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Tufts University School of Medicine
Nutrition and Obesity:
Learning Objectives

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1. Explain the BMI standards used to define obesity: pros and cons.
2. Describe the different types of fat distribution and their effect on disease risk.
3. Explain the association between waist circumference, BMI, and disease risk.
4. Explain the health risks associated with obesity.
5. Discuss the current prevalence of overweight and obesity in the US population.
6. Explain the etiology of obesity, including genetic and environmental factors.
7. Describe the proposed treatments for obesity and the pros and cons of each. This includes popular dietary treatments, as well as pharmacologic and surgical treatments.
8. Identify the four components of a sound weight loss program.

Nutrition and Obesity: Answers to Learning Objectives

1) Obesity: Excess fat mass.

a) Explain the BMI standards used to define obesity.

BMI:

- Normal is 18.5-24.9
- Overweight is 25.0-29.9
- Obesity is divided into class by severity. As class increases, likelihood of risk factors increase. *Class I* is 30.0-34.9, *Class II* is 35.0-39.9 and *Class III* is >40

b) Body weight

Using a scale, weight was the traditional measure of obesity used by insurance companies. Today, BMI (weight adjusted for height) has replaced weight as the standard.

2) Describe the different types of fat distribution and their effect on disease risk.

- *Android* obesity (apple shape) refers to the central distribution of body fat in and around the abdomen and is associated with an increased risk for a number of comorbidities including diabetes, hyperlipidemias, hypertension, and cardiovascular disease.
- *Gynoid* obesity (pear shape), where fat is distributed over the hips and buttocks, is associated with less disease risk

3) Explain the association between waist circumference, BMI, and disease risk.

- In comparison to waist-hip ratio (WHR), *waist circumference* better predicts total abdominal fat content as well as visceral fat content. Waist circumference should be measured directly above the iliac crest.
- Waist circumference > 35 inches for women and > 40 inches for men increases health risk for a given level of BMI as follows:

| BMI | Waist Circumference Men: < 40" Women: ≤ 35" | Waist Circumference Men: > 40 Women: >35" |
|------------|--|--|
| | 25.0-29.9 | Increased |
| 30.0-34.9 | High | Very high |
| 35.0-39.9 | Very high | Very high |
| >40 | Extremely high | Extremely high |

Regardless of weight, having android fat deposition is associated with greater health risks.

4) Discuss the current prevalence of overweight and obesity in the US population.

The current combined prevalence of overweight and obesity (BMI \geq 25) in the US is 64.5% and the prevalence of obesity alone (BMI \geq 30) is 30.5%. Class III (extreme obesity; BMI \geq 40) prevalence is 4.7% or approximately 6 million Americans, and has tripled in the past 10 years. The category that is increasing the most is obesity, not overweight. [American Obesity Association (www.obesity.org); and JAMA 2002, Oct 9;288 (14):1772-1773].

The incidence of obesity among children (\geq 30% above ideal weight) has tripled among children ages 6-11 over the past 30 years and is increasing at a rapid rate (it has doubled within the last 10 years). Now 10% of children ages 2-5, 15% of children ages 6-11 and 15% of adolescents (ages 12-19) are obese [National Academies, 10-1-04 release].

5) Explain the health risks associated with obesity.

• **Diabetes**

Obesity dramatically increases the risk for type 2 diabetes. In the Nurses Health Study, in comparison to a reference BMI of 22, BMI of 23-25 was associated with a four-fold relative risk of type 2 diabetes and BMI $>$ 35 was associated with relative risk of 93.2. While the upper weight range was associated with a staggering risk for diabetes, even a BMI in the high-normal range was associated with increased risk. Conversely, as little as 5-10% weight loss has been shown to improve glucose control.

• **Hypertension**

Obesity is a significant risk factor for elevated blood pressure, and BMI is directly related to risk for hypertension. The prevalence of hypertension in the obese may be as high as 25-50%. Central fat distribution also correlates with blood pressure, with central adiposity further increasing risk for hypertension.

• **Cardiovascular disease**

Obesity is associated with risk for several cardiovascular diseases including coronary heart disease. In 1998, the American Heart Association classified obesity as a risk factor for CHD *independent* of the relationship between obesity and other factors that promote CHD such as hypertension and dyslipidemia.

