PROCEEDINGS OF THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE **180,** 407–408 (1985)

Symposium: Physiological and Metabolic Effects of Dietary Fiber (42196)

Sponsored by the Society for Experimental Biology and Medicine at the Annual Meeting of the Federation of American Societies for Experimental Biology, Anaheim, California, April 24, 1985

INTRODUCTION

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The generally accepted definition of dietary fiber is that it is comprised of plant material which cannot be degraded by the endogenous secretions of the human digestive tract (1). There are a number of terms which have been used to describe this material, among them unavailable carbohydrates (2), nonnutritive fiber (3), edible fiber (4), and plantix (5). However, the term "dietary fiber" coined by Hipsley (6) and popularized by Trowell (1) has become common usage in the lay and scientific communities and will not be dislodged easily.

The major constituents of fiber are:

Cellulose: an unbranched 1–4 β-glucose polymer containing between 3000 and 100,000 glucose units. It is degraded to some extent by colonic bacteria.

Hemicelluloses: also called noncellulosic polysaccharides. They are complex polymers which may be branched extensively. Generally, hemicelluloses are comprised of a spine containing xylose, mannose, galactose, and glucose with arabinose, galactose, and galacturonic acid distributed randomly throughout the polymer. The usual hemicellulose unit contains 150–200 sugar units. Hemicelluloses, too, are degraded by colonic bacteria.

Pectins (or pectic substances): these substances represent 4% or less of cell wall polysaccharides. Pectins are polymers of 1–4 β-D-galacturonic acids which contain 10–25% of neutral sugars—arabinose, galactose, xylose, rhamnose, and fucose. The acidic components of pectins may be methylated to varying degrees and the extent of methylation can influence their physiological functions. Pectins are completely degraded by the intestinal flora.

Gums and mucilages: these are not strictly cell wall components but they are secreted by plants and because their physical and physiological properties resemble those of cell wall constituents, they are accepted under the designation of dietary fiber. The gums are highly branched polymers of uronic acids, principally glucuronic and galacturonic acids. They also contain xylose, fucose, rhamnose, and galactose. The mucilages are primarily neutral polysaccharides containing galactose, glucose, mannose, arabinose, and xylose. They frequently also contain galacturonic acids. The gums and mucilages are completely degraded by colonic bacteria.

Algal polysaccharides: these substances are also classed as dietary fiber. They consist of a backbone of mannose, xylose, glucose, and guluronic acid which carries galactose side chains.

Lignins: these are not carbohydrates but complex polymers of phenylpropanes primarily sinapyl, coumaryl, and coniferyl alcohols. Lignins are found primarily in wood where they may constitute up to half of the cell wall material; they occur in some plants and their content increases as the plants age. Lignins are the only type of dietary fiber completely undegraded by colonic flora.

The parenchymatous tissues of vegetables and fruits contain cellulose, hemicellulose, and pectins; the lignified tissues contain cellulose, hemicellulose, and lignins. Protective coverings such as apple peel or peanut skin contain cutins. Seeds (both endospermic and nonendospermic) contain cellulose, hemicellulose, and pectins. The lignified tissues of cereals contain hemicelluloses, cellulose, lignin, and phenolic esters and the endosperm and aleurone contain hemicelluloses, cellulose, pectins, and phenolic esters.

The physical properties of dietary fibers are of importance to their nutritional effects. These include water holding capacity, which may range from 447 g water held/100 g fiber (bran) to 37 g water held/100 g fiber (turnip) (7); adsorption of organic substances, which

0037-9727/85 $1.50

includes ability to bind bile acids and salts (3, 8, 9), phospholipids, and triglycerides (10, 11); and cation exchange properties which permit them to bind calcium, zinc, iron, and other cations (12, 13). Physiologically, dietary fiber may affect gastric filling and emptying, gastrointestinal transit time and fecal bulk, fecal steroid output, and trace mineral absorption.

Interest in dietary fiber dates back to Hippocrates. Its value was noted by British medical writers of the 16th and 17th centuries. The modern fiber era came with the writings of Cleave (14, 15), Burkitt (16), and Trowell (17). A paper by Burkitt *et al.* (18) in 1974 kindled both professional and public interest in the United States. Several multiauthor books on fiber have recently appeared (19–21). They present the latest information on most phases of this field.

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