

## Chapter 9

# Evaluation\*

### Cancer-preventive activity

#### Humans

There is *limited evidence* for a cancer-preventive effect of consumption of fruit and of vegetables for cancers of the mouth and pharynx, oesophagus, stomach, colon-rectum, larynx, lung, ovary (vegetables only), bladder (fruit only) and kidney.

There is *inadequate evidence* for a cancer-preventive effect of consumption of fruit and of vegetables for all other sites.

#### Experimental animals

Based on evidence obtained in relation to chemically induced cancers, especially of the colon, oesophagus and mammary gland in rodent models, there is *sufficient evidence* for a cancer-preventive effect of fruit and vegetables.

For chemically induced cancers of the bladder and oral cavity, the evidence is *limited*.

For other sites, the evidence is *inadequate*.

For spontaneous tumours, the evidence is *inadequate* for all cancer sites.

### Overall evaluation

Fruit and vegetables have always been a major component of the human diet in most, though not all, parts of the world. Broadly defined, fruit and vegetables are those plant foods consumed by humans, excluding cereal grains, seeds and nuts. Some studies have excluded certain other categories such as pulses, mushrooms and high-starch foods (e.g., potatoes and plantains). Fruit and vegetables contain many nutrients; they also contain other bioactive compounds that may influence many aspects of human biology and related disease processes.

There is much diversity, between and within countries, both in the total amount of fruit and vegetables consumed and in the relative amounts of these two categories. In general, consumption is higher in more affluent, better educated, urban-dwelling populations. In recent decades, there has been a steady, worldwide, increase in availability of fruit and vegetables, and in year-round availability, although some regions have lagged behind.

In much of the published epidemiological literature and in this evaluation, fruit and vegetables have been categorized as two separate food groups – i.e., total fruit and total vegetables. For both of these two groupings, many

bioactive components may act in concert in influencing carcinogenesis. Further, there is difficulty in specifying, and (in humans) in measuring, particular components of either fruit or vegetables that may especially affect cancer risk.

Review of the published scientific literature shows the following:

- The evidence from both epidemiological and animal experimental studies, along with the results of biomarker and mechanistic studies, indicates that a higher dietary intake of fruit and vegetables is associated with a lower risk of various types of cancer.
- More specifically, this evidence indicates that higher intake of fruit *probably* lowers the risk of cancers of the oesophagus, stomach and lung, while higher intake of vegetables *probably* lowers the risk of cancers of the oesophagus and colon-rectum.
- Likewise, a higher intake of fruit *possibly* reduces the risk of cancers of the mouth, pharynx, colon-rectum, larynx, kidney and urinary bladder. An increase in consumption of vegetables *possibly* reduces the risk of cancers of the mouth, pharynx, stomach, larynx, lung, ovary and kidney.

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\*Note that the evaluations refer to fruit and vegetables as whole classes, without consideration of separate sub-categories.

