The results indicate that intracellular respiration can serve as an indicator of the outcome of the interaction between phagocytes and microorganisms and might allow rapid differentiation between obligate extracellular and facultative intracellular microorganisms[12].

J. Gelzer[13] and E. Suter[14]

Department of Microbiology, College of Medicine, University of Florida, Gainesville, July 9, 1959.

Zusammenfassung

1. Es wird gezeigt, dass der Effekt von phagozytierten, *hitzeabgetöteten* Bakterien auf die Atmung von Kaninchen-Leukozyten *in vitro* von der Virulenz der verwendeten Mikroorganismen abhängig ist.

2. Die Tatsache, dass *lebende* Mikroorganismen nach Phagozytose intrazellulär fortfahren zu atmen, wird demonstriert und deren Beziehung zur Pathogenität der Bakterien diskutiert.

[12] E. Suter, Bacteriol. Rev. *20*, 94 (1956).
[13] Present Address: University Childrens Hospital, Zurich (Switzerland).
[14] Markle Scholar in Medical Science.

Karyotype in two Himalayan species of Polygonatum

The liliaceous genus *Polygonatum* is believed to have its centre of diversification in Eastern Himalayas and Western China. The present Himalayan species *P. verticillatum* Allioni and *P. cirrifolium* Royle, belong to the group Verticillata Baker. The former species has a wide geographic distribution; besides occurring throughout the Himalayan range, it is extended as far as Northern Europe. Extensive cytological investigations have been carried out on eighteen European strains of *P. verticillatum* and the occurrence of diploid and polyploid forms were reported[1,2]. Though the chromosome number of all the different diploid forms studied[1,2] was the same ($2n = 28$) differences in karyotype were observed from strain to strain, thus revealing a marked intraspecific structural heterozygosity. The karyotype reported[1,2] for the group Verticillata is characterised by the presence of long chromosomes with subterminal primary constrictions and short chromosomes with subterminal and median primary constrictions. The secondary constrictions are present only in long chromosomes.

In the present study a number of strains of *P. verticillatum* and *P. cirrifolium* from Western Himalayas were analysed. The chromosome numbers, $2n = 30$, 64 in *P. verticillatum* and $2n = 38$ in *P. cirrifolium* were determined from root tip somatic plates and the division of the generative nucleus in the pollen tube (Figures 1, 2, 3). The chromosome complement of *P. verticillatum* can be broadly classified into three groups, (i) one pair of long chromosomes with nearly median primary constrictions, (ii) six pairs of medium chromosomes with subterminal primary constrictions, and (iii) eight pairs of short chromosomes with subterminal and median primary constrictions. The secondary constrictions were revealed in two pairs of long and short chromosomes. The karyotype varies in different strains studied and structural heterozygosity in the chromosome complement was also noticed. Thus the present species differs from its European forms not only in the chromosome numbers ($2n = 30$) but also in gross chromosome types i.e. the presence of an additional pair of long chromosome with nearly median primary constriction and of a pair of short chromosome with secondary constriction (Fig. 1). Such a chromosome complement has been reported[1] to be typical of group Alternifolia, Baker, and so far has been unknown for the group Verticillata.

