

## **DEFINITIONS OF TRACE ELEMENT ESSENTIALITY**

G. C. Cotzias (1967):

A trace element is essential if:

- a) it is present in all healthy tissues of all living things
- b) its concentration from one animal to the next is fairly constant
- c) its withdrawal from the body induces reproducibly the same physiological and structural abnormalities regardless of species considered
- d) its addition either reverses or prevents these abnormalities
- e) the abnormalities induced by deficiency are accompanied by pertinent, specific biochemical changes
- f) these biochemical changes can be prevented or cured when the deficiency is prevented or cured

Walter Mertz (1970):

An element is considered essential if its deficiency consistently results in impairment of function from optimal to suboptimal.

Boyd L. O'Dell and Roger A. Sunde (1997):

*An Essential Element* is one that is required to support adequate growth, reproduction and health throughout the life cycle, when all other nutrients are optimal. ... If an element exerts a catalytic or regulatory role in a critical biochemical pathway, there is little or no doubt about its essentiality.