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# *Mathematical modelling cell population growth with applications to cancer therapy in human*

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**Abstract**

In this talk we present an overview of the work undertaken to model a population of cells and the effects of cancer therapy. We began with a theoretical one compartment size structured cell population model and investigate its asymptotic steady-size distribution (SSD). Some mathematical problems related to the asymptotic behaviour of this cell-growth model will be discussed.

However, these size distributions are not similar to the DNA (size) distribution obtained experimentally via the flow cytometric analysis of human tumour cell lines (data obtained from the Auckland Cancer Society Research Centre, New Zealand). A method of getting appropriate behavior with this one compartment model will be considered.

A model that is more closely related to the biology will then be examined. The cell division cycle can be divided into four distinct phases, namely growth one or $G_1$-phase, DNA synthesis or $S$-phase, growth two or $G_2$-phase and finally mitosis or $M$-phase. In our one compartment model, size was a generic term, but in order to obtain realistic steady size distributions we chose size to be DNA content and devised a multi-compartment mathematical model for the cell division cycle where each compartment corresponds to one of the distinct phases of the cell cycle as mentioned above. We then incorporated another compartment describing the possible induction of apoptosis (cell death) from mitosis phase. This enabled us to compare our model to flow cytometric data of a melanoma cell line where the anticancer drug, paclitaxel, had been added. The model gives a dynamic picture of the effects of paclitaxel on the cell cycle.

Some recent theoretical asymptotic results on the multi-compartment models will then be discussed.