Table 2. Results of One-Step Growth Experiments with *Vi*-phage *D*1 in Different Hosts and at Different Temperatures

Host culture	Growth temperature (° C)	Latent period (min)	Rise period (min)	Burst size
Type *A*	35·0	38	15	100
	39·5	37	17	160
A(*d*1-E)	35·0	37	13	40
	39·5	35	18	65
A(*d*1-C)	35·0	37	35	12
	38·0	36	40	4
	39·5	?	?	1–2

for *Vi*-typing phage *D*1. The burst size in *A*(*d*1-C), which is considerably lower than that in type *A* and *A*(*d*1-E) at all temperatures, is progressively reduced as the temperature is raised from 35·0° C to 39·5° C. In *A* and *A*(*d*1-E) the burst size of phage *D*1 increases with the rise in temperature. The latent period at all temperatures is the same in each of the cultures, but the rise periods with *A*(*d*1-C) are longer than with the other two cultures (Table 2).

Temperature sensitivity of *Vi*-typing reactions was first observed by Craigie, who found that type *N* of *Salmonella typhi* cross-reacted with several *Vi*-phages of the *D* group. The cross-reactions were abolished by incubation above 38·0° C (ref. 6).

The resistance to viral infection of several plant species is increased by raising the temperature at which the plants are grown[7] and it is possible to cure some virus-infected plants by heat therapy[8]. A similar phenomenon has been observed in animal viruses. For example, it has been shown that the likelihood of survival of mice infected with the MEF_1 strain of poliovirus is increased when the environmental temperature is raised[9]. The Lwoffs[10] have found that raising the temperature of incubation reduces the viral yield of tissue cultures infected with attenuated vaccine strains of poliovirus more so than that from cultures infected with a highly neurovirulent wild strain. Mutants of this virus have been isolated which develop preferentially at either a high or a low temperature, and it has been found that the former are usually the more virulent[11a,b].

The phenomenon reported here resembles that found in plants and animals but differs from them in that it is not the intrinsic phage resistance of the bacterial host which is modified, or the virulence of the infecting phage. It is essential that the bacterium carries a prophage such as *d*1-C which confers, on the phage-host cell complex, temperature sensitivity in relation to multiplication of the superinfecting *Vi*-phage.

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Minimum Requirements for Heterotrophic Growth, and Reserve Substance in *Beggiatoa*

Cataldi[1] has shown that *Beggiatoa*, instead of living autotrophically on the oxidation of hydrogen sulphide, can grow heterotrophically on proteinacious substances. Faust and Wolfe[2] observed stimulation by acetate.

We found that most of our 14 strains isolated bacteria-free thrive on acetate, and some other organic salts, as the only organic nutrients, provided the necessary chemical elements are supplied. They utilize inorganic nitrogen and do not require growth substances. This appears to be the simplest medium imaginable for a chlorophyll-free organism.

Beggiatoa is much favoured by aeration. The growth is then dense enough to collect ample material for biochemical purposes. In such circumstances the cells are eventually stuffed with small spherical to oblong bodies slightly less refractive than the sulphur droplets in natural material. These bodies turned out to be poly-β-hydroxybutyric acid.

The utilization of acetate occurs with the help of isocitratase, the main enzyme of the glyoxylic acid cycle. This enzyme is produced not only when the organism lives on acetate but also when aspartate or glutamate is the only substrate.

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CYTOLOGY

A Ring Chromosome in Man

The known chromosomal abnormalities in man comprise mainly whole chromosome and segmental monosomy and trisomy. Ring chromosomes have been described in tumour stem lines[1,2] and in normal tissues following irradiation[3]. Recently a ring *X*-chromosome has been reported in a female with gonadal dysgenesis[4]. A self-perpetuating ring chromosome is now described in a mentally and physically retarded but pubertal male. A full clinical description of the case is being published elsewhere[5].

Cytological investigations have been made of cultured and uncultured peripheral blood, cultured skin tissue, and bone marrow. All mitoses in the bone marrow and most in the cultured leucocytes and skin were found to contain 45 rod chromosomes plus a monocentric ring (Fig. 1). In the cultured tissues a proportion of mitoses with 45 rod chromosomes only were observed (Table 1). Karyotype analyses indicated the absence of one member of the 6–12 chromosome group (Denver classification) in cells possessing the ring chromosome. The size of the ring was found to be consistent with the assumption that it represents this missing chromosome.

Table 1. Karyotype Frequencies

Tissue	Karyotypes: 45 rods only	45 rods + ring
Cultured leucocytes	39	194
Skin	5	31
Bone marrow	0	19

The ring is generally synchronous with the rest of the chromosome complement in mitosis, but shows a significant variation in mean length (Table 2). At late prophase and at metaphase the two chromatids of the ring usually lack relational coiling (Fig. 2), and at anaphase the two daughter chromosomes separate without interlocking. In occasional anaphases interlocked or dicentric rings are present, and these may bridge the anaphase or may lag and be excluded from the daughter nuclei (Figs. 3 and 4). Conformably, micronuclei have been observed in both cultured and uncultured leucocytes.

The observed variation in the size of the ring must result from breakage and re-union of bridged dicentric or interlocked rings. Lagging and exclusion of such rings must also generate the nuclei with 45 rod chromosomes only,