

A Classic Peroxisome Article from 1969—Commentary

Kisaki T, Tolbert NE (1969) Glycolate and glyoxylate metabolism by isolated peroxisomes or chloroplasts. *Plant Physiol* **44**: 242–250

One of the most important discoveries in the past 50 years was that of photorespiration. There are many contributors to this discovery, but the above-named article by Kisaki and Tolbert is one of the key articles in its discovery and traced the pathway of photorespiration into peroxisomes. They used [¹⁴C]glycolate to show that glycolate is converted to Gly in peroxisomes isolated from spinach (*Spinacia oleracea*) leaf tissue. The peroxisomes were isolated from grocery store spinach by Suc density gradient centrifugation and characterized by the presence of glycolate oxidase, which consumes O₂, producing hydrogen peroxide (H₂O₂) as glycolate is converted to Gly. The glyoxylate is then transaminated to Gly. The peroxisomes also contained catalase that recycles the H₂O₂ generated by glycolate oxidase. How then the Gly went on to release CO₂ was not clear at the time and it wasn't even clear where the glycolate was coming from.

Tolbert's group was in the Biochemistry Department at Michigan State University and Takuro Kisaki was a visiting scientist from the Tokyo Central Research

Institute, Japan Monopoly Corporation. It was the discovery of liver peroxisomes (as a compartment containing H₂O₂-generating oxidases together with catalase) by Christian de Duve that led to the realization that a similar metabolic compartmentalization would exist in leaves. De Duve shared a Nobel Prize in 1974 for the characterization of lysosome and peroxisomes. Ed Tolbert was one of the most productive plant scientists during the 1960s, 1970s, and 1980s, publishing more than 270 articles, 46 of which were published in *Plant Physiology* between 1954 and 1995. He became a member of the National Academy in 1984 and died in 1998. Other frequently cited articles concerning peroxisomes from Tolbert's group include: Tolbert et al. (1969; 163 citations), Frederick et al. (1973; 122 citations), and Hanks et al. (1981).

LITERATURE CITED

- Hanks JF, Tolbert NE, Schubert KR (1981)** Localization of enzymes of ureide biosynthesis in peroxisomes and microsomes of nodules. *Plant Physiol* **68**: 65–69
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- Frederick SE, Gruber PJ, Tolbert NE (1973)** The occurrence of glycolate dehydrogenase and glycolate oxidase in green plants: an evolutionary survey. *Plant Physiol* **52**: 318–323

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