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# Technical Paper

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# THE ROLES OF FIBRES IN THE MANUFACTURE OF BAKED PRODUCTS

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Chemically, fibres are part of the family of carbohydrates which is an all-embracing term for food materials that are based on the presence of three types of atoms, carbon, hydrogen and oxygen. As a generic group, carbohydrates are the main source of energy in most diets around the world. The basic building blocks of carbohydrates are the monosaccharides. These are single molecules of simple sugars which are linked in a variety of complex ways to form the different types of carbohydrates, including starches and fibres. It is the complex linkages which determine if and where in the human digestive system carbohydrates are broken down to provide the glucose molecules which are essential for the proper functioning of the brain, nerve cells and developing red blood cells, and to provide energy.

Fibres are mostly polysaccharides and so comprise large number of sugar molecules linked together. These chemical linkages limit the energy contribution that fibres can make in the diet. Their main role appears to be associated with gut health, with only a few types of fibre being broken down by the suite of enzymes in the human gut. Interest in the role of fibre in the human diet has a long history with prominent physicians and many hundreds of years ago the value of cereal fibres as part of a healthy diet was recognised.

### Definition and Measurement of Dietary Fibre

The medical and analytical considerations related to the definition of dietary fibres have changed significantly and it is now common practice to refer to dietary fibre with measurement methods which have replaced the earlier concept ‘crude’ fibre. Much progress has been made with a definition of dietary fibre that better reflects the role of fibre in the human digestive tract. The European Commission (EC) arrived at a definition for dietary fibre in November 2008 and the was agreed with the international CODEX Alimentarius Commission in 2009.

The EC defines fibre as “carbohydrate polymers with three or more monomeric units (to exclude mono- and disaccharides, simple sugars of one or two molecules). These polymers are neither digested nor absorbed in the small intestine.”

The EC goes on to identify that dietary fibre consists of one or more of:

- Non-digestible, edible carbohydrate polymers naturally occurring in the food as consumed.
- Carbohydrate polymers obtained from food raw materials by physical, enzymatic or chemical means.
- Synthetic carbohydrate polymers.

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Except for the non-digestible, edible carbohydrates, the definition goes on to state that there should be evidence of a beneficial physiological effect of any other material captured by the definition. Further it states that any beneficial physiological effect of other materials needs to be supported by generally accepted scientific evidence. This latter point is very important in the context of potential claims for a raw material or baked product being a source of dietary fibre.

The direct measurement of total dietary fibre is not a simple procedure; there are three main methods which are available and have received approval from internationally recognised bodies. In simple terms, the dietary fibre content of a food sample is determined using an enzymic-gravimetric method, the first step of which is to de-fat the sample. Thereafter the sample is treated with an enzyme system designed to mimic the digestive processes which take place in the human small intestine. Digestible carbohydrates are broken down to simple sugars and are removed from the sample. The remaining material contains protein and inorganic materials which must be measured separately and subtracted from the mass left. Laboratories offering the direct measurement of total dietary fibre should have the appropriate accreditation and should state which method has been used. This is important for food manufactures because each of the three main methods of analysis will give slightly different results. In certain cases, it is desirable to know what type of dietary fibre is present in a sample. Two modifications to standard methods exist which allow the dietary fibre content to be divided into soluble and insoluble dietary fibre.

## Generic Characteristics and Sources of Fibre

### Characteristics of Fibres

As noted above, fibres are composed of complex linkages of simple sugar molecules. Fibres may be referred to as polysaccharides or complex carbohydrates. In nature they are found in many different plant including grains, pulses, vegetables, and fruits. They are most commonly (but not always) associated with the outer layers and seedcoats of plant materials and while they vary in their physical make-up and complexity, they are tough and difficult to penetrate or break down with a mechanical force. The mechanical toughness of the various fibre-fibre rich skins and seedcoats fulfil a number of different roles in nature, including the retention of water in fruits and vegetable, and protection of the food source which will support the growth of seeds. The mechanical toughness of fibres often means that complex methods of separating them from the other components of plants and seeds are required.

There are two primary types of fibre and they are usually described as being soluble or insoluble which relates to the ability of the fibre to dissolve in water. Typically, both types of fibre occur in many types of plants, seeds, seeds and vegetables, but in varying ratios of soluble and insoluble forms. Sources rich in soluble fibre include pectins, gums, psyllium, and oats (*beta*-glucans). The insoluble fibres are mainly the celluloses, hemicelluloses and lignin, and are therefore more commonly associated with nuts, grains and some vegetables. Lignin is not a carbohydrate but is very closely associated with the carbohydrates in the celluloses and hemicelluloses in the cell walls of plants and so is often considered within the category of dietary fibre.

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