Integrating SAS JMP® into the Research Process Moves Analytics from the Statistician’s Desktop to the Laboratory Benchtop.

John P. Davies Jr., Dr. Teri Lalain, Edgewood Chemical Biological Center, APG MD 21010

Abstract
This Decontamination Sciences Branch (DSB) of the U.S. Army Edgewood Chemical Biological Center (ECBC) makes an effort to spread statistical knowledge and awareness throughout the organization. Experience shows that it especially benefits for those who are not typically exposed to and generating data that are proficient in basic statistical tests such as t-test, ANOVA, and Tukey-honest. The DSB uses JMP® and has incorporated it into all levels of decontamination research ranging from ANOVA to multivariate regression analysis and DOE. In addition to the analysis of single day tests, JMP® was recently utilized for a methodology validation using ISO 5725. The interactive capabilities and dynamic visual analytics were useful not only as a tool for statistical analysis but also as a vehicle to help permeate statistical understanding throughout the DSB from principal investigators to laboratory technicians. Because JMP® has a wide range of capabilities, from advanced analytics to univariate distribution functions combined with embedded help features, it supports the advanced or novice analyst. This flexibility gives JMP® a wide appeal that makes it particularly well suited for use throughout all levels of the organization. The ability to rapidly view data from many different perspectives, make discoveries, and quantitatively support conclusions is both satisfying and empowering to the individual. As more experienced analysts experience hands-on data exploration, data analysis evolves from qualitative generalizations ("gut feelings") toward analysis based on numerical statistical calculations.

Introduction
The DSB of ECBC, performs chemical warfare agent decontamination testing over a wide range of conditions. Experimentation is a highly multivariate nature and may involve numerous factors relating to substrate materials, temperatures, contamination times, decontamination formulations, and decontamination agents. With each of these factors combinations there may be several measured responses of interest. Additionally, covariate values in the form of atmospheric fluctuations and other uncontrollable factors can also be recorded. The multitude of factors and responses creates a challenging multivariate environment where efficient data management and analysis become essential. The means of deciding the new data and analysis within the organization becomes a critical aspect of the research process. ECBC utilizes the SAS JMP® statistical software package to meet these challenges. JMP software has been integrated directly into the research process flow from start to finish and is utilized across many levels of the organization by program managers, chemists, experimental designers, laboratory technical personnel, and statistical analyst.

Benefits of Integrating Analytics into the Research Process
- Having a standard analytical software eliminates the need for multiple input/output in and out of various spreadsheets or databases and allows for raw data, analyses, and ideas to be quickly shared. This is done in JMP through the use of shared data tables with scripted analysis attached directly to the data table. This allows for the thought process to flow between departments as one analysis builds on top of the other.
- Graphics and analysis techniques become standardised through the use of JMP scripted analysis and graphic templates. This increases efficiency and reduces the time from laboratory experimentation to final report.
- Providing laboratory personnel with an analytical tool allows them to perform real-time preliminary analysis of the data which can be particularly beneficial since they have the best “feel” for the non-biological aspects of the data.
- Having an integrated statistics package in which people are proficient with the basic analysis platform creates a foundation for teaching the more complex forms of statistical analysis.
- Providing all levels of the organization with a “hands on” data analysis increases the awareness of the importance of statistical concepts such as randomization, blocking, balanced design, and orthogonality.
- Integrating statistical software into all levels of the organization fosters an environment of quantitative thought where decisions are more likely to be data based.

Summary
There are numerous benefits of having a single statistical software package integrated throughout the research process flow. Perhaps the most valuable is that all levels of the research organization are given the ability to share data and statistical analysis in a highly efficient manner. In this way, JMP® effectively becomes a consolidated data transfer of data, ideas, and discoveries between personnel from all phases of the research process. When entire teams are all engaged in analytics the organization as a whole becomes more focused on the goal of transforming raw data into useful information.

JMP FACILITATES PROGRESSION OF DATA ANALYSIS

Research Question: What are the effects of test parameters/conditions on the decontamination performance?

Research Question: What is the most efficient experimental design to identify active factors and then optimize decontamination?

Research Question: From a Quality Control standpoint, what are the root-causes of experimental noise?