Since tan α is a function of the molecular length and of the intermolecular interaction these results are consistent with a picture of DNA in which the two polynucleotide chains forming the double helix separate when all the hydrogen bonds involving cytosine and most of those involving adenine are broken by titration. On back titration to neutrality the double helix is not re-formed. The single chains, below pH 3.8, show much greater flexibility and smaller asymmetry than the unchanged DNA molecule.

This work is being extended to lower concentrations of DNA where the value of tan α (*i.e.* $(\tan \alpha)_0$) is independent of concentration, to obtain estimates of the molecular dimensions, and to the alkaline side of neutrality. At pH 6.0, $\log (\tan \alpha)_0 = -2.54$.

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L-Azaserine as an inducing agent for the development of phage in the lysogenic *Escherichia coli*, K-12*

The ability of an agent to induce the development of active bacteriophage from the prophage state in lysogenic bacteria can be correlated with mutagenic and carcinogenic activities[1]. These and other radiomimetic agents bring about cytological changes in bacteria characterized by chromosomal aberrations and filamentation[2].

L-Azaserine (O-diazoacetyl serine) is a new antibiotic which is receiving special attention because of its anti-neoplastic activity[3]. As a mutagenic agent in bacterial systems, azaserine was more active than nitrogen mustard[4]. Induction of filament formation in *Escherichia coli* by azaserine has also been observed[5]. Because of these radiomimetic properties, we predicted that azaserine could induce the formation of active phage (*lambda*) in the lysogenic *Escherichia coli*, strain K-12. This was indeed true.

TABLE I

EFFECT OF L-AZASERINE ON BACTERIA AND *lambda* PHAGE IN CULTURES OF *Escherichia coli*, K-12

Medium	L-*Azaserine* μg/ml	*Bacteria per ml*		*Phage per ml*	
		0 h	*5 h*	*0 h*	*5 h*
S–G*	0	$2.14 \cdot 10^6$	$1.25 \cdot 10^8$	0	$5.8 \cdot 10^4$
	0.1	$2.14 \cdot 10^6$	$1.00 \cdot 10^6$	0	$2.3 \cdot 10^7$
Nutrient	0	$8.43 \cdot 10^6$	$1.03 \cdot 10^9$	0	$1.6 \cdot 10^5$
Broth	200	$1.44 \cdot 10^6$	$< 10^3$	0	$> 5.0 \cdot 10^7$

* S–G = Salts-Glucose medium.

Cells growing in the respective media were harvested at the logarithmic phase of growth, washed twice with media and inoculated into fresh media to give the initial colony counts indicated for time zero. Samples were taken at intervals and plated for colony formers and for free phage. Free phage was measured as plaque formers on a streptomycin resistant mutant (C-Sr) of the indicator, strain C, in the presence of streptomycin (method of BERTANI[6]).

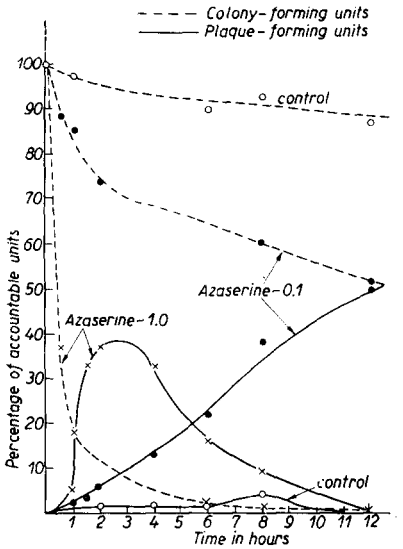

Fig. 1. Recovery of *Escherichia coli*, K-12 as either colony formers or plaque formers after exposure to azaserine. (Azaserine concentrations in μg/ml).

In salts-glucose or in broth media the spontaneous liberation of *lambda* phage parallels the rate of bacterial growth reaching an average of one free phage per 2–3000 bacteria in a saturated culture. In the presence of as little as 0.1 μg of azaserine per ml in the salts-glucose medium the phage yield after 5 hours was 400 times greater than that of the spontaneous control with a decrease in bacteria giving 23 phages per surviving bacteria (see Table I). In nutrient broth, greater concentrations of azaserine are required for both inhibition of bacterial growth and induction of phage formation. With 200 μmg of azaserine per ml of broth the bacterial count dropped precipitously and the phage count rose to over 500 times that of the growing control (Table I). With proper concentrations of cells and drug, mass lysis could also be demonstrated.

A more accurate measure of induction was obtained by exposing washed bacteria to azaserine in phosphate buffer. In this medium, neither growth of the bacteria nor maturation of induced phage occurs. Starting with a given population of bacteria, 100% of which are colony formers, the inducing action was measured by the conversion of colony formers to plaque formers or infectious centers when plated on the sensitive indicator, *Escherichia coli*, strain C. The proportion of the population which cannot be accounted for as either colony or plaque formers are apparently cytotoxic victims of the drug action. Though the percentage of plaque formers per accountable population increases rapidly with increased concentration of or exposure to the drug, the percentage of "unaccountables" lost by the cytotoxic action also increases. After a two hour exposure to 1.0 μg of azaserine per ml, 48% of the original population was recovered as either a colony former (11%) or a plaque former (37%). Fig. 1 also shows that further exposure resulted in a complete sterilization of all forms at 12 hours. The cytotoxic action at 0.1 μg/ml is nil allowing almost complete accountability with 49% plaque formers and 50% colony formers after a twelve hour exposure.

Thus azaserine joins the ranks of chemical inducers of prophage development. This is of particular interest, not only because of the antibiotic nature of azaserine, but because of its radiomimetic and anti-neoplastic properties.

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The application of mineralogical theories to the "mineral" phase of teeth and bones

For many years mineralogists have recognized that constant ratios of elementary constituents are not essential to the existence of a single phase having characteristic physical and optical properties. Thus, for example, one of the commonest rock-forming minerals is plagioclase feldspar, the composition of which might be: $Na_{0.68}\ Ca_{0.32}\ Al_{1.32}\ Si_{2.68}\ O_8$. This substance, called andesine, can be considered as an isomorphic intermediate between albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2Si_2O_8$), being 68% of the former and 32% of the latter.