individuals (see De La Chapelle, 1963). The present investigation shows that it may also occur sporadically due to unknown causes under apparently well controlled culture conditions.

5. SUMMARY

1. In a leucocyte culture from a normal male, some of the acrocentric chromosomes of groups D and G have quadripartite satellites with four separate stalks.

2. Some of the acrocentric chromosomes of both groups also have enlarged satellites. The structure of the satellites varies in different cultures made from the blood of the same individual.

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THERMO-ELECTRIC COOLING FOR MAKING PERMANENT CYTOLOGICAL PREPARATIONS *

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Received 8.ix.67

THE rapid freezing of cytological preparations for the removal of coverslips is widely recognised as quick, reliable and superior to the traditional cytological procedures. However, the necessity for either "dry ice" (Conger and Fairchild, 1953) or liquid carbon dioxide (Bowen, 1955) to produce the low temperature required has, on occasions, restricted the use of the technique.

* Demonstrated at the Second Oxford Chromosome Conference, held at the Botany School and Magdalen College, Oxford, 5th to 8th September 1967.

The recent successful application of thermo-electric cooling to the freezing microtome (Ioffe, 1957; Brown and Dilly, 1962; Hardy and Rutherford, 1962; Rutherford, Hardy and Isherwood, 1964) shows that low temperatures are readily and quickly obtained. The same principle has now been used for the removal of coverslips in the making of permanent cytological preparations.

The instrument (Fig. 1 and Plate 1) contains an insulated 2-stage unit of 8 on 36 thermo-elements, to the top of which is fixed a thin, circular, aluminium plate (38 mm. in diameter) which functions as the cooling stage.

FIG. 1.—Schematic section of freezing unit.

The thermo-elements are supplied with a direct current of up to 15 amps at 4 volts from a variable power unit and the heat is extracted from their lower surfaces by a water-cooled sink.

Operating at 14 amps at normal room temperature, the cooling stage maintains a steady minimum temperature of -58°C. , which, although 21°C. higher than that of solid CO_2 (dry ice), is nevertheless adequate for making cytological preparations. Squashes in either 45 per cent. acetic acid, aceto-carmine or aceto-orcin are frozen within 2-3 minutes, the coverslips are easily removed, leaving, in the majority of instances, all the squashed material on the slide. Permanent preparations can then be made in the usual manner by dehydration followed by mounting in Euparal.

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Plate I

Photograph of the freezing unit.

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MAINTENANCE OF HISTOCOMPATIBILITY POLYMORPHISMS

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Received 17.ix.67

1. INTRODUCTION

BILLINGTON (1964) and James (1965) have shown that the placenta of a mouse is larger if the foetus is antigenically incompatible with the mother (*i.e.* if the mother would reject skin grafted from an individual of the foetal genotype) than if it is compatible. Assuming this to confer a selective advantage on incompatible foetuses, Clarke and Kirby (1966) showed that a balanced polymorphism can be maintained at a histocompatibility locus with two alleles. I will show that a balanced polymorphism with an indefinitely large number of alleles can be maintained if it benefits a foetus to elicit an immunological reaction from its mother.

2. ANALYSIS

Consider a locus with n alleles, $a_1 \dots a_i \dots a_n$, with population frequencies $p_1 \dots p_i \dots p_n$. A foetus is incompatible with its mother if it possesses an allele not present in the mother. Let the relative fitnesses of compatible and incompatible foetuses be $1-s$ and 1 , respectively.

If a sperm carries the allele a_1 , and the mother has the genotype $a_i a_j$, the zygote will be compatible if $i = 1$ or $j = 1$ or both. The probability that an a_1 sperm will enter into a compatible zygote is therefore $1 - (1 - p_1)^2$, or $2p_1 - p_1^2$.

If an egg carries the allele a_1 , two cases must be considered:

1. The female is $a_1 a_1$. The probability of this, given that the egg is a_1 , is p_1 . The zygote is compatible if the sperm carries a_1 . The probability of both these events occurring is p_1^2 .

2. The female is $a_1 a_i$ ($i \neq 1$). The probability of this is p_i . The zygote is compatible if the sperm carries a_1 or a_i ; the probability of this is $p_1 + p_i$.

The net probability that an egg carrying a_1 will become a compatible zygote is the sum of these, with the probabilities in case 2 summed over all values of $i \neq 1$; *i.e.*

$$p_1^2 + \sum_{i \neq 1}^n (p_1 p_i + p_i^2), \text{ or } p_1 - p_1^2 + \sum_{i=1}^n p_i^2.$$

The mean relative fitness of the allele a_1 , *i.e.* the weighted mean fitness of all zygotes into which a_1 enters, is the unweighted mean of the fitnesses of