**College of Applied Medical Sciences/ Department of Environmental Health**

**Lab(6)**  **Determination of Carbohydrates**

Carbohydrates are one of the most important components in many foods. Carbohydrates may be present as isolated molecules or they may be physically associated or chemically bound to other molecules. Individual molecules can be classified according to the number of monomers that they contain as **monosaccharides, oligosaccharides or polysaccharides.**

Molecules in which the carbohydrates are covalently attached to proteins are known as ***glycoproteins*,** whereas those in which the carbohydrates are covalently attached to lipids are known as ***glycolipids***. Some carbohydrates are digestible by humans and therefore provide an important source of energy, whereas others are indigestible and therefore do not provide energy. Indigestible carbohydrates form part of a group of substances known as ***dietary fiber***, which also includes **lignin**. Consumption of significant quantities of dietary fiber has been shown to be beneficial to human nutrition, helping reduce the risk of certain types of cancer, coronary heart disease, diabetes and constipation. As well as being an important source of energy and dietary fiber, carbohydrates also contribure to the sweetness, appearence and textural characteristics of many foods. It is important to determine the type and concentration of carbohydrates in foods for a number of reasons.

* ***Standards of Identity*** - foods must have compositions which conform to government regulations
* ***Nutritional Labeling*** *-*to inform consumers of the nutritional content of foods
* ***Detection of Adulteration*** *-*each food type has a carbohydrate "fingerprint"
* ***Food Quality*-** physicochemical properties of foods such as sweetness, appearance, stability and texture depend on the type and concentration of carbohydrates present.
* ***Economic -***industry doesn't want to give away expensive ingredients
* ***Food Processing*** - the efficiency of many food processing operations depends on the type and concentration of carbohydrates that are present

**Methods of Analysis**

A large number of analytical techniques have been developed to measure the total concentration and type of carbohydrates present in foods. The carbohydrate content of a food can be determined by calculating the percent remaining after all the other components have been measured:

**%carbohydrates = 100 – (%moisture + %protein + %lipid +%mineral).** If you want determination of saccharides only : **%carbohydrates = 100 – (%moisture +%protein + %lipid + %fiber %mineral).** Nevertheless, this method can lead to erroneous results due to experimental errors in any of the other methods, and so it is usually better to directly measure the carbohydrate content for accurate measurements.

**Physical Methods**

Many different physical methods have been used to determine the carbohydrate concentration of foods. These methods rely on their being a change in some physicochemical characteristic of a food as its carbohydrate concentration varies. Commonly used methods include (polarimetry, refractive index, IR, and density) .

**Refractive Index (RI)**

The refractive index (*n*) of a material is the velocity of light in a vacuum divided by the velocity of light in the material **(*n*= *c*/*c*m).** the refractive index of carbohydrate solutions is usually measured at a boundary with quartz. The refractive index of a carbohydrate solution increases with increasing concentration and so can be used to measure the amount of carbohydrate present. The RI is also temperature and wavelength dependent and so measurements are usually made at a specific temperature (20 oC) and wavelength (589.3nm).

-This method is quick and

-simple to carry out and

-can be performed with simple hand-held instruments.

-It is used routinely in industry to determine sugar concentrations of syrups, honey, molasses, tomato products and jams.

column

I air

surfus

liquid

R

**Types of Refractive Index :-**

1-Abbe Refractive meter ( measurement of solutions of solid reading (07/01 to 03/01) concentration of (0 - 95%) .

2- Ziess Refract meter reading (1:57 - 1.3 ) .

3-Hand Refract meter to measure the concentration of dissolved solids does not measure of the refractive index .   
importance :-