

# Are you what you eat?

## Summary

### Case Study Problem No. 1 C-643 Intermediary Metabolism

**Comments on Case Study:** Photosynthesis is a key process supporting life on earth. Yet, with the emphasis on human metabolism in most biochemistry courses, the topic is not covered or is only touched upon. Because virtually all carbon in living systems must have been derived from atmospheric CO<sub>2</sub>, photosynthesis seemed to be an appropriate topic for the first PBL problem in a course on intermediary metabolism. In order to provide human interest, I framed the case study around an anthropological question that seems totally unrelated to photosynthesis (the domestication of corn) and a chemical phenomena (kinetic isotope effects) not often covered in undergraduate courses. Among the issues I expect students to address in this problem are:

- The relationships among pathways and their regulation, e.g. the Calvin-Benson Cycle, glycolysis, and the pentose phosphate pathway.
- Relationship between photosynthesis and respiration.
- The Calvin-Benson Cycle (C<sub>3</sub> Pathway) and the Hatch-Slack (C<sub>4</sub> Pathway).
- The origin of kinetic isotope effects in CO<sub>2</sub> fixation reactions, their measurement, and their use in answering some interesting questions.
- The use of radioisotopes in elucidating metabolic pathways.
- Mechanism of ribulose-1,5-bisphosphate carboxylase.
- Mechanism of transketolase and thiamin-dependent reactions.
- Metabolic regulation based on oxidation-reduction in plants.
- Respiration and other pathways in plants.
- Origin of life on earth and early importance of photosynthesis.

### Selected References:

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Written by Harold B. White, Department of Chemistry and Biochemistry, University of Delaware