Second Edition

NUTRITION HANDBOOK

For Nursing Practice

Susan G. Dudek

J. B. Lippincott Company

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Preface

Because nutrition is a basic human need, ever-changing throughout the life cycle and along the wellness–illness continuum, it is a vital and integral component of nursing care. Knowledge of nutrition principles and the ability to apply that knowledge are required of nurses, whether they are involved in some or all of the stages of nutritional care (assessment, planning, implementation, and evaluation).

NUTRITION HANDBOOK FOR NURSING PRACTICE, 2nd edition, is a comprehensive handbook that may be used as a core or supplemental text by students from a variety of educational backgrounds, or as a reference manual by practicing nurses. Using the nursing process format, it provides easily accessible, practical information to facilitate the integration of nutrition into nursing care plans. Tables are used extensively throughout the book for concise presentation of material. Current nutrition topics, including some that are controversial, are featured under the heading *Food for Thought*. Where applicable, *Drug Alerts* have been included, which highlight possible adverse nutritional side effects of commonly used medications and specify appropriate actions to alleviate those effects. Special displays of *sample menus* and *specific modified diets* allow the reader to see, at a glance, how nutritional needs are met in specific situations. Besides providing the most recent current nutrition information and most recent revision of the RDA tables, the new Food Pyramid, and up-to-date diet recommendations from leading health organizations, this edition also features other significant changes such as a stronger nursing process format that includes nursing diagnoses, and the addition of "newer" health concerns such as AIDS and Alzheimer's disease.

Section One: Principles of Nutrition presents the fundamentals of nutrition. Topics covered include carbohydrates, protein, lipids, energy balance and weight control, vitamins, minerals, and fluid and electrolytes. Background data on nutrient functions, sources, and requirements are augmented by brief overviews of nutrient or body metabolism. Potential adverse side effects of deficient and excessive intakes, and current intake recommendations are discussed. Consumption trends and future areas of research are presented where applicable.

Section Two: Nutrition in Health Promotion focuses on optimal nutrition for the "well" population at various stages of the life cycle and is presented in the nursing process format. Where appropriate, alterations in health that commonly occur only at certain stages of the life cycle (*i.e.*, during pregnancy, infancy, and childhood) are discussed, along with recommended dietary interventions.

Building on the foundation laid in Sections One and Two, **Section Three: Nutrition in Clinical Practice** combines the knowledge and application for nutrition in clinical practice. Alterations in health are presented, which range from stress and surgery to oncology. For each particular disorder, background information regarding etiology, com-

plications, treatment, and diet therapy objectives is reviewed. Assessment data follows: Please note that the focus of this information is on the nutritional and dietary implications of each specific disorder and, therefore, should not be viewed as a complete nursing assessment guide. A sample, or generic, nursing diagnosis is given for each clinical disorder to illustrate how nutrition can be incorporated into nursing care plans. It should be noted that in *practice*, actual nursing diagnoses are formulated only after all pertinent assessment data is gathered and analyzed. For any given individual, the sample diagnoses may be incomplete or inappropriate. Although, in practice, Planning and Implementation are two distinct steps, they are grouped together for the sake of written presentation. As with the assessment data, client goals and nursing interventions, including Diet Management, Client Teaching, and Monitoring, focus only on nutrition. Evaluation projects optimal client outcomes.

Throughout Section Three, specific modified diets are presented in tabular form and emphasize potential problems, the rationale, nursing interventions, and client teaching.

Finally, Appendices provide a wealth of useful reference material such as food composition tables, the American Diabetes Association/American Dietetic Association Exchanges Lists, generalizations about diet and drugs, and a composite of selected enteral formulas.

Susan G. Dudek, R.D., B.S.

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Contents

I

Principles of Nutrition

1 *The Study of Energy*

1 Carbohydrates

Carbohydrates, commonly known as sugars and starches, provide the major source of energy in almost all human diets. Americans consume 40% to 45% of their calories in the form of carbohydrates (CHO). People in developing countries may obtain as much as 80% to 90% of total calories from CHO.

Carbohydrates are found mainly in plants. Compared to raising animals for food, plants are easy to grow, have a high energy yield per unit of land, are easy to store after harvesting, and are therefore relatively inexpensive. As such, CHO intake and income have an inverse relationship—as income goes up, CHO intake decreases, and the intake of protein and fat (more expensive forms of energy) increases.

SYNTHESIS

Through the process of photosynthesis, all green plants trap energy from the sun, water from the soil, and carbon dioxide from the air to make CHO. Plants store CHO as either sugar (*i.e.*, fruit and sugar beets) or starch (*i.e.*, root and tuber vegetables, dried peas and beans, and cereal grains). As some plants ripen and mature, they become less sweet as

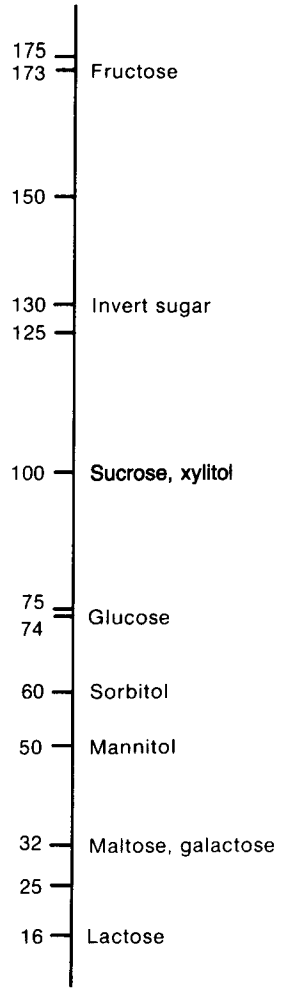

Figure 1-1
Sweetness scale. (Krause MV, Mahan LK: Food, Nutrition, and Diet Therapy. 7th ed. Philadelphia: CV Mosby, 1984)

sugar is converted to starch (*i.e.*, peas, corn, and carrots). Conversely, fruit becomes more sweet as it ripens because starch is converted to sugar.

