



PLANTS VERSUS ANIMALS IN THE DINING HALL

**CHEM-643 Intermediary
Metabolism
Case Study in Amino Acid
Metabolism**

Page 4 : *Nothing in biology makes sense except in the light of evolution*⁽¹⁾

With Janis's help, Maura thought she was beginning to get an idea of the reasons some amino acids were essential and others weren't. Nevertheless she still had many unanswered questions relating to amino acids and vegetables. By now Janis had joined the fray. One day, they ran into their friend Doby at lunch in the dining hall and began trying to convince him of the virtues of being a vegetarian. Doby is a biology major who always seems to make sense out of things in evolutionary terms. It didn't take him long to get started, particularly because he was not about to be ganged up on by a couple of evangelistic women.

"If you want to understand plants as food, you've got to view the world from their perspective. You know, 'think' like a plant. Basically, you can't run away when some hairy caterpillar starts chomping on you. So, how do you protect yourself? ...Chemical warfare. You produce compounds that taste terrible, like [glucosinolates](#) in Brussels sprouts and their relatives in the cabbage family. You synthesize [toxic compounds](#) that make caterpillars and mice sick and maybe die -- like [canavanine](#) in lima beans and alfalfa sprouts. Or, you make yourself nutritionally deficient for those multiply auxotrophic, plant-eating animals."

Janis and Maura looked at each other and rolled their eyes. Doby didn't notice and continued with his professorial monologue.

"Take seeds; beans, wheat, corn, for example. They are like eggs -- loaded with nutrients for the next generation but almost always seeds are deficient in some essential amino acid. This may also be why plants have no [vitamin B₁₂](#) and lack certain fatty acids. My guess is that there is hardly a plant in the wild that doesn't taste bad, is toxic, or is nutritionally deficient. The only exception are some fruits that taste sweet when they are ripe because the plant 'wants' the consumer to disperse its indigestible seed somewhere in a pile of manure where it will grow. Natural selection would favor those traits. I suspect humans, through artificial selection, have bred some of the 'undesirable' characteristics

out of agricultural crops so that they are edible. No doubt that is also why we have to spray pesticides on them. Now we have to keep bugs away because the plants no longer can do that themselves. When you think about it, organically grown vegetables aren't so natural after all. ...By the way, this cheese steak tastes great -- Want a bite?"

Doby's words reminded Maura of some of her mother's comments at Thanksgiving. As Maura and Janis examined each item on the plates in front of them, Maura thought, "Salads will never be the same," but replied curtly, "No thanks. *You* can clog your arteries with cholesterol."

Does Doby's argument make sense? Are beans and other seeds really deficient in essential nutrients such as amino acids?

How do plants make glucosinolates? Why is canavanine toxic?

In evolutionary terms, what would be the rationale for the inability of animals to synthesize certain amino acids?

1. [Th. Dobzhanski](#) (1973)