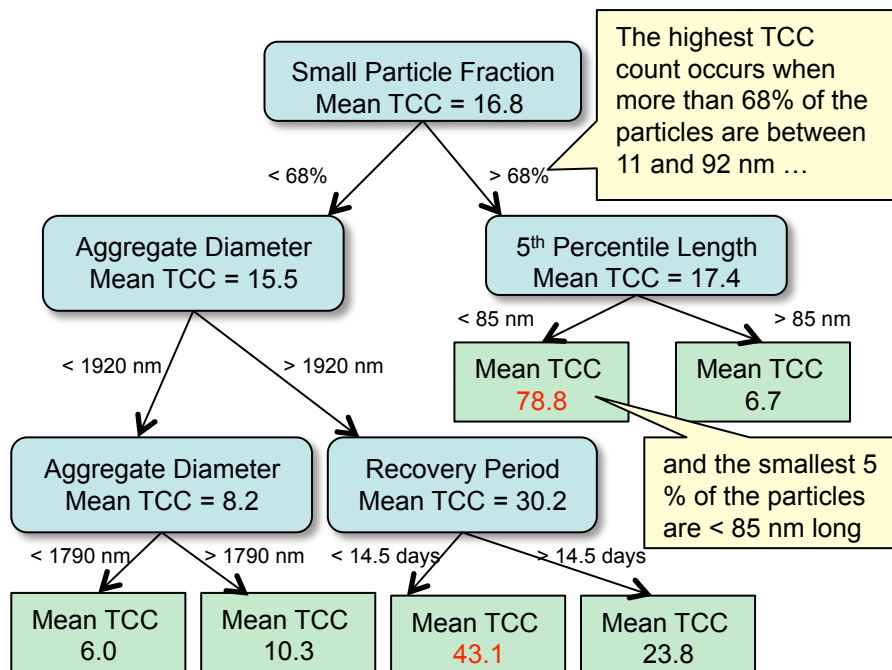# Mapping Nanoparticle Properties to Toxicity

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Regression Tree Analysis was used to perform a meta-analysis of 8 rodent inhalational toxicology studies of carbon nanotubes (CNT) to identify and rank the important predictive variables.

Regression Tree for Total Cell Count (TCC) in BAL Fluid

Small Particle Fraction
Mean TCC = 16.8

The highest TCC count occurs when more than 68% of the particles are between 11 and 92 nm …

< 68%

> 68%

Aggregate Diameter
Mean TCC = 15.5

5th Percentile Length
Mean TCC = 17.4

< 1920 nm

> 1920 nm

< 85 nm

> 85 nm

Mean TCC
78.8

Mean TCC
6.7

Aggregate Diameter
Mean TCC = 8.2

Recovery Period
Mean TCC = 30.2

and the smallest 5 % of the particles are < 85 nm long

< 1790 nm

> 1790 nm

< 14.5 days

> 14.5 days

Mean TCC
6.0

Mean TCC
10.3

Mean TCC
43.1

Mean TCC
23.8

Major findings:

- Different CNT properties were associated with different toxicological endpoints measured in BAL fluid (e.g., immune response, inflammation, cell damage).

- For Total Cell Count, there are two size-related responses, the more severe associated with high doses of short CNT fragments, the other one associated with large aggregate sizes > 2μm.

- For Total Protein concentration, the impurities in the CNTs are the most important variables.

- The mode of exposure (instillation vs. inhalation) has very little effect on toxicity outcomes relative to the other variables like dose and CNT geometry.

- The most information-rich measure of dose for CNTs is by mass, however limitations in particle count and surface area measurement methods may explain this.

- Mouse and rat studies are comparable for outcomes measured on a relative-change-from-control basis.

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