

An Automated System for the Culturing and Harvesting of Human Chromosome Specimens

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Summary

This paper describes a system for the automated culturing and harvesting of human chromosome specimens. The machine is capable of handling different preparation methods simultaneously, such as standard blood cell, blast cell and bone marrow cultures, and can be programmed to perform the prophase synchronization techniques. It is composed of a culture tray, centrifuge, mixer, input and output station and a head assembly capable of transporting samples between the various stations. The head is equipped with an aspirator needle to aspirate the supernatant and fluid dispensers for the dosing of the various chemicals. A microprocessor system controls all hardware functions and schedules the manipulations of all samples. The samples (up to a maximum of 255) are processed by the machine in small batches of at most 16, which can be activated at any time according to one of 16 culture procedures. The cytogeneticist can modify these procedures using a simple interpretive language specifying both the types of manipulations, such as centrifugation, addition of chemicals, aspiration of supernatant, and the minimal and maximal variation in time which is allowed between two sequential manipulations. Besides the hardware setup and software organization of the machine, the first preliminary results and future prospects for the machine are presented.

1. Introduction

In the past two decades considerable effort has been devoted to the automation of chromosome analysis. Most of the work was thereby dedicated to metaphase finding, both interactive and automated karyotyping and the automated detection of chromosome aberrations caused by environmental insults. Relatively little attention has been paid to the automation of culturing, harvesting and slide preparation. Although the latter aspects seem to have been neglected, these procedures involve relatively simple manipulations, which can be easily mechanized and do not require any human evaluation. Another argument in favour of automation of preparation techniques is the rather monotonous work pattern involved, while it still takes approximately forty percent of a technician's time.