Comments and Communications

Action of Coal-tar Dyes and Related Compounds on α-Amino Acids

Recently, it was found (SCHÖNBERG, MOUBASHER, and MUSTAFA, *J. Chem. Soc.*, London, 1948, 176) that bacteriostatic agents related to benzil, e.g., 2-hydroxy-2′-methoxybenzil are capable of reducing α-amino acids having the structure (I) to the corresponding aldehydes containing one less carbon atom, in an aqueous medium under physiological conditions of temperature and pH (e.g., alanine $\longrightarrow$ acetaldehyde; phenylaminoacetic acid $\longrightarrow$ benzaldehyde). The theory was advanced that the bacteriostatic action of these substances is connected with this reduction, since they destroy α-amino acids essential for the bacterium and they interfere with its enzyme system.

Systematically investigating substances showing bacteriostatic action, we found that crystal violet and malachite green (JORDON and BARROWS, *Comp. textbook of bacteriology*, 13th ed., 1941, p. 69) rapidly reduce α-amino acids and we wish, as in the case of 2-hydroxy-2′-methoxybenzil, to connect their bacteriostatic action with their power of reducing α-amino acids.

The spermatocidal action of certain triphenylmethane dyes and of *p*-quinones, e.g., toluquinone and crystal violet (SCHÖNBERG, *et al.*, *loc. cit.*, and CLARK, *Applied pharmacology*, 7th ed., London: 1940, p. 564), should be explained in a similar manner.

It seems that a general principle has been found which enables us to predict that water soluble substances capable of reducing α-amino acids to the corresponding aldehydes containing one less carbon atom will show bacteriostatic and spermatocidal action.

The parent substance of these coal-tar dyes, namely triphenylcarbinol, is also capable of bringing about the reduction of α-amino acids, because its hydroxyl group is very active.

As triphenylcarbinol is not easily soluble in water, its action on α-amino acids was studied in a mixture of water (2 vol.) and acetic acid (3 vol.). The reduction proceeds as follows:

$$(C_6H_5)_3COH + R-\overset{\displaystyle H}{\underset{\displaystyle NH_2}{C}}-COOH \longrightarrow$$
$$(C_6H_5)_3CH + RCHO + NH_3 + CO_2 \qquad (I)$$

Crystal violet (1.5 g), phenylaminoacetic acid (0.3 g), and water (50 cc) were refluxed for 40 min in a stream of carbon dioxide in a distilling flask provided with a condenser dipping into an aqueous-alcoholic solution of phenylhydrazine hydrochloride; benzaldehyde phenylhydrazine (0.2 g) was obtained.

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Neurospora as an Object of Genetic Study—a Correction

In summarizing the history of the study of *Neurospora* (*Science*, 1948, **108**, 735), David M. Bonner has written: "The life cycle of this organism had been worked out by the mycologist, Dodge, and the usefulness of *Neurospora* as a genetic tool had been demonstrated by the geneticist, Lindegren." This statement implies a somewhat startling disparagement of the important and widely recognized contribution to biology embodied in the series of papers on *Neurospora* published by B. O. Dodge. In justice to all concerned, and for rectification of the historical record, a further note seems necessary.

The very earliest of the accounts of *Neurospora*, that published by Shear & Dodge in 1927 (*J. agric. Res.*, **34**, 1019), dealt not only with the taxonomy and life cycle (connection of conidial and ascigerous stages) of the genus, but also with hybridity and with the most important of its genetical properties, heterothallism. A sequel, published by Dodge in the same year (*J. agric. Res.*, 35, 289) described the cytological bases for hetero- and homothallism in *Neurospora*. In 1928 (*J. agric. Res.*, 36, 1) Dodge reported an amplification of his original study of interspecific hybrids in the group, and the recovery of the parental types, and later in the same year (*Mycologia*, 20, 226) the segregation of parental types in conidia borne on miktohaplontic mycelium. In 1929 Dodge demonstrated the place of segregation of mating factors and of factors for conidial types (*Mycologia*, 21, 222; 22, 9), and in 1931 issued a study of the inheritance of these factors in interspecific crosses (*Mycologia*, 23, 1). Early in 1932 (*Torrey Bot. Club Bull.*, 58, 517) he refuted a claim that the fructification of *Neurospora* is apogamous.

For an organism to be a useful genetic tool it should be, one would suppose, capable of easy cultivation, amphimictic, and possessed of readily distinguishable alleles. In addition to these, *Neurospora* possesses further sources of usefulness not shared by most genetic material: 1) the haploid generation is susceptible of indefinite propagation and multiplication, so that there can be produced any number of identical cells of known genetic composition and capable of behaving as gametes; 2) the exact cytological interrelations of all the cells arising from a single zygote can be determined, so that cytological and genetic phenomena can be directly correlated; and 3) all the products of a single meiosis can be recovered, related, and identified, so that the exact products of one meiosis, rather than the statistical results of many, can be analyzed. All of these attributes of *Neurospora* were demonstrated by Dodge in the papers cited; and in more than one place he pointed out that *Neurospora* is a profitable and significant object of genetical study. All of this work was in print before the publication of Lindegren's first paper on the genus (*Torrey Bot. Club Bull.*, **59**, 85). Because of Dodge's demonstration of "the usefulness of *Neurospora* as a genetic tool," T. H. Morgan had asked for cultures of the species and strains employed in Dodge's studies; these Morgan subsequently turned over to Lindegren. Beginning in 1932 both Dodge and Lindegren made frequent contributions to the growing knowledge of the genetics of *Neurospora;* and Dodge's work continues. It does not detract in the least from the considerable interest of Lindegren's work to insist that the discovery and development of these fungi as means of bringing to light additional knowledge of genetic processes were accomplished by "the mycologist, Dodge," before Lindegren ever undertook work on the group.

