Table III

The R-Na form of the resin is treated with 20×10 ml 0·1 n succinic acid, washed with 10×10 ml distilled water until of neutral reaction:

			Initial pH	
H·R	10 ml 2% NaCl consumed (until 3·60 pH)	4·23 ml 0·1 n NaOH	1,54	
	10 ml 2% NaCl consumed (until 3·60 pH)	6·63 ml 0·1 n NaOH	1,23	
	10 ml 2% NaCl consumed (until 3·60 pH)	4·60 ml 0·1 n NaOH	1,30	
	10 ml 2% NaCl consumed (until 3·60 pH)	2·20 ml 0·1 n NaOH	1·60	
	10 ml 2% NaCl consumed (until 3·60 pH)	0·81 ml 0·1 n NaOH	2·00	
	10 ml 2% NaCl consumed (until 3·60 pH)	0·38 ml 0·1 n NaOH	2·45	R·Na
	Liberated HCl	20·82 ml 0·1 n NaOH		

The results of our experiments do not contradict those of DAVIES; our data even explain and complete them in detail. Thus they elucidate the remark of DAVIES concerning the process of HCO_3^- formation $-OH^- + CO_2 = HCO_3^-$. We believe that this picture can help to throw light on some observations of DAVENPORT[1] which could not be brought into agreement with his general considerations, e. g. the absence of the effect on the acid production of some substances inhibiting the action of carboanhydrase. If the steps of the whole process are separated, as they must be separated, then these contradictions do not exist any more.

The question might still arise whether our model could be applied to gastric secretion. The literature referring to the ion exchange substances does not mention until 1949 that substances of similar function occur in human organs. This, however, does not seem improbable. The anion exchange resins are amines of high molecular weight and it is probable that other amino groups can also exert similar functions. In our laboratory experiments are in progress for the study of ion exchange functions of some proteins. According to the data hitherto available, these processes—corresponding to the manifold functions of the proteins—are very complex and the observed exchanges must be proved in long series of experiments.

We believe that the permeabilities in the organ can only be observed if a peculiar affinity exists between the transferring and the transferred substances when the permeability can be reduced to a continuous ion exchange.

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Department of Chemistry University of Szeged, Hungary, March 1, 1951.

Zusammenfassung

Da einerseits Kationaustauschharze, die mit schwachen Säuren in die Form $H \cdot R$ übergeführt worden waren, mit Kochsalzlösung Salzsäure ergaben; und andererseits Anionaustauschharze, die mit Kochsalzlösung behandelt worden waren ($R \cdot Cl$), Salzsäure in den Zustand einer Lösung einer schwachen Säure überführten, so glauben die Autoren, daß der Ionenaustausch an Harzen als Modell für die Magensäuresekretion gelten könne. Die Permeabilitäten können auch als fortwährende Ionenaustauschvorgänge beteiligt sein.

[1] H. W. DAVENPORT, Physiol. Rev. *26*, 560 (1946).

Possible Immature Forms of Bacteriophage

Though it has not been hard to obtain electron micrographs showing bacteria in many stages of the lysis they undergo when attacked by bacteriophage, these photographs have contained surprisingly little unequivocal evidence as to how new bacteriophage particles are produced during this process. In the usual preparations[1] new particles are commonly seen in clumps and strings distributed through the remains of a bacterium; and often these groups, especially in the case of such tailless bacteriophages as T_3 or T_7 against *Escherichia coli*, have had the appearance of microcolonies[2]. Nevertheless, they have not contained particles which could be recognized as being in course of division. This has stimulated a continuing search for objects that may be incompletely formed, or immature, particles of bacteriophage. A year ago HERČÍK[3] and the writer[4] independently found segmented filaments having the diameter of bacteriophage heads in certain lysates of *Escherichia coli*; but the conditions under which these have appeared suggest that they are not steps in the usual process of bacteriophage proliferation. This note describes other objects in cultures of *Escherichia coli* infected with T_2 and T_4 bacteriophages which are connected with the lytic process and may be forms of bacteriophage in course of development.

