

The choice of statistical methods is quite large. For the evaluation of biotests, you only need very specific ones.

ToxRat has all the tools you need.

And it knows which method is suitable for which data.

Hypothesis testing

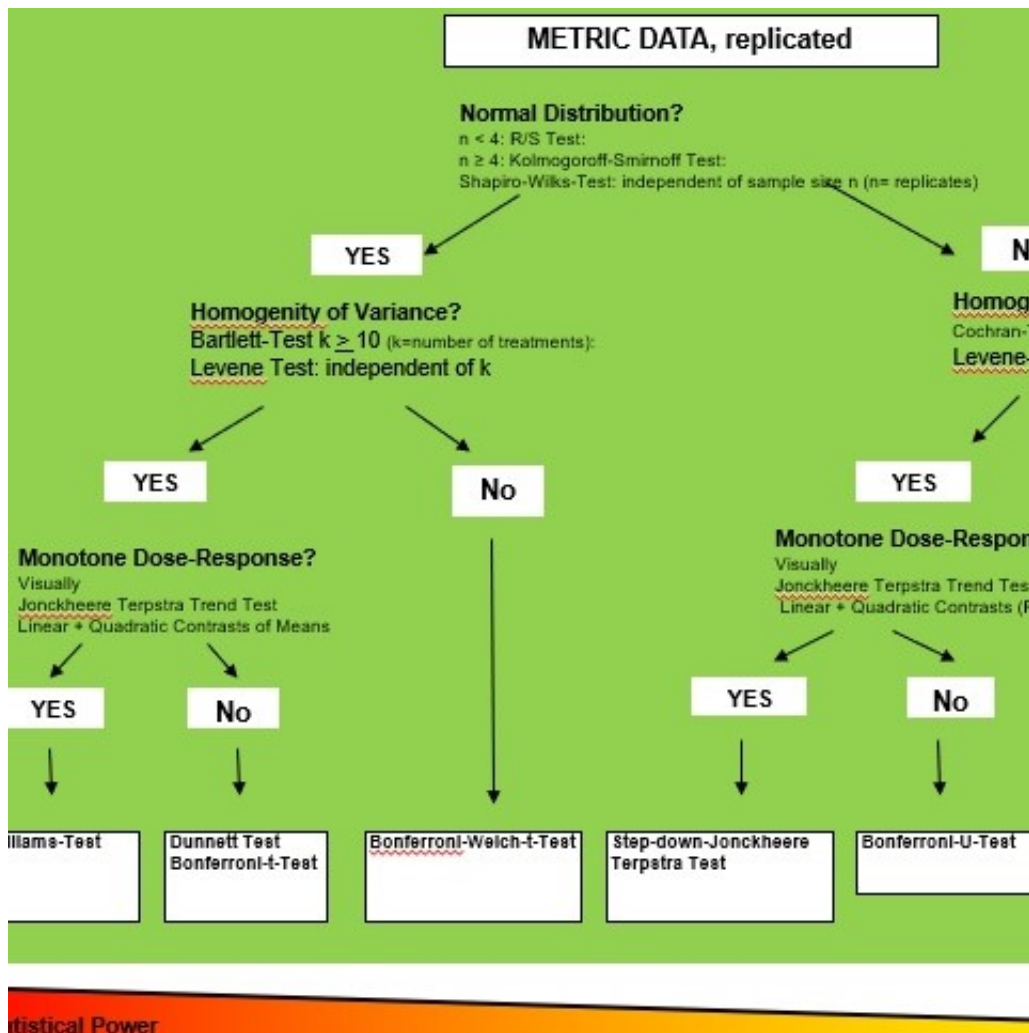
Simple statistics:

- mean, median, standard deviation, coefficient of variation, confidence interval, minimum and maximum

Statistical testing

- **Variance analysis** (ANOVA, Kruskal-Wallis Test, χ^2 - and exact contingency table tests)
- **Analysis of Variance plus Trend** (Jonckheere-Terpstra, Cochran Armitage)
- **Pretests on normal distribution** (R/S-Test, Kolmogorov-Smirnov Test, Shapiro Wilks Test)
- **Pre-tests on homogeneity of variance** (Cochran, Bartlett, Levene, Tarone test for extrabinomial variance)
- **Tests for monotony** (linear + quadratic contrasts, (Rao-Scott-) Cochran Armitage Trend Test, Jonckheere-Terpstra Trend Test)
- **Pairwise (two-sample) comparisons** (Student-t-Test, Welch-t-Test, Mann-Whitney-U-Test, Mediantest, Fisher Exact Binomial Test, χ^2 Fourfold Table Test)
- **Multiple Comparisons** (t-Test with Bonferroni-Correction, Dunnett Test, Williams Test, Welch-t-Test with Bonferroni-Correction, Step down Jonckheere Terpstra Test, Bonferroni-Median test, Wilcoxon-Mann-Withney-U-Test with Bonferroni Correction, Step down (Rao Scott-) Cochran Armitage Test, χ^2 - and Fisher Exact Test with Bonferroni Correction)
- **Tests for outliers** (Dixon/Grubbs, Hampel outlier test)