• **Gallbladder disease**

Obesity is associated with increased risk for gallstones, although the relationship has been more consistently found in women than men. In the Nurses Health Study, in comparison to those with a BMI $<$ 24, gallstones were 3.7 times more prevalent for those with a BMI of 30-35, and 7.4 times more prevalent for those with a BMI \geq 45. Central adiposity does not seem to be a factor. Several studies have found a relationship between rate of weight loss and gallstone formation. Those who are rapidly losing weight (greater than 1.5 kg/wk) are at increased risk of gallbladder disease.

• **Other diseases associated with obesity**

Obstructive Sleep Apnea
Osteoarthritis
Obesity Hypoventilation Syndrome
Immune Dysfunction

Increased risk of certain cancers: endometrial, breast (post-menopause), colon, kidney (renal cell), esophagus (adeno), thyroid

6) Explain the etiology of obesity.

The long-term balance between energy intake and energy expenditure determines body weight. The current obesity research seeks to understand the complex interplay between the neuroendocrine system, and genetic and environmental factors that influence energy balance. Neuroendocrine and genetic factors provide a predisposition to obesity, but in most cases, environmental factors are necessary to achieve obesity.

- **Genetic factors**

Evidence for a role for genetics can be found from human studies as well as from animal models of obesity. Human studies include cross-sectional studies of families, twins, and adoptees, and overfeeding studies in twins. Multiple factors have been proposed to underlie the genetic contribution to human obesity including resting energy expenditure (REE), hormonal response to overfeeding, DNA polymorphisms or mutations in beta-adrenergic receptors and mitochondrial uncoupling proteins, regulation of adipocyte differentiation, and patterns of energy expenditure, compulsive behavior, dietary intake, and taste preference. Over 60 common single nucleotide polymorphisms (SNPs) have been identified to date. Phenotypic expression may require a combination of multiple SNPs, plus the presence of environmental factors.

Several animal models of obesity are characterized by single gene defects. The best-described model is the ob/ob mouse, which has a genetic defect coding for the protein **leptin**. Leptin is normally produced in fat cells in proportion to the animal's fat mass. Circulating leptin binds to specific receptors in the hypothalamus, initiating a signaling cascade resulting in decreased food intake and increased thermogenesis. The identification of leptin stimulated widespread hope that human obesity could be explained by a similar single gene defect. However, most obese individuals have high levels of leptin, suggesting resistance to the hormone. Trials are underway to determine if leptin administration will reduce body weight.

- **Ghrelin** and **Neuropeptide Y (NPY)** are also being given much attention as potential dietary intake modulators. It appears **ghrelin**, a peptide hormone synthesized predominantly in epithelial cells lining the fundus of the stomach, has a significant effect on appetite and energy balance. **NPY** is the most abundant neuropeptide in the brain. A member of the pancreatic polypeptide (PP) hormone family, NPY has involvement in a number of physiological activities, such as induction of food intake, inhibition of anxiety, vasoconstriction, and regulation of ethanol consumption. NPY appears to play a strong central influence in feeding behavior.

- **Environmental factors – Diet and energy expenditure determining caloric requirements:**

It is very difficult to accurately measure total energy expenditure (TEE) in free-living persons. There are three components – resting energy expenditure (REE), an activity factor, and the thermic effect of food (the amount of energy it takes to digest and absorb

food). Resting energy expenditure (REE) is determined by genetic factors but is most closely related to lean body mass (LBM).

Specifically, the equation looks like this:

$TEE = REE$ (resting energy expenditure) \times Activity Factor + TEF (thermal effect of food).

REE can be determined by using the Harris Benedict Equation, World Health Organization Tables, or kcal/kg models. See Nutritional Assessment Chapter for specifics on calculating TEE.

Given fewer Americans performing manual labor jobs, the current emphasis on convenience and advances in labor-saving devices (TV clickers, escalators, motorized doors) and an increased reliance on the automobile for transportation, daily energy expenditure level has decreased.

Because obese people weigh more than lean people, their TEEs are increased in absolute value. When adjusted for lean mass, the REEs of obese persons are not appreciably different than leaner persons; however, the physical activity level of the obese person is lower than that of his lean counterpart. Obese individuals have also been found to expend less **nonexercise activity thermogenesis (NEAT)**, such as fidgeting. Therefore, the amount of energy expended daily on physical activity is less in the obese than lean persons.

