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Gill J L & Hafs H D. Analysis of repeated measurements of animals. *J. Anim. Sci.* 33:331-6, 1971.
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This paper pointed out common misuses of statistical analysis of longitudinal data from experiments with animals. Correct procedures were presented in a way useful to biologists, and emphasis was given to examination of assumptions required for valid statistical inference. [The *SCI*® indicates that this paper has been cited in over 315 publications, making it the most-cited article from this journal.]

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During the 1960s, collection of longitudinal data in studies on reproductive physiology was enhanced greatly by the introduction of radioimmunoassays. With the rapid increase in data, it became apparent to us that many scientists didn't understand the difference between proper analyses of completely randomized factorial experiments and proper analyses of those with the split-plot (split-error) structure that arises when animals are measured repeatedly to assess rates of response to treatments. Furthermore, many who were performing ostensibly correct analyses seemed unaware that some of the assumptions associated with univariate analysis of variance often are violated (usually because of heterogeneity of the variance-covariance matrix with respect to time).

We set out to write a statistical methodology paper that would provide details of analysis and examination of assumptions in a way that could be appreciated readily by biologists. Two of our colleagues, Paape and Tucker,[1] had recently finished an experiment that included some data on the influence of pregnancy on concurrent lactational performance of rats, as measured by gains in weight of foster litters replaced every four days. We found those data to be a good vehicle for explaining the required statistical manipulations because they incorporated two aspects frequently found in longitudinal experiments: (1) strong, positive correlations between successive measurements and (2) heterogeneity of the variance-covariance matrix over time.

While I was on sabbatical leave at the University of New South Wales in Sydney, Australia, I received the reviews of the manuscript. As the attitudes of the reviewers clearly were very positive, I felt that the paper would be well received by the intended readers. That, of course, has been borne out by the subsequent citation frequency. I believe that the high rate of citation occurred because the paper presented a widely useful general methodology and because the timing was right. Whereas behavioral scientists had been made aware of the problems with longitudinal data by reading texts such as those produced by Winer[2] and Kirk,[3] none of the statistical books commonly referred to by animal scientists included much (if anything) about the topic. The fact that my coauthor already was highly respected for his research in the physiology of reproduction undoubtedly helped to draw immediate attention to our paper.

General acceptance of the paper and the importance of the topic for a wide spectrum of research disciplines inspired me to write a text that contains extensive coverage of analysis of repeated measurements.[4] In the years since the publication of my book, other facets of the subject have been explored. Some of those results can be found in a major review[5] and in a recent article of mine.[6]

1. Paape M J & Tucker H A. Mammary nucleic acid, hydroxyproline, and hexosamine of pregnant rats during lactation and post-lactational involution. *J. Dairy Sci.* 52:380-5, 1969.
2. Winer B J. *Statistical principles in experimental design.* New York: McGraw-Hill, 1962. 672 p.
3. Kirk R E. *Experimental design: procedures for the behavioral sciences.* Belmont, CA: Wadsworth, 1968. 577 p.
4. Gill J L. *Design and analysis of experiments in the animal and medical sciences.* Ames, IA: Iowa State University Press, 1978. Vol. 2. 301 p.
5. Koch G G, Amara I A, Stokes M E & Gillings D. Some views on parametric and non-parametric analysis for repeated measurements and selected bibliography. *Int. Statist. Rev.* 48:249-65, 1980.
6. Gill J L. Repeated measurement: sensitive tests for experiments with few animals. *J. Anim. Sci.* 63, 1986. (In press.)

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