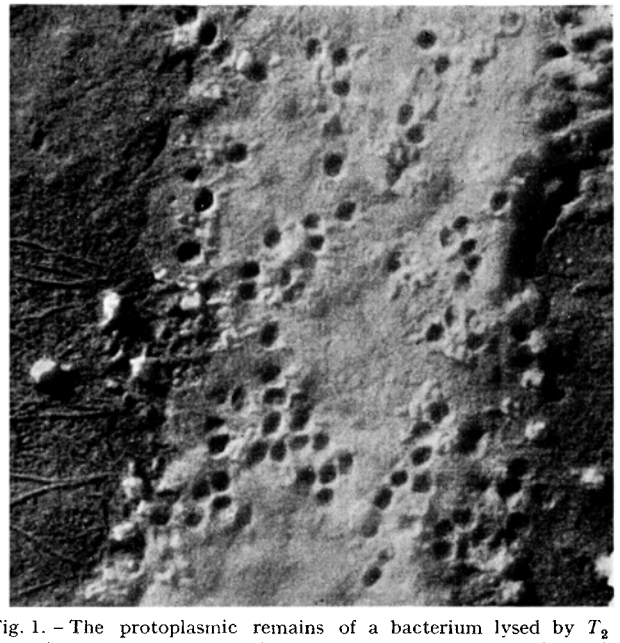

Fig. 1. – The protoplasmic remains of a bacterium lysed by T_2 bacteriophage. Distributed throughout it are some granules and many "holes" with the short "tails" referred to in the text. Magnification = 38,000 ×.

Many "holes" having the diameter of bacteriophage heads (fig. 1) have already[1] been seen in lysed bacteria. At first these were thought to be protoplasmic sites from

[1] R. W. G. WYCKOFF, Biochim. et biophys. acta *2*, 27, 246 (1948).
[2] R. W. G. WYCKOFF, Proc. Soc. Exp. Biol. Med. *71*, 144 (1949).
[3] F. HERČÍK, Exper. *6*, 64 (1950).
[4] R. W. G. WYCKOFF, Exper. *6*, 66 (1950).

which bacteriophage particles had escaped; but careful study reveals detail incompatible with this interpretation. They show a gradation to forms like mature particles and HERČÍK[1] has suggested that they are indeed partially developed particles. A common feature of the "holes" are granules, a rim and a short thick "tail". The "tails" are uniform in diameter and much shorter, though possibly somewhat thicker, than the tails of mature particles. Objects of the same size and shape as these short "tails" also occur both around the periphery and within the protoplasmic remains of lysing bacteria. They are found both singly and in the characteristic associations shown in figure 2. Here some of them are ranged radially about a central flat mass like the spokes about the hub of a wheel. Sometimes these "wheels" are practically complete; more often the short "tails" only partly surround the central body, which is flatter and of a somewhat greater diameter than a mature bacteriophage head. At their outer ends some but not all the "tails" seem attached to other flattened heads that have the same diameter and otherwise resemble the "holes" of figure 1. In other fields particles are seen which have heads substantially like those of normal bacteriophage and the short tails discussed here. It is perhaps significant that lysis under the unfavorable conditions that produce filaments having the diameter of heads, also gives rise to numerous long filaments having about the diameter of these "tails".

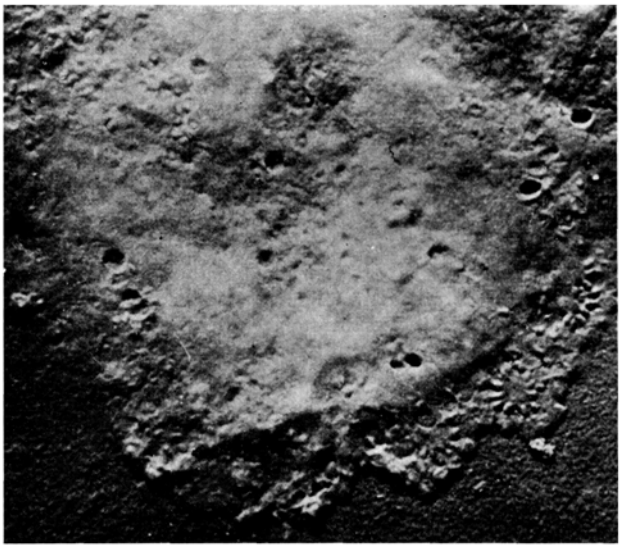

Fig. 2. - A bacterial residue showing a few "holes" and many "tails". An especially well-developed "wheel" is seen at the bottom center of the mass. Magnification 36,000 ×.