Historically, *caloric intake has been increasing* in the US population as energy expenditure has been decreasing. According to the CDC, in 2000, women consumed 22% more calories per day than they did in 1971; men consumed 7% more. The bottom line: Americans today habitually move less and eat more than those 20-30 years ago.

Diet:

A high fat diet is linked to obesity for its high energy density (9 kcal per gram vs. 4 kcal per gram of carbohydrate and protein) and prevalence in the US diet (meats, cheeses, fast food, baked goods, etc.). While many focus on the fact that fat now constitutes a lesser percentage of dietary macronutrients consumed in the US compared to the past few decades while obesity is increasing, other dietary issues are being considered, including increased daily caloric intake, portion sizes of foods, a high sugar/refined carbohydrate intake, **glycemic index (GI)**, and fiber. For example, David Ludwig from Boston's Children's Hospital has demonstrated that children fed a low GI breakfast ate significantly less at the next meal than children fed a typical high glycemic index breakfast and were able to more easily lose weight. Dietary variety has also been positively associated with obesity. A wide variety of accessible sweets or snack foods, coupled with a dietary pattern marked by consumption of a small variety of vegetables, has been associated with increased intake and fatness. See the required reading "Glycemic Index" by D. Ludwig assigned in the Carbohydrate chapter and read section on obesity.

Exercise:

Our highly mechanized lifestyle is associated with decreased amounts of energy spent on transportation, work, and recreation. Cross-sectional studies suggest that obese persons,

in comparison to leaner counterparts, are more sedentary and spend more time engaged in recreational activities requiring little energy expenditure. Weekly time spent watching television has been associated with obesity in both children and adults, and like dietary intake, is often underestimated by the individual. Although evidence is inconsistent regarding energy expenditure and weight gain, the fact remains that the US has become an increasingly sedentary population while the incidence of obesity continues to rise. Dr. Rena Wing from Brown University has established a “**National Weight Control Registry**” for people who have successfully lost at least 30 pounds and kept the weight off for more than a year. As of 2004, the registry has collected data from over 4,200 participants; the average weight loss over 60 lbs and the weight loss maintained more than 6 years. Along with a balanced, low fat diet, and self-monitoring, regular, consistent exercise (and lots of it) was found to be a key component of successful long-term weight loss and weight loss maintenance. For information on this registry, go to www.nwcr.ws/. Please see “A descriptive study of individuals successful at long-term maintenance of substantial weight loss,” *Am J Clin Nutr* 66:239-46; 1997.

7) **Psychiatric, emotional and quality of life (QOL) issues.**

a) **Depression**

Among women, obesity is related to major depression and this relationship increases with higher socioeconomic status. Among men, there is an inverse relationship between obesity and depression, with no relationship to socioeconomic status.

b) **Eating disorders**

- i) **Binge eating disorders (BED) vs. Bulimia** - BED patients eat large volumes in secret, very quickly, with guilt, but often without hunger cues. Bulimics not only binge, but purge, fast or rigorously exercise post-binge to get off binged calories. BED patients have weight loss expectations that exceed expert and governmental guidelines (14% vs. 5-10% of current weight)
- ii) **Night eating syndrome (NES)** - Night eaters compulsively consume >1/3 of daily kcals after 7:00 p.m.

There are 5 characteristics of NES:

- (1) Not feeling hungry in the morning (morning anorexia)
- (2) Overeating in the evening (hyperphagia)
- (3) Difficulty falling asleep
- (4) Repeated awakenings throughout night and eating
- (5) Feeling depressed, out of control, and/or ashamed

This eating pattern is more common in overweight and obese individuals, especially those seeking surgical intervention, than in normal weight individuals. NES is disruptive to sleep and appears to contribute to weight gain. The syndrome is reported to run in families, so may have genetic, as well as physiologic and psychological factors

8) **Economic impact of obesity.**

a) **Societal cost**

The national direct and indirect health care expenditures related to *adult* overweight and obesity range from \$98 billion to \$129 billion annually. Obesity-related medical

expenditures constitute 4 to 6.7% of each state's budget, and up to 9.8% of state Medicare expenditures.

