

Background Resources on Detection and Quantification

- For a good general introduction to the various considerations that go into deriving Data Quality Indicators for method sensitivity and an overview of the current concepts we recommend section 3.5 on "Sensitivity", from the following EPA guidance document:

USEPA Office of Environmental Information, Quality Staff, "Guidance on Data Quality Indicators" (Peer Review Draft) EPA QA/G-5i, September 28th, 2001

For an understanding of the statistical underpinnings and fundamental regulatory concepts of the detection and quantification issue a must have resource is the following book by Robert Gibbons and David Coleman:

Robert E. Gibbons & David D. Coleman, "Statistical Methods for Detection and Quantification of Environmental Contamination", John Wiley & Sons, 2001

We recommend the following chapters (in the order given)

- Chapter 2, "Conceptual Foundations"
- Chapter 5, "Single-Concentration-Based Detection Limits"
- Chapter 6, "Single-Concentration-Based Quantification Limits"
- Chapter 12, "Comparison of a Single Measurement to a Regulatory Standard"
- Chapter 3, "Statistical Foundations and Review"
- Chapter 4, "Calibration-Based Regression Models"
- Chapter 7, "Calibration-Based Detection Limit Methods"
- Chapter 8, "Calibration-Based Quantification Limit Methods"

Dr. Lloyd Currie has many publications out on this subject, but we recommend the following as the most germane to the FACDQ. The readers should decide how deeply they want to delve into the statistical theory of detection and quantification. We will list them in order from the simplest to the most complex.

Currie, L.A. and Horwitz, W., "IUPAC Recommendations for Defining and Measuring Detection and Quantification Limits", *Analisis Magazine*, Vol 22, pp. M24-M26, 1994

Currie L.A., "Nomenclature in Evaluation of Analytical Methods Including Detection and Quantification Capabilities", *Pure & Appli. Chem*, Vol 67, No. 10, pp. 1669-1723, 1995

Currie L.A., "Detection: International Update, and some Emerging Dilemmas Involving Calibration, the Blank and Multiple Detection Decisions", *Chemometrics and Intelligent Laboratory Systems*, Vol 37, pp. 151-181, 1997

Currie L.A. (Editor), "Detection in Analytical Chemistry, Importance, Theory and Practice", ACS Symposium Series 361, 191st Meeting of the American Chemical Society, April 13-18, 1996

The following chapters from the above symposium may be of particular interest:

- Chapter 1, "Detection: Overview of Historical, Societal and Technical Issues" by Lloyd Currie
- Chapter 2, "Realistic Detection Limits and the Political World" by Mike McCormack
- Chapter 3, "Scientific Measurements and Data in Public Policy-Making" by Thomas Moss
- Chapter 4, "Estimation of Detection Limits for Environmental Analytical Procedures: A Tutorial" by Cliff Kirchmer
- Chapter 5, "Interlaboratory Aspects of Detection Limits Used for Regulatory and Control Purposes" by L. B. Rogers
- Chapter 16, "Real-World Limitations to Detection" by Dated Kurtz et. al.