them(6,12).

Summary. 'Benemid', p-(di-n-propylsulfamyl)-benzoic acid, inhibits the conjugase responsible definitively for the over-all reaction involved in the conjugation of glycine with p-aminobenzoic acid. It was demonstrated that the compound did not decrease the availability of energy derived from the phosphate cycle, which is a coupled component of the conjugative reaction, since 'Benemid' did not inhibit glucose phosphorylation by phosphorylase plus preformed ATP.

The implication of such conjugative reactions was discussed and several pharmacological and clinical applications of the anti-catabolite hypothesis were indicated.

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Labelling in the Glucose Deposited as Starch during Photosynthesis. (18044)

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We have extracted radioactive starch from detached tobacco leaves which were permitted to carry on photosynthesis in an atmosphere of 5% $C^{12}O_2$ containing about 0.25 mc of $C^{14}O_2$. Prior to the experiment plants were kept in darkness to deplete their initial starch reserves. The extracted starch was hydrolized, and on addition of ordinary glucose, as a carrier, radioactive glucose was crystallized. The technic of the experiments was essentially that of Putman *et al.*(1). Radioactive glucose obtained was fermented with *Lactobacillus casei* and degraded according to Wood *et al.*(2). The results are shown in Table I.

From the results of the Experiment 1, it is evident that if after 24 hours of preliminary starvation photosynthesis is permitted to take place for a long time, then C^{14} is spread fairly evenly in all positions.

It has been shown by Benson *et al.*(3) that in the initial stages of photosynthesis C^{14} appears in glucose at first in the 3 and 4 positions and only later spreads to others. It was thought that an extension of the period of darkness prior to photosynthesis may accentuate this tendency, and that under these conditions either the bulk of C^{14}, or even all of it, may appear in the positions 3 and 4. To test this, plants were at first starved for 72 hours and then permitted to carry on photosynthesis for various periods of time. The results are represented by Experiments 2, 3 and 4, Table I.

While the bulk of C^{14} is now in the 3 and 4 positions, considerable amounts still are present in the 2 and 5 and the least in the 1 and 6. The results are essentially the same in all 3 experiments in spite of the fact that the duration of photosynthesis in them varied from 3½ to 48 hours. One can conclude, therefore, that it was the length of the preceding starvation period and not the length of the illumination, which was responsible for the observed distribution of C^{14}.

One may also expect that if a period of photosynthesis in $C^{14}O_2$ is followed by that in $C^{12}O_2$, the final labelling in starch will be reversed. The greatest activity should be in 1 and 6, followed by that in 2 and 5, and the least in 3 and 4. To test this, 2 detached leaves were permitted to carry on photosynthesis for 3 hours in an atmosphere of $C^{14}O_2$. At the end of this period one leaf was killed and the distribution of C^{14} was determined. The other leaf was transferred to 5% $C^{12}O_2$

1. Putman, E. W., Hassid, W. Z., Krotkov, G., and Barker, H. A., *J. Biol. Chem.*, 1948, v173, 785.

2. Wood, H. G., Lifson, N., and Lorber, V., *J. Biol. Chem.*, 1945, v159, 474.

3. Benson, A. A., Calvin, M., Haas, V. A., Aronoff, S., Hall, A. G., Bassham, J. A., and Weigl, J. W., *Photosynthesis in Plants*, 1949, Chap. 19, pp. 381-401, a monograph of the American Society of Plant Physiologists, edited by J. Franck and W. E. Loomis.

TABLE I.
Distribution of C^{14} in Glucose Derived from Starch. % of Total Activity in Various Positions.

				3 and 4 %	2 and 5 %	1 and 6 %
Exp. 1	24	hr of darkness				
	24	" " illumination	with $C^{14}O$	34.3	33	32.7
Exp. 2	72	" " darkness				
	3½	" " illumination	" "	52	25.9	22.1
Exp. 3	72	" " darkness				
	24	" " illumination	" "	47.5	39	13.5
Exp. 4	72	" " darkness				
	48	" " illumination	" "	54.5	25.5	20
Exp. 5	16	" " darkness				
	3	" " illumination	" "	41	37	32
Exp. 6	16	" " darkness				
	3	" " illumination	" "			
		followed by				
	3	" " illumination	" $C^{12}O_2$	14.3	32.7	53

and was permitted to carry on photosynthesis for 3 hours longer. The results obtained, as shown in the Experiments 5 and 6, indicate that the distribution of C^{14} was changed as expected.

There is one other point of interest which appeared from the Experiment 5. A short period of illumination of 3 hours, after an overnight darkness of 16 hours resulted in fairly even but not quite uniform distribution of C^{14}. Like in the sugars produced in photosynthesis initially(3) there was somewhat more activity in 3 and 4 than in 2 and 5 and the least in 1 and 6.

From the results of our experiments we can conclude, therefore, that the distribution of C^{14} in glucose, deposited during photosynthesis as starch, may be affected by the following factors: 1. Duration of the starvation period prior to the illumination. 2. Duration of the illumination period itself. 3. By permitting plants to carry on photosynthesis at first in an atmosphere of $C^{14}O_2$ and then in $C^{12}O_2$.

Summary. It is shown that glucose recovered from starch deposited in photosynthesis in presence of $C^{14}O_2$ may be labelled primarily in 3 and 4 or 1 and 6 positions or evenly in all 6 positions, depending upon the periods of darkness and illumination to which the leaf is subjected.

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Effects of X-Irradiation and Urethane Treatment on Chicken Bone Marrow Enzymes.* (18045)

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Previous work(1,2) has shown that the injection of aminopterin into mature hens results in a leucopenia, reduced bone marrow cell counts, and a loss of bone marrow choline oxidase. It was suggested that the loss of marrow choline oxidase may have been a sig-

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1. Dinning, J. S., Keith, C. K., and Day, P. L., *Fed. Proc.*, 1950, v9, 359.

2. Dinning, J. S., Keith, C. K., Davis, P., and Day, P. L., *Arch. Biochem.*, 1950, v27, 89.