncertainty. Frame the uncertainties in problem 5-1 in the context of this typology. Present and discuss examples for at least 6 of the 8 types of uncertainty.

**Two:**

Consider the data in table 5-2 (page 175 of *SWRI*) for rats exposed to 1-3 butadiene.

- a. Graph these data (probability as a function of dose).
- b. Calculate the tumor probability associated with each dose level. (See the equation at the bottom of page 167).
- c. Discuss whether a linear model would be reasonable for these data. To do this, find a linear model from the highest response to the origin (0,0). Then use the average response rate to calculate the  $r$  (see handout) and  $\chi^2$  (equation 3-13). Discuss your findings.
- d. Propose an alternate model to the linear model. Demonstrate that it better explains the data by computing the  $r$  and  $\chi^2$ , and comparing your results with those in two above.