Chapter 3

Carotenoids in Food

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A. Introduction

No members of the animal kingdom, including humans, can synthesize carotenoids. Even those animals (birds, fish, invertebrates) that use carotenoids for colouration must obtain them from the diet. Although humans, being mammals, are normally not coloured by carotenoids, analysis of human blood and tissues reveals a significant content of carotenoids which, as discussed later in this book, are associated with good health and reduced risk of diseases. Although some carotenoids are added to manufactured foods as colourants, or are taken as supplements (Chapter 4), most ingested carotenoid is obtained direct from natural food, especially vegetables and fruit.

In richer countries, where food is plentiful, much publicity is given to the possible benefits of a carotenoid-rich diet to maintain health and reduce risks of serious age-related degenerative diseases and conditions such as cancer, coronary heart disease and macular degeneration, as discussed in later Chapters in this Volume. Attention is focused on encouraging the consumption of ‘healthy foods’ or ‘functional foods’ which provide high intake of the carotenoids of interest. The target is to have dietary sources that provide a high concentration of those carotenoids, notably β-carotene (3), lycopene (31), lutein (133), zeaxanthin (119) and β-cryptoxanthin (55), which have been investigated most for an association with beneficial effects.

A large proportion of the world’s population live in poverty and don’t have the luxury of living long enough to develop these diseases. For people who live in poorer countries, the priority need for carotenoids is different but acute. The essential nutrient vitamin A is a metabolite of the provitamins β-carotene and some related carotenoids, notably α-carotene (7)
and β-cryptoxanthin (55), and these carotenoids provide most of the vitamin A for many populations in the world. In countries where vitamin A deficiency is a real or potential problem, the availability and provision of food containing sufficient amounts of provitamin A carotenoids, especially β-carotene, can be a matter of life or death (see Chapter 9).

In the context of both rich and poorer countries, knowledge of carotenoid content and composition is therefore essential in order that guidance can be given on what food sources can provide adequate supplies of desired carotenoids.

Over many years, thousands of papers have been published describing carotenoid content and composition of particular species and varieties under different conditions. The literature is