Obesity's annual cost to employers is estimated at \$12 billion, including lost productivity due to employees' weight-related illnesses and disabilities. In addition, obese *toddlers, children and adolescents* are at high risk for becoming obese adults with many costs to society. Children with at least one obese parent are also at high risk for becoming obese.

b) Individual cost

- i) **Years lost due to obesity** - The optimal BMI associated with the greatest longevity is 23-25 for whites and 23-30 for blacks. Racial differences in risk are evident. Life expectancy is not decreased in blacks until higher BMIs (32 for men and 37 for women). Obesity lessens life expectancy markedly, especially in younger individuals. Compared to older adults, younger adults have the greatest years lost for any level of overweight.
- ii) **Work related** - Weight-based discrimination at work is widespread. According to a review of 29 studies, overweight women in particular consistently experience a penalty in the workplace, both in terms of employment opportunities and in fair pay for comparable work [Mark Roehling, Western Michigan University]. Mildly obese *white women* are paid 6% less than their "normal weight" counterparts, while the salaries of morbidly obese and normal-weight women differ by 26%. Slightly obese *men* actually make a little more than normal-weight men, though morbidly obese men are penalized.
- iii) **Treatment related** - Obese consumers are expected to pay an additional 36% in medical costs per year (\$395 extra), compared to smoking or problem drinking, which add about \$230 and \$150 to medical costs per year, respectively [Rand Corp report, 2002]. By reducing weight by as little as 10%, a consumer may save between \$2,200 and \$5,300 on lifetime medical costs, and reduce the chances of being rejected for private health insurance and becoming liable for treatment costs.
- iv) **Life related** - In 2002, Southwest Airlines began requiring larger customers to purchase more than one ticket and pay for the number of seats they actually use. The policy still stands; however, customers may receive a refund on the extra seat payment, if the flight is not oversold. As of the 2003 tax returns, the Internal Revenue Service now offers a tax break on prescribed weight-loss programs. (Medical and Dental Expenses, [IRS Publication 502](#).)

9) Describe the proposed treatments for obesity and the pros and cons of each.

a. Lifestyle (Diet and Exercise)

Hundreds of diets have been promoted for "easy" weight loss, most with limited success. Because calories come from protein, carbohydrate and fat, many of the popular diets promote one macronutrient over another, claiming that a special balance of these nutrients is the key to weight loss. For example, the Atkins diet discourages all carbohydrates while promoting a free intake of foods high in fat and protein; the Zone diet recommends a balance of 40% carbohydrate, 30% protein, and 30% fat to promote an optimal hormonal balance for weight loss; and Dean Ornish restricts fat to 10% of calories, with very high carbohydrate intake (70-75%), with an emphasis on high-quality, high-fiber carbohydrates.

None of these popular weight loss diets emphasize the importance of moderating caloric intake. In fact, many of them state that calories do not count. However, we know weight gain occurs when caloric intake exceeds caloric output.

When daily energy intake is reduced to an amount *above 800 kcal/d*, it is considered a **low calorie diet (LCD)**. When intake is set *below 800 kcal/day*, it is considered a **very low calorie diet (VLCD)**. Weight loss on a LCD is typically **0.5-1 kg/wk**, although the relationship between level of energy intake and actual weight lost depends on a number of factors, including the degree of obesity, level of activity, gender, and age. It is unusual for obese patients not to lose weight when consuming between 1000-1500 kcal/d. There is currently no scientific evidence to warrant a recommendation that LCD's be very low in fat (< 20% of energy), very low in carbohydrate (< 100 g/d), or very high in protein [A Astrup et al, *Lancet* 2004; 364:897-99]. According to the National Weight Loss Registry, the participants most successful at losing and maintaining a 30+ pound weight loss reported consuming about 1400 kcal/d with a low fat diet (24% of calories from fat) and expending 350-400 kcal each day, seven days a week, in physical exercise (most chose walking).

The most realistic approach for successful weight loss is to encourage a balanced intake of foods from every food group, with emphasis on portion control and low fat choices to help decrease caloric intake. High fiber/low **glycemic index (GI)** choices of foods should be encouraged to promote health and control satiety. **Weight Watchers**, a peer-led support and education program follows these guidelines. However, structuring a diet and lifestyle plan must be a joint effort between patient and clinician. An inflexible, clinician-driven plan that is not developed with consideration of the patient's lifestyle and intellectual capacity may result in short-term loss but is unlikely to be effective long-term.

Rating the Popular Diets:

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| The Atkins Plan |
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The Atkins Plan is one of the most popular diets in the US today and is also one of the most controversial.

