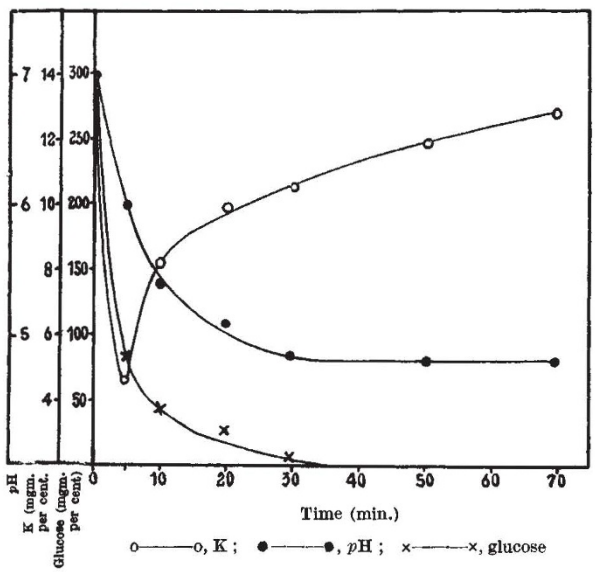
LETTERS TO THE EDITORS

The Editors do not hold themselves responsible for opinions expressed by their correspondents. No notice is taken of anonymous communications.

Potassium in Bacterial Fermentation

Verzar and Pulver[1] discovered that alcoholic fermentation by living yeast cells is accompanied by a striking shift of equilibrium between extracellular and intracellular potassium. The beginning of fermentation is marked by a vigorous intake of potassium from the surrounding medium. With the progress of fermentation the potassium is again liberated from the cells. No plausible explanation of this phenomenon has as yet been advanced.

It now appears that the 'potassium effect' is not confined to alcoholic fermentation by yeast but represents a general feature of glycolytic processes. We were able to demonstrate exactly the same phenomenon in the desmolysis of sugars (glucose, maltose) to lactic acid, hydrogen, etc., by *E. coli*. The accompanying table and diagram are representative of a series of experiments which yielded analogous results.



A suspension of *E. coli* in a solution of *M*/60 glucose, *M*/250 potassium chloride, *M*/30 (NaH_2PO_4-Na_2HPO_4), *p*H 7·05, was incubated at 41°; glucose and potassium were determined in samples drawn from the solution and cleared by centrifuging.

The intrinsic nature of the relationship between the 'potassium effect' and sugar metabolism in the bacteria is demonstrated by the following facts: (1) no such effect occurs when fermentable sugar is omitted from the phosphate-potassium chloride medium; (2) different experimental factors (temperature, *p*H, substrate concentration, aerobiosis or anaerobiosis) exert a parallel influence upon both fermentation-rate and potassium absorption.

Time (min.)	Glucose mgm./100 c.c.	Potassium mgm./100 c.c.	*p*H
0	300	13·9	7·05
5	79	4·7	6·00
10	43	8·2	5·40
20	32	9·9	5·10
30	9	10·4	4·81
50	0	10·9	4·80
70	0	12·9	4·80
90	0	13·5	4·80
120	0	13·8	4·77

The first period of fermentation is marked by a rapid and steep decrease of potassium in the medium. Then the process is reversed, the absorbed potassium being gradually released. The initial conditions are restored simultaneously with, or shortly after, the end of fermentation. At the turning point of the process, that is, at the maximum potassium intake and the beginning of potassium release, the fermentation substrate is still far from exhausted and acid production is still vigorously continuing. Therefore it is clear that the absorption of potassium is connected with some initial phase of the reaction chain of fermentation.

During the brief period in which potassium absorption occurs, glucose disappears from the medium at a rate far exceeding its 'fermentation-rate', as measured by acid formation. This discrepancy in the reaction balance could be accounted for by the detection of the formation in the cells of a non-reducing, hydrolysable polysaccharide which disappears in later stages of fermentation. *The conversion of sugar into a polysaccharide in the initial stage of sugar desmolysis has thus been established by us for bacterial fermentation*, as it has been for alcoholic fermentation in yeast and for glycolysis in muscle by Willstätter and Rohdewald[2,3]. There is a close coincidence in time between the maximum of polysaccharide accumulation and the maximum of potassium absorption in the bacteria. It seems reasonable, therefore, to ascribe to potassium a specific function in the synthetic reaction with which fermentation begins.

A detailed report on this investigation will be given elsewhere.

J. LEIBOWITZ.
N. KUPERMINTZ.
Department of Hygiene and Bacteriology,
and
Chemistry Department,
Cancer Research Laboratories,
Hebrew University,
Jerusalem.
June 18.

[1] Verzar and Pulver, NATURE, **145**, 823 (1940).
[2, 3] Willstätter and Rohdewald, *Z. physiol. Chem.*, **247**, 269 (1937); *Enzymologia*, **8**, 1 (1940).

Thio-Ureas as Goitrogenic Substances

AN attempt to isolate the goitrogenic substance present in rape seed[1,2] suggested the possibility of its being a derivative of this urea. Allyl thio-urea was therefore tested. Doses of 20 mgm. were given to rats daily by stomach tube for a period of eight weeks, after which the thyroids were examined. They had an average weight of 43 mgm., this being three to four times the normal weight. Histologically, the glands show extreme hypertrophy and hyperplasia, and almost complete loss of colloid. The administration of 50 mgm. daily by stomach tube, for ten days, produced identical histological changes in the thyroid, although the weight of the gland is not so great—average of 30 mgm. per 60 gm. body weight. This dose had no toxic effect. Preliminary