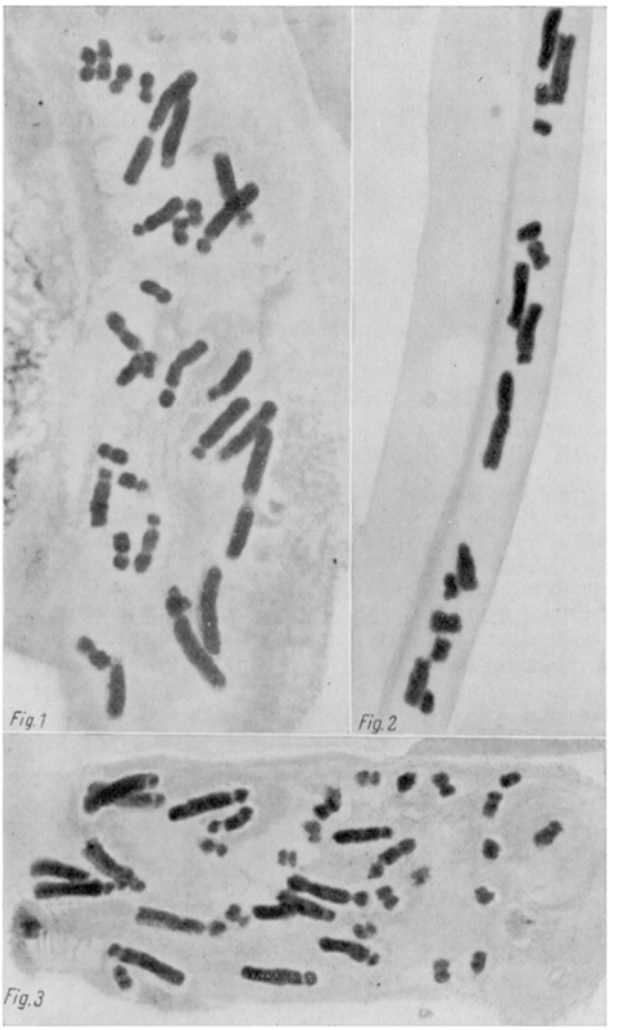

Fig. 1. – Mitotic Stage in Root Tip Cell showing 30 Chromosomes.
Fig. 2. – The Division of the Generative nucleus in the Pollen Tube showing Haploid Chrom. Complement.
Fig. 3. – *P. cirrifolium:* Root Tip, Mitotic Stage showing 38 Chroms.

The karyotype of *P. cirrifolium* ($2n = 38$) is found to be allied to 'Verticillata' type[2] of chromosome complement as it lacks the long chromosome with sub-median primary constriction. However, the number of long and medium chromosomes (seven pairs) is more or less constant and also two pairs of long and short chromosomes have secondary constrictions. In this respect it is similar to the Himalayan forms of *P. verticillatum*. The karyotype of *P. cirrifolium* differs from *P. verticillatum* by the presence of four additional pairs of short chromosomes in the former.

[1] E. Therman, Hereditas *39*, 277 (1953).
[2] E. Therman, Ann. Bot. Soc. 'Vanamo' *25*, 1 (1953).

The differences in chromosome number and gross chromosome morphology between the European and Himalayan forms of *P. verticillatum* can be explained on the assumption that the Himalayan forms are primitive ones and European forms as comparatively recent ones, since it is believed that the centre of origin lies in Eastern Himalayas and Western China. Therefore, one can assume that the chromosome number $2n = 28$, noticed in the European forms has probably been derived from the original chromosome number $2n = 30$. It has been pointed out[3] that the presence of long chromosomes with median constriction is a primitive feature. It is difficult to say definitely at present whether the European forms have evolved from the Himalayan ones by losing the long or short chromosome pair. However, one cannot overlook the possibility of interspecific hybridization with some species of the group Alternifolia and this may have subsequently been followed by introgression. A detailed study on species from Eastern Himalayas is in progress.

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Department of Biology, Delhi College, Delhi University, Delhi (India), June 18, 1959.

Zusammenfassung

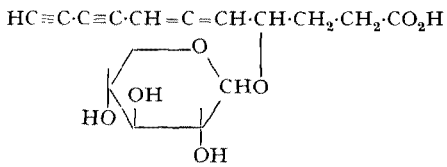
Die Chromosomenzahl und der Karyotypus von *Polygonatum verticillatum* Allioni ($2n = 30, 64$) und *P. cirrifolium* Royle ($2n = 38$), die im Himalaya vorkommen, wurden mit früher untersuchten europäischen Formen verglichen. Die beobachteten Unterschiede lassen sich durch die Annahme erklären, dass die europäischen Formen aus den Himalaya-Formen durch den Vorgang der Chromosomenverminderung und Veränderungen des Karyotypus hervorgingen.