Diet recommendations:

The diet allows only 20 grams of carbohydrate per day with limitless amounts of fat and protein. Carbohydrates are found in all starchy foods, sweets, milk and milk products, fruits, and vegetables. During the first phase of the diet, no fruits, milk, breads/cereals/grains, and sweets are allowed. Starchy vegetables like potatoes, peas, corn, winter squash, etc. are also forbidden, and only small amounts of low carbohydrate vegetables are permitted each day. A typical day's intake is very high in fat (50-75% of calories), saturated fat ($\geq 20\%$ of calories), very low in fiber (< 1 gram/d; fiber RDI is > 28 g/d) and low in many vitamins and minerals and phytochemicals. In addition, diets low in fiber often cause constipation.

The Atkins book encourages *four phases*.

- *Phase 1* recommends beginning with very low carbohydrate intake (< 20 grams/d primarily from salads) for **only two weeks**. However, most followers of Atkins remain on this very low carb plan indefinitely. Long term adherence to such a restrictive diet

that is very high in fat and saturated fat, and so low in fiber and many micronutrients can have major negative health consequences.

- The *Phase 2* weight loss phase allows a *weekly increase* of 5g carbs/day, until you find your weight loss stops, then the plan restricts the carbs to the previous week's level (maximum 60 grams/d).
- *Phase 3* (maintenance phase) allows adding 10g carbs/day until your weight maintenance stops, then back it down (maximum 100 grams/d).
- *Phase 4* limits non-green vegetables, fruits, nuts, beans and whole wheat bread, controls carb intake in order to "support weight maintenance". Foods *excluded forever* include white potatoes, pasta*, white bread, non-diet soda, sugar, and honey.

***Note:** Over the past few years, new pasta formulations from 'white wheat' have improved the protein and fiber content, and illustrate the importance of staying current with food supply and science advances.

Rationale

Dr. Atkins states that excessive calories are not the cause of weight gain, excessive insulin is. By keeping carbohydrate intake low, insulin levels are low. Because insulin is an anabolic hormone, which promotes the storage of calories as fat, without insulin, Atkins claims, there can be no fat storage. In addition, without carbohydrates to burn for fuel, the body turns to fat as the primary energy source. The byproducts of fat metabolism, ketone bodies, build up in the body, causing ketosis. The Atkins plan encourages the development of ketosis to promote fat burning and to curb appetite, which ketosis appears to do. Ketone strips are sold on his website and participants are encouraged to maintain ketosis for at least two weeks. Dr. Atkins also promotes his diet as being "heart healthy" even though it is unusually high in saturated fat and cholesterol. He claims that, without insulin, saturated fat is burned for energy and cannot be converted to LDL cholesterol. He provides no scientific data to support this claim.

Pros and Cons

Dieters on the Atkins plan do lose weight. However, whether this weight loss is actually fat loss remains to be seen. The body's metabolic pathways prefer to burn carbohydrates for energy. During the initial phase of the Atkins diet, glycogen, the body's storage form of carbohydrate, is burned for energy. (When glycogen stores are depleted, the body switches to fat as the primary energy source). Because water is stored along with glycogen, there is a significant amount of water loss when glycogen stores are depleted. Furthermore, ketosis promotes diuresis to aid in the excretion of ketone bodies. Much of the initial weight that is lost on the Atkins plan is water, which is rapidly regained when carbohydrates are consumed. Yet, independent, controlled studies have found no benefit from being 'ketotic state' while following the Atkins approach. Also, such low carbohydrate intake makes exercise, an integral component for short and long-term success, difficult to perform.

The diet is easy. There is no food to measure or weigh, no portion sizes to think about, no calories to count. There is very little decision-making to deal with – entire food groups are eliminated and the ones allowed have no limits on them. However, the down side of this is that, long term, it is difficult to avoid whole groups of food (no bread, no pasta, no grains, no potatoes, no fruit, no milk, no desserts, etc.). Participants tend to yo-yo on and off the Atkins plan, often regaining more weight than they lost.

Atkins Nutritionals did promote its own food product line of pre-made “low carb diet products” of meals, shakes, bars and snacks. It is easy to adhere to the Atkins low carb philosophy, yet eat 1200 kcals (30g carb) of Atkins ‘junk food’ without consuming the nutrient-dense foods necessary for health.

Given its popularity - where is the data? Only five Randomized Clinical Trials (RCT) comparing low carb vs. high carb diets have been published, offering limited preliminary data on dietary effects on risk of heart disease. Of these, only 2 studies were carried out for one year. In this limited sample (total n ~ 100), TGs appear to be lowered and HDL appeared to increase with low-carb diets. While weight loss data at 6 months was greater with the low-carb dieters, at one year, there was no weight loss advantage over traditional high carb diets. Also, both groups had low compliance and high attrition rates.

