synthesis in bacteria, incubated under starvation conditions or in a deficient medium.

The starving bacteria, incubated in acetate buffer, contain also an amino-acid pool which is, however, not utilized for protein synthesis, as can be seen in Fig. 1. This observation may point to the possibility that the limited potentiality of utilization of energy for anabolic processes in the starving cells is also oriented in the first place toward DNA synthesis. If this assumption was also shown to be correct, it would indicate that in our systems the kinetics of biochemical reactions on the precursor's level are such that processes leading to DNA synthesis are favoured over those leading to the synthesis of other macromolecules.

This work was performed with the financial support of the Federal Foundation for Scientific Research.

B. Brdar
E. Kos
M. Drakulić

Laboratory of Cellular Biochemistry,
Institute Ruder Bošković, Zagreb, Yugoslavia.

[1] Drakulić, M., and Kos, E., *Radiation Research*, **19**, 429 (1963).
[2] Burton, K., *Biochem. J.*, **62**, 315 (1956).
[3] Mejbaum, W., *Z. Physiol. Chemie*, **258**, 117 (1939).
[4] Lowry, O. H., Rosebrough, N. J., Farr, A. L., and Randall, J. R., *J. Biol. Chem.*, **193**, 265 (1951).
[5] Fraser, D., and Jerrel, E. A., *J. Biol. Chem.*, **205**, 291 (1953). Goldstein, A., and Brown, B. J., *Biochim. Biophys. Acta*, **53**, 19 (1961).
[6] Schmidt, G., and Tannhauser, S. J., *J. Biol. Chem.*, **161**, 83 (1945).
[7] Spirin, A. S., and Belozerski, A. N., *Biokhimija*, **21**, 768 (1956).
[8] Kirby, K. S., *Biochim. Biophys. Acta*, **18**, 575 (1955).

VIROLOGY

Transmission of Guamá and Oriboca Viruses by Naturally Infected Mosquitoes

Most of the present knowledge about the ability of mosquitoes to serve as natural hosts for arthropod-borne viruses is based on two methods. The first consists of triturating the wild-caught mosquito and inoculating it into a laboratory animal; subsequent virus isolation proves natural infection of the mosquito but not ability to transmit. The second consists of infecting the mosquito on a viraemic laboratory host and demonstrating transmission by bite to another laboratory host. This method demonstrated the ability to transmit, but may not reflect what happens under natural conditions. The technique described here makes possible a demonstration of transmission by naturally infected arthropods.

Mosquitoes captured during the first half of 1964 in mouse- and chicken-baited traps in the Instituto Agronomico do Norte forest near Belém, Brazil, were identified while alive and liberated in screened holding cages (100 cm × 100 cm × 115 cm) in the forest. A separate cage was set up for each mosquito species examined. Families of 3-day-old Swiss mice with the mother mouse were placed in the cages to provide a blood meal. These mice were observed for subsequent illness on the chance that the wild-caught mosquitoes might have been naturally infected with arthropod-borne viruses and have transmitted them to the mice.

Between February 24 and June 30, 2,846 *Culex* (*Melanoconion*) *taeniopus* females were released in their cage and 68 families of mice exposed, each for a 24-h period. Guamá virus was isolated from the blood of a mother mouse exposed on April 14.

Between January 30 and June 30, 2,860 *Culex* (*Melanoconion*) females, of a species morphologically similar to '*Culex* No. 9'[1] of Trinidad, were released in another cage and 109 families of mice exposed. Oriboca virus was isolated from a baby mouse exposed on May 9.

The transmission of Guamá and Oriboca viruses to Swiss mice by naturally infected *Culex* (*Melanoconion*) has thus been demonstrated. This same technique was used by Sérié *et al.*[2] to transmit yellow fever to laboratory mice by the bite of naturally infected *Aedes simpsoni* in Ethiopia.

Amazonia Toda
Robert E. Shope

Belém Virus Laboratory,
Instituto Evandro Chagas,
Belém, Pará, Brazil.

[1] Aitken, T. H. G., Jonkers, A. H., and Worth, C. B., *Ann. Microbiol. (Rio de J.)*, **11**, Part A, 67 (1963).
[2] Sérié, C., Andral, L., Lindrec, A., and Neri, P., *Bull. World Hlth. Org.*, **30**, 299 (1964).

CYTOLOGY

Circulation in the Cell

The rapidity with which cells respond to the presence of solutes or suspensoids in their immediate vicinity has made the problem of the permeation of the cell a matter of major interest, but the question of how substances are distributed once they have entered the cell has not commanded nearly so much attention. I shall propose that the rapid distribution of nutrilites and reactants within the microcosm of the protoplast (that is, inside the plasma membrane) is effected by an active circulatory apparatus, by which fluid is forced through pores by hydrostatic pressure, somewhat analogous to the apparatus by which a corresponding circulatory distribution is effected in the macrocosm of the animal body. The concept of the cell-circulation is based almost exclusively on work with the yeast cell; but there are many indications which suggest that the conclusions are generally applicable. Many cellular membranes, which were previously thought to be intact, have been shown by electron microscopy to possess systems of pores. Pores which have been first observed by electron microscopy have been afterwards observed by direct light microscopy.

The circulation-hypothesis explains the rapid distribution of cell-substances which is inconsistent with a diffusion hypothesis. The fact that cells continuously change in their ability to take up substances from the external *milieu* is indisputable. It seems unrealistic, however, to try to account for such changes by changes in the composition of the membrane because a minor change, which might accommodate one substance, would certainly alter the behaviour of the membrane to a variety of other substances. It seems essential that any hypothesis should require that the structural integrity of the membrane-systems should remain unaltered throughout the life of the cell. It is interesting in this connexion that Lehninger[1] has suggested: (*a*) that membranes are usually assembled *in situ*; (*b*) that protein synthesis is concerted with phospholipid synthesis in such a manner that the two syntheses are mutually dependent; (*c*) that membrane synthesis occurs by a process in which the lipid and protein components of the membrane serve as 'structural templates' for each other, to form a thermodynamically stabilized end-product; (*d*) that each membranous structure may produce new membrane from proteins and lipids present in the protoplasm by using the pre-existing membrane as a template.

Although genes might change by mutation to produce enzymes which might be able to synthesize new membrane-components which might be able to alter the selective permeability of the membrane, it seems unlikely that changes in permeability are primarily due to such a mechanism. It seems much more likely that genes controlling the entry of a substance into the cell do so by eliciting the production of an enzyme which converts the substance into a form which can pass through the cellular membrane. According to the receptor hypothesis[2], genes act only in response to the contact stimulus of an inducer. As a general corollary to this hypothesis, a large molecule which might not be able to pass through the intact barrier of the plasma membrane and which could not enter any 'normal' membrane in metabolically