Chemically, all CHO are composed of the elements carbon (C), hydrogen (H), and oxygen (O). Like water (H_2O), CHO have twice as many hydrogen atoms as oxygen atoms. Because each particular CHO has a distinct chemical arrangement, sweetness (Fig. 1-1) and other physical properties vary.

CLASSIFICATIONS

The two major classifications of carbohydrates are simple carbohydrates (sugars) and complex carbohydrates (starches and fiber). *Simple carbohydrates* are composed of one or two sugar, or saccharide, molecules; they are known as monosaccharides and disac-

charides, respectively. This group includes naturally occurring sugars that do not taste sweet (*i.e.*, lactose, maltose), as well as sugar sweeteners, like sucrose and fructose, which are known as *nutritive* sweeteners because they provide calories. (*Non-nutritive* sweeteners, like aspartame and saccharin, are considered noncaloric, high-intensity, or alternative sweeteners;[1] they are not true carbohydrates.)

Complex carbohydrates, or polysaccharides, are made of long chains of many (poly) sugar (saccharide) molecules. Because of the way their sugar molecules are arranged, polysaccharides do not taste sweet. Starch, dextrins, glycogen, and fiber belong to this category.

Monosaccharides: Simple Sugars

Monosaccharides are the simplest type of CHO because they cannot be hydrolyzed (broken down) into smaller molecules, instead, they are absorbed directly into the bloodstream without undergoing digestion. Depending on the number of carbon atoms contained in each sugar molecule, monosaccharides may be classified as trioses, tetroses, pentoses, or hexoses (three, four, five, and six carbon atoms, respectively). The hexoses, specifically glucose, fructose, and galactose, are the only monosaccharides abundant in food and nutritionally significant (Table 1-1). Mannose is a hexose of limited nutritional importance.

Glucose: D-glucose, Dextrose, Grape Sugar, Blood Sugar

Glucose is the major fuel of the body and the form of CHO to which all other CHO are converted in order to be transported through the blood or utilized for energy. Because of this, glucose is the only sugar found in the body in significant amounts. Normal blood glucose levels range from 70 mg/dl to 100 mg/dl and are regulated by hormones (Table 1-2).

Fructose: Fruit Sugar, Levulose

Fructose is the sweetest simple sugar and is particularly effective at sweetening high-acid and cold foods. When used in other foods, it may not produce a sweeter taste. Pure

Table 1-1
The Common Hexoses and Their Sources

Hexose	*Sources*
Glucose	Fruits, vegetables, honey, and corn syrup; made commercially from the hydrolysis of starch or corn through the action of heat, acid, or enzymes
Fructose	Fruits, vegetables, corn syrup, and honey; commercially available from the hydrolysis of sucrose or natural extraction from fruit
Galactose	Not found freely in food, but is combined with glucose to form the disaccharide lactose
Mannose	Found in small amounts in peaches, apples, and oranges

Table 1-2
The Effect of Hormones on Blood Glucose Levels

Hormone	*Effect on Blood Glucose Level*	*Mechanism*
Insulin: produced by the β cells of the islets of Langerhans in the pancreas	Decrease	Enhances the uptake of glucose by muscle and adipose cells Promotes the conversion of glucose to glycogen in the liver and muscle cells (glycogenesis) Enhances the conversion of glucose to fat in the liver and adipose cells (lipogenesis)
Glucagon: produced by the α cells of the islets of Langerhans in the pancreas	Increase	Stimulates the synthesis of glucose from non-CHO sources (gluconeogenesis) Promotes the breakdown of glycogen to release glucose (glycogenolysis)
Epinephrine: produced by the adrenal medulla	Increase	Stimulates glycogenolysis Decreases the release of insulin
Glucocorticoids: produced by the adrenal medulla	Increase	Stimulate gluconeogenesis Cause the tissue to be insensitive to the action of insulin
Thyroxine: produced by the thyroid gland	Increase	Stimulates glycogenolysis in the liver Stimulates gluconeogenesis Increases the rate of intestinal absorption of the hexoses

crystalline fructose produces a flatter insulin response and smaller increase in blood glucose levels than sucrose. As such, small amounts of fructose can be used by diabetics, but calories and CHO must be considered. Like other sugars, fructose is converted to glucose in the liver. Fructose is widely used both in the pharmaceutical industry and in food processing.

Galactose

Galactose is not found freely in food but is combined with glucose in the disaccharide lactose. It is also converted to glucose in the liver.

Monosaccharide Derivatives: Sugar Alcohols

Sugar alcohols, of which sorbitol, mannitol, and xylitol are the most common, are produced when an aldehyde group is changed to an alcohol. Although sugar alcohols provide the same amount of calories per unit of measure as other sugars, they are not completely absorbed, and therefore their calorie content may be slightly less. They are used most commonly as sugar substitutes in dietetic products because they are slowly absorbed and produce less of an effect on blood glucose levels and insulin secretion than sucrose. However, when consumed in significant amounts, sugar alcohols can produce osmotic diarrhea and other side effects. Sources of sugar alcohols appear in Table 1-3.