With the record set straight on the one point, a moment's attention may be devoted to a matter of terminology. A mycologist, it is assumed, is one who works with, studies, and knows something abount fungi. A mycologist, like a bacteriologist, botanist, zoologist, or microbiologist, may be a taxonomist, morphologist, cytologist, physiologist, geneticist, or ecologist, or several or all of these. One group of subdivisions of biology, according to organisms studied, is intersected by the other, based on aspects studied; thus far no two of them, fortunately, are mutually exclusive.

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Reply to D. P. Rogers

In a recent paper published in *Science* (1948, **108**, 735), I summarized very briefly the work leading to the adoption of *Neurospora* by G. W. Beadle and E. L. Tatum for investigation of the genetic control of biochemical reactions. It is difficult in a few words to do ample justice to various investigations spanning a number of years, and D. P. Rogers has written outlining much more fully the fundamental contributions of B. O. Dodge to the biology of *Neurospora.* I agree with Rogers' insistence that discovery and development of *Neurospora* as a genetic tool should be credited to Dr. Dodge.

In terms of the use of this organism for investigations in the field of biochemical genetics, however, one cannot omit the contribution of C. C. Lindegren. Lindegren's work on the genetics of *Neurospora* played an important role in the selection of this organism by Beadle and Tatum. Thus I feel that the investigations of both Dodge and Lindegren merit particular mention when discussing the biology of *Neurospora.*

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Scientific Book Register

BIRKELAND, JORGEN. *Microbiology and man.* (2nd ed.) New York: Appleton-Century-Crofts, 1949. Pp. xii + 525. (Illustrated.) $5.00.

BLOOM, WILLIAM. (Ed.) *Histopathology of irradiation from external and internal sources.* (National Nuclear Energy Series IV-221). New York: McGraw-Hill, 1948. Pp. xxv + 808. (Illustrated.) $8.00.

DAUS, PAUL H., and WHYBURN, WILLIAM M. *First year college mathematics with applications.* New York: Macmillan, 1949. Pp. xiii + 495. (Illustrated.) $5.00.

DUNBAR, CARL O. *Historical geology.* New York: John Wiley; London: Chapman & Hall, 1949. Pp. xii + 567. (Illustrated.) $5.00.

FAXON, NATHANIEL W. (Ed.) *The hospital in contemporary life.* Cambridge, Mass.: Harvard Univ. Press, 1949. Pp. 288. $5.00.

FRANCIS, CARL C. *Introduction to human anatomy.* St. Louis: C. V. Mosby, 1949. Pp. 470. (Illustrated.) $5.50.

FRANKENBURG, W. G., KOMAREWSKY, V. I., and RIDEAL, E. K. (Eds.) *Advances in catalysis and related subjects.* New York: Academic Press, 1948. Pp. xiii + 321. (Illustrated.) $7.80.

FREBERG, C. R., and KEMLER, EMORY N. *Elements of mechanical vibration.* (2nd ed.) New York: John Wiley, 1949. Pp. xiii + 227. (Illustrated.) $3.75.

HOUWINK, R. (Ed.) *Elastomers and plastomers: their chemistry, physics and technology.* (Vol. III.) *Testing and analysis; tabulation of properties.* New York: Elsevier Publ., 1948. Pp. 174. (Illustrated.) $4.50.

LEITNER, S. J. (English translation revised and edited by C. J. C. Britton and E. Neumark.) *Bone marrow biopsy haematology in the light of sternal puncture.* New York: Grune and Stratton, 1949. Pp. xi + 433. (Illustrated.) $8.50.

LYONS, WILLIAM R., and WOODHALL, BARNES. *Atlas of peripheral nerve injuries.* Philadelphia-London: W. B. Saunders, 1949. Pp. 339. (Illustrated.) $16.00.

MONGE, CARLOS. *Acclimatization in the Andes: historical confirmations of "climatic aggression" in the development of Andean man.* Baltimore, Md.: Johns Hopkins Press, 1948. Pp. xix + 130. $2.75.

RICE, FRANCIS OWEN, and TELLER, EDWARD. *The structure of matter.* New York: John Wiley; London: Chapman & Hall, 1949. Pp. xiii + 361. (Illustrated.) $5.00.

———. *Tables of Bessel functions of fractional order.* (Vol. II.) (Computation Laboratory of the National Applied Mathematics Laboratories, National Bureau of Standards.) New York: Columbia Univ. Press, 1949. Pp. xviii + 365. $10.00.