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Kisaki T & Tolbert N E. Glycolate and glyoxylate metabolism by isolated peroxisomes or chloroplasts. *Plant Physiol.* 44:242-50, 1969.
[Dept. Biochemistry, Michigan State Univ., East Lansing, MI]

The paper contains a description of glycolate and glyoxylate metabolism and photorespiration in peroxisomes and chloroplasts. Glutamate:glyoxylate aminotransferase was present in peroxisomes, but no further metabolizing enzyme of glycine was present, and no CO_2 evolution from glyoxylate, a presumed substrate for photorespiration, took place. [The *SCI*® indicates that this paper has been cited in over 115 publications since 1969.]

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I felt that I had completed my all-absorbing work on nicotine biosynthesis when I received an award for this work from the Japan Agricultural Chemical Society. Following this, I went to work in N.E. Tolbert's laboratory to study photosynthesis. I was introduced to him by Byerrum, dean of Michigan State University, whose research field was alkaloid biosynthesis. I started to work on (phospho-)glycolate mixed-function oxidase, the presence of which had been shown by Tolbert,[1] and which was presumed to be responsible for photorespiration. There were too many obstacles for me to isolate the protein. Piles of confusing data, mainly caused by the highly variable contamination of glycolate oxidase into the chloroplast fraction, annoyed and entrapped me for over a year. After a while, I realized that the determination of the loci of glycolate oxidase and its related enzymes in a cell was essential to further progress in this work. As a result, we were able to demonstrate the existence of leaf peroxisomes.[2]

This paper seems to have been an initiative work in the study of the synthesis from glycolate of an initial photosynthesate under atmospheric conditions by mutual cooperation of chloroplasts (glycolate formation, etc.), peroxisomes (glycolate→glycine, etc.), and mitochondria (glycine→serine, etc.). (Examples of the important work that developed after the publication of this paper can be found in references 3, 4, and 5.) The already excited state of photosynthetic study of the C_4 pathway appeared to be further activated by the findings presented in this paper. Further developments in this area have been reviewed in many publications.[4,5] I believe that one of the obstacles in my research development has been my difficulty with the English language, which may have been responsible for my concentration in this research area.

1. **Tolbert N E.** Phosphoglycolate and glycolate mixed function oxidation with NADPH or reduced dichlorophenol-indophenol ($DCPIPH_2$) by chloroplasts. *Fed. Proc.* 26:454, 1967.
2. **Tolbert N E, Oeser A, Kisaki T, Hageman R H & Yamazaki R K.** Peroxisomes from spinach leaves containing enzymes related to glycolate metabolism. *J. Biol. Chem.* 243:5179-84, 1968. (Cited 240 times.)
3. **Kisaki T, Yoshida N & Imai A.** Glycine decarboxylase and serine formation in spinach leaf mitochondrial preparation with reference to photorespiration. *Plant Cell Physiol.* 12:275-88, 1971. (Cited 75 times.)
4. **Stumpf P K & Conn E E, eds.** *The biochemistry of plants: a comprehensive treatise.* New York: Academic Press, 1980-1981. 8 vols.
5. **Ogren W L.** Photorespiration: pathways, regulation, and modification. *Annu. Rev. Plant Physiol.* 35:415-42, 1984.