The "wheels" are frequently seen in preparations made by pouring suitably incubated broth cultures onto agar plates, draining, allowing the broth to soak into the agar and "replicating" the surface that results. It is necessary to entertain the possibility that the "wheels" are artifacts developed during surface drying. Against this is the uniformity in diameter of their "hubs" and their occurence both within and without the bacterial residues. If they are not such artifacts, they represent an important phase in bacteriophage development. This implies for the tail of the even-numbered bacteriophages an unexpected rôle in the process of multiplication. There has already been considerable evidence that the several types of bacteriophage may not proliferate in the same fashion; evidently the tailless strains cannot show the forms just described.

The existence of immature and developing forms would be compatible with many other results bearing on the multiplication of these viruslike agents. In particular it suggests a possible reason why infecting bacteriophage particles cannot be recovered[1] from a diseased bacterium during the first few minutes after their adsorption. It would also make more understandable the very rapid increase in demonstrable bacteriophage that occurs towards the end of the burst period; this increase would then be influenced by the rates of both maturation and multiplication of the developing bacteriophage.

Because of their obvious bearing on attempts to understand the mechanism of the proliferation of bacteriophage, we are continuing to investigate these and other "immature" forms and the conditions under which they appear.

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Zusammenfassung

Wird *Escherichia coli* mit T_2- oder T_4-Bakteriophagen infiziert, so findet man innerhalb und außerhalb der Bakterien kurze Stäbchen mit oder ohne Kopf. Diese sind oft radähnlich angeordnet und können als Entwicklungsstadien der Phagen angesehen werden.

[1] F. HERČÍK, Czech. Med. J. *89*, 91 (1950).

[1] A. H. DOERMANN, Carnegie Institution Washington, Yearbook *47*, 176 (1947-1948).

Über die chemische Natur der Induktionsstoffe im Implantatversuch bei *Triton*

Nachdem TOIVONEN und CHUANG[1] gezeigt hatten, daß es mindestens zwei verschiedene Induktionsstoffe gibt, war die nächste Aufgabe, die chemische Natur dieser Stoffe näher zu charakterisieren. Schon die Versuche dieser Autoren machten es wahrscheinlich, daß das spinokaudale Agens ein Protein sei (Kochexperimente[2]). Eine weitere Stütze brachten die Untersuchungen von TOIVONEN und KUUSI[3], in welchen die spinale Induktionswirkung durch proteolytische Enzyme vernichtet wurde. Auf der anderen Seite ist nach BRACHET[4] die Bedeutung der Nukleinsäuren für die Induktion sehr wichtig. Auch LEHMANN[5] hat die Meinung geäußert, daß das spinale Agens ein Protein, das archenzephale eine Nukleinsäure sei. In diesen Arbeiten wurde versucht, in diese Probleme mehr Klarheit zu bringen.

Als Testmaterial dienten *Triton taeniatus* und *Triton palmatus*. Die Implantationsmethode wurde angewandt, die Weiterzüchtung der Tiere dauerte zwei Wochen lang. Als Ausgangsmaterial für die Fraktionierungen habe ich die zwei von TOIVONEN als regionalspezifisch gefundenen Gewebe verwendet: Meerschweinchenleber als archenzephalen Induktor, Meerschweinchenniere als spinokaudalen Induktor. Über die Resultate dieser Experimente kann ich folgendes berichten:

[1] S. TOIVONEN, Ann. Acad. Sci. Fenn. [A] *55*, 6 (1940). - H.-H. CHUANG, Roux'Arch. *139*, 556 (1939).

[2] H.-H. CHUANG, Roux'Arch. *139*, 556 (1939); *140*, 25 (1940). - S. TOIVONEN, Rev. suisse Zool. *57*, 41 (1950).

[3] S. TOIVONEN und T. KUUSI, Ann. Zool. Soc. zool.-bot. Fenn. Vanamo *13*, 3 (1948).

[4] J. BRACHET, *Embryologie chimique* (Masson, Paris 1944).

[5] F. E. LEHMANN, *Einführung in die physiologische Embryologie* (Birkhäuser, Basel 1945).