3 hr. before increasing again to a constant value of about 1·03 (Fig. 2).

Most of the work carried out on the endogenous metabolism of yeast has been on cell suspensions[1–4], but in 1901 Harden and Rowland[6] described an endogenous fermentation in pressed brewer's yeast, resulting in the production of about equimolecular amounts of alcohol and carbon dioxide. These results with pressed yeast have been questioned[1,2,7] because of the possibility that the cells might have been damaged mechanically during the pressing process. The present work with cell suspensions shows that the brewer's yeast used in these experiments does degrade its reserve carbohydrate by a fermentation process, and at the same time the rate of respiration of the yeast doubles.

It is hoped to publish these results in greater detail elsewhere.

I wish to thank the directors of Arthur Guinness Son and Co. (Park Royal), Ltd., for permission to publish this work.

V. E. Chester

Arthur Guinness Son and Co. (Park Royal), Ltd.,
Laboratory,
Park Royal Brewery,
London, N.W.10.
Nov. 11.

[1] Stier, T. J. B., and Stannard, J. N., *J. Gen. Physiol.*, **19**, 479 (1936).
[2] Spiegelman, S., and Nozawa, M., *Arch. Biochem.*, **6**, 303 (1945).
[3] Rothstein, A., and Berke, H., *Arch. Biochem. Biophys.*, **36**, 195 (1952).
[4] Brady, T. G., and Duggan, P. F., Résumés Com. 3ème. Congr. Int. Biochem., 92 (1955).
[5] Trevelyan, W. E., and Harrison, J. S., *Biochem. J.*, **63**, 23 (1956).
[6] Harden, A., and Rowland, S., *J. Chem. Soc.*, 1227 (1901).
[7] Trevelyan, W. E., "The Chemistry and Biology of Yeasts", edit. by Cook, A. H. (Academic Press, Inc., New York, 1958).

Allyl Alcohol as a Nutrient for Micro-organisms

Allyl alcohol has in recent years come into some use as a herbicide active against dormant seed. Experiments in progress in this Laboratory have shown that this compound is rapidly detoxicated by biological agencies when added to soil at the rate of 0·02–0·05 per cent; various bacteria capable of utilizing it for growth were isolated from enrichment cultures by plating on selective agar medium. (A few earlier investigators[1,2] have tested allyl alcohol with negative results as a carbon source for fungi and bacteria.)

The active bacteria were partly varieties probably of *Pseudomonas fluorescens* and *P. putida* and partly strains of *Nocardia corallina*. Their growth was tested in soil extract medium containing 0·5 per cent (vol.) allyl alcohol, 0·05 per cent ammonium sulphate, 0·05 per cent dipotassium phosphate and 0·02 per cent magnesium sulphate. Duplicate cultures were grown for one week on a rotating shaker at 25° C., the cells were collected by centrifugation and the amount of growth was measured by determination of nitrogen in the washed-cell deposit. Some representative results are shown in Table 1.

Table 1

Organisms		Cell nitrogen (mgm.) from 100 ml. medium	
		+ Allyl alcohol	Control
Pseudomonas spp. (7 strains)	Min.	2·2	0·2
	Max.	6·8	0·5
	Mean	5·0	0·4
Nocardia corallina (3 strains)	Min.	3·2	0·3
	Max.	4·8	0·5
	Mean	4·1	0·4

Only 2 among 22 strains of *Pseudomonas* spp. isolated by non-selective methods were able to utilize allyl alcohol. Several bacteria belonging to other genera were tested qualitatively with negative results. All bacteria that grew with allyl alcohol could also utilize propanol and sodium propionate, but the reverse did not apply. Among 40 strains of *Azotobacter* and *Beijerinckia* spp. two strains of *A. vinelandii* and one of *A. insigne* utilized allyl alcohol for nitrogen fixation; some 14–20 mgm. nitrogen were fixed per gm. of allyl alcohol supplied.

Also several strains of the fungus *Trichoderma viride* were able to use allyl alcohol for growth. Table 2 shows results found with seven strains grown for 20 days at 25° C. as stationary cultures in soil extract medium with 0·5 per cent (vol.) allyl alcohol. Four of these strains were isolated from selective medium and the rest non-selectively; the two groups of strains showed no essential difference.

Table 2

Dry weight of mycelium, mgm. per 100 ml. medium		
	+ Allyl alcohol	Control
Min.	14	1
Max.	169	5
Mean	90	3

A number of other fungi, collection cultures as well as random isolates from soil, were tested qualitatively with negative results; among these were also some strains of *Trichoderma viride*.

Experiments on the rate and mechanism of biological detoxication of allyl alcohol are in progress; the results will be published elsewhere.

I am indebted to Dr. Hans Lautrop, Statens Seruminstitut, Copenhagen, for supplying me with a number of strains of *Pseudomonas* spp.

H. L. Jensen

State Laboratory for Soil and Crop Research,
Department of Bacteriology,
Lyngby, Denmark.
Jan. 5.

[1] Coupin, H., *C.R. Acad. Sci., Paris*, **138**, 389 (1904).
[2] Den Dooren de Jong, L. E., "Bijdrage tot de kennis van het mineralisatieproces", thesis, Rotterdam (1926).

Mode of Division of Pediococci

The differentiation of pediococci from other groups of spherical lactic acid bacteria has frequently been based on the characteristic morphological arrangement into tetrads[1–3]. It has been generally assumed that the occurrence of tetrads is attributable to division in two planes[1,3]. However, some workers[4,5] have expressed the view that pediococci divide in one plane only, giving rise to chains similar to those formed by streptococci, and that tetrad formation is due to re-arrangement of 3–4 membered chains.

In all these investigations the mode of division has been deduced from examination of stained preparations only. It was decided, therefore, to follow the sequence of division of several strains, starting from single cells, by direct microscopic observation of developing slide cultures under a phase-contrast microscope. The cultures were made on semi-solid

© 1959 Nature Publishing Group