The Standard of Care: The American Heart Association, American Dietetic Association, and the American Medical Association strongly discourage this plan, for its lack of nutritional balance (very low in vitamins, minerals, fiber) and its excessive amount of total and saturated fat. No emphasis is placed on choosing healthy, quality fats and foods.

The South Beach Diet

Diet recommendations

Like Atkins, it has carbohydrate restriction phases.

Phase 1 lasts 14 days, recommends 3 meals/day to ward off hunger, allows *lean* protein, eggs, nuts, cheese, and vegetables, places no limits on portion size, limits only ‘unhealthy carbs’ (rice, pasta, breads, fruits) and proposes to reduce weight by 8-13 lbs. [Q: Can that weight loss all be fat? *8-13 lbs = 28,000 to 45,5000 kcal deficit!*]

Phase 2 (60-100 grams carbohydrate/d) lasts from Phase 1 until you reach your goal weight. It includes the addition of fruits, whole grain products and low-fat dairy back into the diet.

Phase 3, the maintenance phase, lasts for life.

Rationale

The basic assumption is that simple carbs are bad, making blood sugar regulation difficult, and leading to cravings.

Pros and Cons

Dieters on the South Beach plan do lose weight. Emphasize is on healthier fats, like olive oil, egg substitutes to reduce cholesterol intake, as well as leaner meats, and excludes butter. The plan mistakenly limits some vegetables, with the rationale being that carrots are ‘high GI’. In order to achieve the 50 g carbohydrate intake needed for a GI test load, a serving size that would rarely be eaten is required – *1½ lbs* of carrots. Using **glycemic load (GL)**, which considers the food’s normal portion size rather than the test standard of 50 g, carrots would *not* rate as ‘high GI’ food.

The Zone Diet

Diet recommendations

The Zone Diet encourages strict adherence to a “40-30-30” plan – 40% of calories from carbohydrate, 30% of calories from protein, and 30% of calories from fat – at each meal and snack time. Although not strictly forbidden, the author, Barry Sears, PhD, recommends trying to avoid all refined starchy carbohydrates like bread, bagels, pasta, potatoes, etc. and choosing lots of high fiber vegetables, fruits, and legumes for carbohydrate choices. He allows fat – up to 30% – but only unsaturated fats like olive oil, nuts, etc. He encourages the omega-3 fats in fish as well. Each meal also should have a moderate portion of lean protein.

Rationale

The author claims that, in order to lose weight, key hormones – insulin and glucagons – need to be finely balanced. He also talks about the importance of regulating harmful eicosanoids in the body by avoiding saturated fats and consuming omega 3 fats (*Q: Where’s the data?*). Once your body is in this perfect hormonal “zone,” weight loss will occur.

Pros and Cons

The diet appears to promote plenty of fiber, vitamins, and minerals, while encouraging a low intake of saturated fat and cholesterol. However, it is fairly complicated to follow precisely, and could lead to an excessive intake of protein. The USDA recommendation of 10-15% of calories from protein not only meets the DRI of 0.8 grams/kg/d, but also usually exceeds it. The average American protein intake is already 150% of the recommendation. Athletes following a 3,000-4,000 kcal/d training diet who take in the Zone’s recommended 30% protein would be taking in 900-1,200 kcal/d of protein. This translates to the 150 lb female athlete consuming more than 4 times the RDA; and the 175 lb male, 3.75 times the RDA! Long-term intake of 30% of calories from protein is more than the body needs and may tax the kidneys, which excrete nitrogenous waste products of protein metabolism. In addition, research has shown increased bone loss with high intakes of protein. Although the Zone approach implies that weight loss depends upon hormonal balance, most of the suggested menus are between 1200 and 1500 calories, which are low enough to promote weight loss in most people. A low calorie diet in disguise!

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| The Reversal Diet also called the Life Choice Diet |
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Diet recommendations

Adapted from his studies of cardiovascular disease, Dean Ornish, MD, developed a weight loss plan that is very low in total fat, saturated fat, and cholesterol. The diet is a vegetarian plan with only 10% of calories from fat and almost no saturated fat and cholesterol. The only animal products he allows are nonfat milk or yogurt, 1-2 servings per day. High-quality carbohydrates make up about 75% of total calories and protein 15%.