[3] G. L. STEBBINS, JR., *Variation and Evolution in plants* (Oxford University Press, 1950).

Pathways of Sugar Metabolism in Relation to the Biosynthesis of Polyacetylenic Antibiotics

As part of a general programme of research into the biochemistry of antibiotic production we have been especially concerned with the Basidiomycete B-841, which produces polyacetylenic antibiotics with C_{11} (nemotinic acid, nemotin) and C_{12} (odyssic acid, odyssin) chains. Having established the structures of these compounds[1] and their biogenesis from a C_2 unit related to acetate[2] we turned our attention to the general metabolism of the fungus so that this might ultimately be correlated with the special processes of antibiotic formation. In this we were greatly assisted by the discovery that a high proportion of the nemotinic acid produced by B-841 is in the form of the xyloside (I) (in which the stereochemistry of the allene unit, the adjacent $C_{(4)}$, and the glycoside carbon atom remain uncertain). By the isolation of this compound we were enabled to study some aspects of pentose and polyacetylene synthesis simultaneously.

When B-841 is utilising glucose as sole nutrient, labelling from added [1-^{14}C] acetate is efficiently incorporated (15–20%) into the polyacetylenes but not into the xylose moiety of I. However B-841 will also utilise ethanol as sole nutrient; under these circumstances both moieties are labelled by [1-^{14}C] acetate, the ratio of activities in the xylose and C_{11} portions of I being about 1·5/6 (the C_{11} chain contains 6 'active' C atoms[2]). We conclude that in the ethanol cultures, in which all metabolic intermediates are being synthesised from C_2 units, the xylose is produced by way of compounds closely related to glucose; this explains the absence of labelling in the glucose cultures and is of course probable on general grounds.



(I); $[\alpha]_D^{25} + 237°$ ($c = 0{\cdot}1$ in EtOH)

Degradation of the labelled xylose revealed the pattern of labelling shown in II, the activities being relative to that of $C_{(4)}$ of the xylose. Our explanation of this labelling-pattern involves the operation of at least three well-known pathways of sugar metabolism in B-841.

	CH_2OH–CHOH–CHOH–CHOH–CHO				
Activity	27	28	45	100	3

(II)

Labelling from [1-^{14}C] acetate is normally incorporated into sugars by way of conversion into [1-^{14}C] pyruvate or its enol phophate, followed by the reversal of Emden-Meyerhof glycolysis. We have independent evidence for the operation of the Emden-Meyerhof route and citrate cycle in B-841; in the case when ethanol is the only nutrient, a special modification of the citrate cycle must be operative. As is well known, the overall effect of this process will be the synthesis of hexose labelled equally at $C_{(3)}$ and $C_{(4)}$. Now it has been shown that in a variety of systems the principal cause of randomisation of labelling in $C_{(1)}$–$C_{(3)}$ of hexoses is the action of enzymes of the transaldolase-transketolase cycle; the pattern of labelling in our xylose is exactly that which would be expected for $C_{(1)}$–$C_{(5)}$ of a hexose, initially labelled at $C_{(3)}$ and $C_{(4)}$ only, and subsequently randomised in this way[3]. This also implies that the xylose itself is not formed from one of the pentose phosphates intermediate in the transaldolase-transketolase cycle, but from a hexose derivative by loss of $C_{(6)}$. Such a process is involved in a known metabolic route, viz. the conversion of glucose *via* glucuronic acid into pentoses, including xylose[4].

Thus, without having isolated any of the relevant enzymes of intermediates we have circumstantial evidence

[1] J. D. BU'LOCK, E. R. H. JONES, and P. R. LEEMING, J. chem. Soc. *1955*, 4270; *1957*, 1097.

[2] J. D. BU'LOCK and H. GREGORY, Biochem. J. *72*, 322 (1959).

[3] H. G. WOOD and J. KATZ, J. biol. Chem. *233*, 1279 (1958).

[4] F. EISENBERG, P. G. DAYTON, and J. J. BURNS, J. biol. Chem. *234*, 250 (1959).