

Obesity and Diabetes: Excess Food or Toxic Environment

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The increased prevalence of obesity in the US population began about 1980 and is continuing worldwide. By 2015 1.5 billion people of the predicted 8 billion world population, (19%), will be obese. WHO estimates that by then non-communicable diseases will be the main causes of morbidity and mortality globally.

The resource burden of chronic disease engendered by obesity is now added to that of malnutrition and infection in developing countries. The complications of obesity related diabetes, stroke and heart disease are seen at lower body weight in certain Asian and Hispanic populations and are seen with weight gain in abdominal fat depots. Treatment of these three diseases is a great burden to all societies. For example, China expects to spend \$556 billion on diabetes, heart disease and stroke during the ten years between 2005 and 2015. In developed nations it is now predicted that decreased life expectancy will be the result of increasing obesity. Even more alarming, treatment is largely unsuccessful and dedicated therapists who have placed patients on "diet plans" espoused in the last forty years have usually been frustrated, with failure ultimately blamed on lack of patient compliance, not scientific ignorance.

Epidemiologic studies have provided some correlations with obesity including: psychotropic medication use, home temperature, mother's age at first birth, smoking, time spent awake, being Hispanic in the USA, being age 35 to 55, increased food intake, decreased activity, fast food availability, and global warming. Additional changes in the past half century include: vitamin / mineral content of fruits and vegetables, body composition of food animals and the introduction of thousands of food additives into our food supply. The causes of obesity may be associated with some or many of these changes.

Just as it is critical to continue to investigate these correlations, it also is crucial to investigate the fuel $\square\square\square$ energy equations at the physiologic, biochemical and molecular levels. For a long time, increased fat was seen as a cosmetic issue by governments. Recent knowledge shows adipose tissue to be a very dynamic actor in energy balance. Simple models that equated fat accumulation with overeating alone have not held up. Scientific studies of normal, weight stable individuals who have been enlisted to either restricted diet or forced overeating show a return, up or down, to their baseline weight, rapidly and spontaneously. This yo-yo effect is also seen in the vast majority of obese dieters and favors the presence of yet other factors in body weight balance. The fat cell number in the body is largely determined in childhood; for those in whom this is excessive, neither aging nor weight loss in later years changes this number. To treat malnutrition in children with solutions that cause obesity may yield chronic disease in childhood and adulthood.

Neither obesity nor malnutrition will abate until sufficient understanding of the metabolic engine that we all are has been achieved. When pathways, genetics, and cell signaling are understood in a holistic way, then rational choices of treatments can be offered to the earth's people. As we have learned in the past decades, one must be astute to avoid implying causation when our data show only a correlation.

Future science must improve our scientific and technological understanding of nutrition with consideration for the economic and ethical implications of poor choices.