Rationale

Dean Ornish’s Lifestyle Heart Trial, conducted from 1986 to 1992, found that a very low fat ($\leq 10\%$ of calories), vegetarian diet in combination with exercise, stress management and emotional support, reversed the progression of coronary artery disease. In addition, patients following this low fat diet lost an average of 10.7 kg of weight (23.6 lb) after one year, whereas the control group gained weight (average 1.4 kg or 3.2 lb). This prompted Dr. Ornish to promote his vegetarian diet as a method for weight loss. His book, “Eat More, Weight Less” was published in 1996. He encourages whole grains, pasta, legumes, egg

whites, fruits and vegetables and up to 2 servings of fat free milk or yogurt. He discourages all foods high in fat, including those with unsaturated fats, like fish, nuts, vegetable oils, avocados, etc. Dr. Ornish has published ten articles in peer-reviewed journals that report success of his program.

Pros and Cons

The diet is rich in most vitamins, minerals, antioxidants, and fiber and very low in saturated fat and cholesterol. As with any vegetarian diet, however, the participant needs to be careful to include enough vegetable sources of protein to meet his or her protein needs, and to include good sources of calcium, iron, and vitamin B₁₂. In addition, the diet may be low in essential fatty acids, including omega 3 fatty acids. Recently, Dr. Ornish has begun recommending full fat fortified soy products and omega-3 supplements to address this issue. As the name of his book implies, Dr. Ornish claims that a very low fat diet allows you to eat more and still lose weight. There seem to be no limits on the amounts of foods allowed from the Grain, Fruit, and Vegetable food groups. However, it *is* possible to over consume low fat, high carbohydrate foods, especially grain products like bread, cereal, pasta, potatoes, etc. Dr. Ornish stresses carbohydrates that are high fiber, low glycemic index and the use of whole grains.

Persons following this plan should follow the basic guidelines within a caloric level that will allow them to lose weight.

Weight Watchers

Diet recommendations

Weight Watchers was founded 40 years ago to offer advice and support to people trying to lose weight. The company is now worldwide with millions of members, and includes registered dietitians, physicians, and other health professionals on staff.

Rationale

Weight Watchers believes that a healthy body results from a healthy lifestyle – which means mental, emotional, and physical health. Their diet plan encourages a balanced intake of foods within each food group while allowing the participant to include foods he or she enjoys. The plan uses a *point system*, with low fat, high fiber, nutrient dense foods being low in points and high fat, high sugar foods high in points. The points are based on calories, but participants do not have to count calories. They simply choose foods within their personal point range. Exercise is encouraged and built into the point system. The unique aspect of Weight Watchers is the ongoing social support. For a nominal fee, members can attend a meeting where stories are shared, recipes exchanged, etc. Meetings are available throughout America and around the world.

Pros and Cons

The current Weight Watchers program encourages balanced nutrition by allotting less points to nutritious foods and more points to high fat, high sugar foods. However, it is possible for a participant to select a poor diet and remain within their point allotment. The Weight Watchers magazine, website, and educational materials encourage nutritionally balanced, low fat, high fiber meal planning, but participants' main goal is to adhere to their own personal

point allotment. Also, group leaders are not necessarily health professionals. Many are people who have had personal success at losing weight on the program are there to lend their advice and support, but may not have the knowledge base to support dietary selections based on nutrient quality. There are no published peer-reviewed articles comparing the Weight Watchers Program and other approaches. However, it is a reputable group that promotes a healthier new eating pattern for weight loss and maintenance.

b. Pharmacologic treatments and supplements

All individuals should initially attempt to decrease weight by non-pharmacologic means. Those who do not achieve weight goals and who have a BMI ≥ 30 , or a BMI ≥ 27 with existing comorbid conditions can be considered for addition of medication to diet and lifestyle changes.

Pharmacologic agents can be classified by mechanism or by site of action. Mechanisms include inhibition of food intake, decreasing absorption of ingested nutrients, or increasing energy expenditure. Sites of action include the central or peripheral nervous systems, the digestive tract, or peripheral tissues capable of energy expenditure. Drugs acting on the nervous system can be further sub-classified for the primary neurotransmitter(s) affected.