Several **data transformations** available



Point Estimation - linear regression, interpolation

Dose-Response-Curves / Find effect levels: up to 6 user definable effect levels, 95% Confidence limits

Linear regression (metric and quantal variables):

- Functions: Probit, Logit, Weibull
- Fitting algorithms: linear / linear weighted / linear max. likelihood
- Confidence limits: Fieller's Theorem, Normal Approximation, Bootstrap procedure
- Correction of variance for covariance of control
- Abbott Correction
- Parallel Line Assay and Potency Estimation

Interpolation methods to determine the EC50 for quantal data:

(Trimmed) Spearman Kärber, Moving Averages, Binomial estimation

Methods Based on Dose/response-Functions

Linear Regression

<p>Available Functions</p> <p><input checked="" type="radio"/> Probit, Normit</p> <p><input type="radio"/> Logit</p> <p><input type="radio"/> Weibull</p> <p><input type="radio"/> Linear (straight line)</p>	<p>Algorithm</p> <p><input type="radio"/> Linear regression</p> <p><input type="radio"/> Weighted linear regression</p> <p><input checked="" type="radio"/> Linear max. likelihood regression</p>
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Use replicates while fitting

<p>ECx-Confidence Limits Based on</p> <p><input checked="" type="radio"/> Fieller's Theorem</p> <p><input type="radio"/> Normal Approximation</p> <p><input type="radio"/> Bootstrap (only replicated metric data)</p>
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Data Adjustment for Normal Distribution

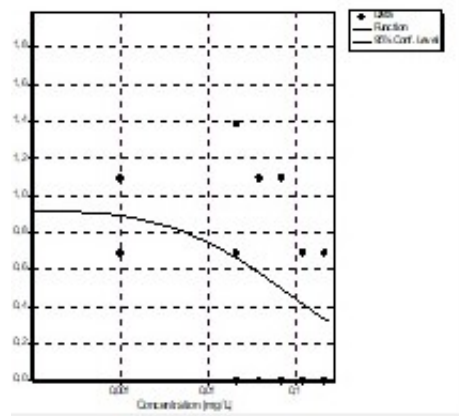
In case responses are less than 0% or greater than 100%, you may wish to replace those values by ones slightly greater than 0% or smaller than 1 (Pre-set x%: you may enter a value x which replaces those $\leq 0\%$ ($\geq 100\%$: $100\% - x$)).

Point Estimation - non linear regression

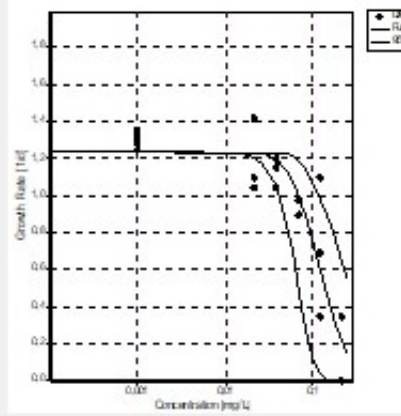
Non-linear regression

- 2-3-4 parameter Normal, Sigmoid (Bruce-Versteeg)
- 2-3-4 parameter Logistic
- 2-3-4 Parameter Weibull
- Weighting: relative, Poisson, by variability
- Optimization methods: Levenberg-Marquardt, Downhill-Simplex
- Confidence limits: Monte Carlo Simulation, Bootstrap procedure

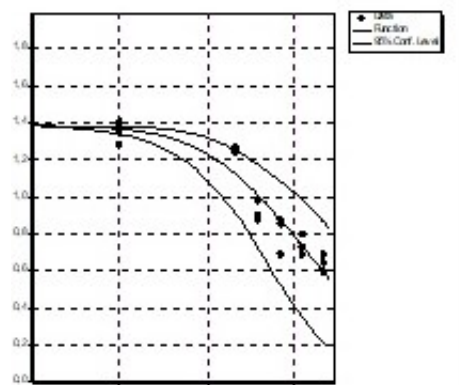
Growth Rate Response Curve 0 - 24 h



Growth Rate Response Curve 0 - 48 h



Growth Rate Response Curve 0 - 72 h



Growth Rate Response Curve 0 - 96 h

