

A GENERAL APPROACH FOR THE ANALYSIS OF REPEATED MEASURES EXPERIMENTS

A. P. VERBYLA and B. R. CULLIS

1. INTRODUCTION

Over the past decade, there has been great interest in developing methods for analysis of repeated measures data. The major papers in the area promote statistical modelling to extract structure from the data which is often of prime interest to the researcher. The papers by LAIRD and WARE [9], DIGGLE [5], and CULLIS and MCGILCHRIST [3], as well as those by the authors are but a few examples. The reason for these developments is the desire to provide relevant, comprehensive and comprehensible analyses for complex situations.

Our approach outlined below can be found in three papers, VERBYLA and CULLIS [15], CULLIS and VERBYLA [4] and VERBYLA and CULLIS [16]. We feel the approach is comprehensive because it handles

- complete or *incomplete* data
- time-dependent covariates
- between experimental unit dependence through *blocking or spatial correlation* as well as temporal correlation
- modelling of treatment contrasts using linear and nonlinear models and smoothing techniques

Our approach is relevant and comprehensible because we strive to elicit as much structure as possible from the data and hence to answer the questions of interest to the researcher. Our analyses in section 5 illustrate the value of the approach.

We carry out our analysis as follows.

- Treatment effects are examined at each time or a saturated linear model (full treatment structure) is fitted assuming independence.
- Using the residuals from the preliminary fitting, we use one or more of the diagnostics
 - Residual sum of squares and products/correlation matrix
 - correlogram
 - empirical semi-variogram (DIGGLE, [5])

to determine a reasonable covariance structure.