Only two prescription drugs are approved for long-term use: orlistat (inhibits lipase) which blocks fat absorption in the gut and sibutramine (in the class of amphetamines, blocks uptake of serotonin, norepinephrine, dopamine), often prescribed for patients preoccupied with food and hunger, because it suppresses appetite. Both are known for their adverse effects, as much as the weight loss action. Safety data beyond one year is not available, nor are data on children. Drugs affecting the digestion and absorption of fat have not been shown to result in consistent long-term weight loss and may impair absorption of fat-soluble vitamins.

Many of the medications have serious side effects. For example, the medication “phen-phen”, a combination of phentermine (works on CNS) and phenylpropanolamine, was removed from the market for its link to damage of cardiac valves. Phenylpropanolamine (PPA), an appetite suppressant available in several over-the-counter diet medications, was removed from the market for its association with hemorrhagic stroke. Ephedra, also known as ma huang, a popular over-the-counter herbal supplement formerly found in Metabolife, HydroxyCut, has been used as a “diet” aid for helping to reduce food intake, increase thermogenesis and stimulate CNS and cardiovascular system. However, in 2004 the FDA required it be removed from the market for its role in a number of serious cardiovascular and CNS events and deaths. Over the counter supplements rely on anecdotal evidence, enhanced photography, have neither short-term, long-term, nor safety data behind their use.

c. Surgical treatments

As obesity rates soar, so does the demand for surgery. In 2001, about 47,000 surgeries were performed in the U.S. In 2004, it is estimated 98,000 will be done. Potential surgical patients must weigh more than 200% of their IBW or have a BMI > 40 , or at a minimum, have a BMI > 35 and suffer from obesity-associated comorbidities. In addition, all potential

candidates should have demonstrated repeated failure to control weight by medical means including supervised dietary programs.

Over the last five decades, a number of surgical procedures have been used to promote weight loss, including:

1. Gastric bypass
2. Gastric restrictive procedures
 - stomach stapling (no longer in use)
 - lap-band gastroplasty

1. Gastric bypass (GBP) is the most commonly performed of these procedures. In general, weight loss with the GBP is about *60% of excess weight* within the first two years and remains stable over time. However, *weight loss failures* occur in approximately 20-25% of patients, and are usually due to non-compliance with diet and insufficient follow-up with providers. *Weight regain* after loss is possible, as GBP does not necessarily alter the behavioral, emotional, or situational triggers for overeating. Overeating is possible by enlarged meal size (despite signals of fullness), increased meal frequency, or increased ingestion of energy-dense foods. Perioperative complications occur in about 10% of patients, the most common of which are wound problems. *Long-term complications* are also quite common and include weight loss failure, vitamin/mineral deficiencies, persistent nausea and vomiting, dehydration, dumping syndrome, and gallstones.

2. Lap-band weight loss is about 56% of excess weight within the first 2-3 years and also remains stable over time. The complication rate has been very low (mortality 1 in 2,000 procedures), with low early complication rate of prolapse or erosions, but more frequent late complications. Both GBP and Lap-band are associated with improvements in comorbid conditions, including type 2 diabetes, insulin resistance, pancreatic beta-cell function, gastroesophageal reflux, sleep apnea, and depression. Currently, the NIDDK has established a Bariatric Surgery Clinical Research Consortium to generate 5-year follow-up data to answer treatment questions.

8. Identify the 4 components of a sound weight loss program.

- **Diet**

Incorporating a nutritionally balanced diet that includes low fat, high fiber choices from each food group in portions appropriate for weight loss and developing sound eating patterns. The initial weight loss goal of 10% initial body weight lost in 6 months is attainable and results in health improvements.

- **Behavior**

Learning new methods of selecting and preparing food to achieve weight loss and health goals. Behavioral skills include realistic goal setting, self-monitoring, planning for high risk situations, recovery from relapses, identifying personal “cues” which trigger overeating, etc.

- **Exercise and physical activity**

Adopting a more active lifestyle. Studies have shown that moderate exercise at least 5 times a week is essential for losing and maintaining weight. The National Weight Loss Registry found that participants who were able to expend 2500 calories a week (equivalent to ~ 60 minutes/day walking) were the most successful at losing and

maintaining long term weight loss. Increasing physical activity through daily living choices has also been shown to offer a sustainable energy expenditure behavior.

- **Social support**

People who have the support of family and friends are more likely to be successful in weight loss. This also helps in maintaining an exercise program. Group meetings and group walking have been initiated for this reason.