THE CONTRIBUTION OF DIFFERENT GROUPS OF FOODSTUFFS TO THE INTAKE OF DIETARY FIBRE*

DAVID A.T. SOUTHGATE
&
SHEILA A. BINGHAM
(Norwich)

ABSTRACT

The intake of Dietary Fibre (which is defined as the sum of lignin and the polysaccharides not hydrolysed by the endogenous secretions of the human digestive tract) is derived from the plant cell walls in the diet and other non-structural polysaccharides either present naturally in foods, or derived from polysaccharide food additives such as gums or algal polysaccharides.

The composition of this complex mixture, its chemical and physical properties, and therefore, the physiological effects associated with its ingestion, will vary according to the foods making up the diet.

While techniques for the measurement and characterisation of dietary fibre still call for a considerable amount of methodological development it is possible to obtain reliable estimates for the major components and the overall composition of these components.

These show that in fruits and vegetables the total dietary fibre content (on a fresh weight basis) lies between 2 and 5 g/100 g with peas and beans being an exception in having higher contents.

The dietary fibre in cereals varies with the cereal and the rate of extraction used; for example, wholemeal wheat flours contain between 12 and 15 g/100 g whereas white wheat flour (72% extraction) contains between 3 and 4 g/100 g. Wheat bran and related products have much higher contents.

The proportion of the dietary fibre present as cellulose does not show great variability but lignin is extremely variable. Fruits and vegetables contain very small amounts of lignin unless they have lignified seeds or special lignified tissues.

The non-cellulosic polysaccharides of fruits and vegetables are characteristically rich in uronic acids (from pectic substances) and arabino-galactans. In cereals β-glucans and arabino-xylans predominate and wheat bran and wholemeal wheat and rye flours are particularly rich in arabino-xylans.

The amounts and composition of the dietary fibre in foods commonly forming the diet eaten in the United Kingdom will be reviewed and their contribution to the diet as a whole will be discussed.

Changes in the pattern of food consumption in the United Kingdom in the past century will be discussed in relation to the effects that these have had on the consumption of dietary fibre.

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It has been postulated (Burkitt & Trowell, 1975) that a high intake of dietary fibre is protective against many of the diseases of Western Civilisation. The verification of this hypothesis depends on careful epidemiological comparisons relating the incidence of these diseases to intake of dietary fibre and it is therefore necessary to have quantitative estimates of dietary fibre in foods and the diet as a whole.

For the purpose of the present discussion dietary fibre is defined as the sum of lignin and the polysaccharides not hydrolyses by the endogenous secretions of the human digestive trace (Southgate, Hudson & Englyst, 1978). Dietary fibre is a complex mixture derived from the plant cell walls in the diet and related polysaccharides either present naturally in foods or used as food additives (Southgate, 1976a). The precise measurement of such a complex mixture is difficult without recourse to a very complex scheme of analysis. However, several practicable approaches are available which give comparable results (Southgate, Hudson & Englyst, 1978) although most measure insoluble dietary fibre and thus give an underestimate of the total. Crude fibre values do not bear any constant relationship to dietary fibre values (Van Soest & McQueen, 1973) and the use of crude fibre values in place of dietary fibre may give completely misleading results (James & Southgate, 1976).

A range of foods have been analysed using a modification of the method described by Southgate (1969; 1976b). Dietary fibre as defined above is synonymous with unavailable carbohydrate as used by McCance & Widdowson (1960) and by combining these values with those from new analyses (Southgate, Baily, Collinson and Walker, 1976; Southgate, 1978 and Bailey & Southgate, unpublished observations) we have been able to compile (Paul & Southgate, 1978) total dietary fibre values for most items in the British diet.

This paper describes some features that emerge from these analyses and some calculations that we have made from them regarding changes in the dietary fibre intake in the United Kingdom (Southgate, Bingham & Robertson, 1978).

QUANTITATIVE AND QUALITATIVE OBSERVATIONS ON DIETARY FIBRE IN VALUES.

First, the amounts of total dietary fibre in various foods. These foods show that fruits Table 1 and vegetables Table 2 are relatively poor sources of dietary fibre on a fresh weight basis and considerable quantities would be required to be consumed to provide a high intake from these sources alone, Table 1.