

# Obesity and Metabolic Syndrome Overview

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Modern societies suffer from an obesity epidemic, despite considerable societal pressure to be thin. The epidemic persists in spite of the widely accepted notion

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that obesity is unhealthy, unattractive, and shortens life expectancy. Conservation of energy (the first law of thermodynamics) tells us that obesity must result when caloric intake chronically exceeds caloric expenditures. Historically, physiologic control mechanisms suppressed appetite and promoted physical activity, enabling most people to avoid a positive energy balance. But what forces compel modern humans, the most intelligent and rational of beings, to chronically exceed their caloric requirements?

In the first article, we compare the development of obesity to a “highway” whose destination is obesity. This “Highway to Obesity” has many “entrance ramps” that represent the many biological, genetic, and psychological factors that underlie overindulgence. We explore the genetic deficiencies and biological tendencies that predispose one toward obesity. In recent decades, these inherited tendencies toward obesity are more likely to be expressed, due to easy access to high calorie foods and decreased physical activity. Complete genetic deficiencies rarely occur and generally result in early-onset, morbid obesity. More commonly, obesity involves a gradually acquired dysregulation of hormonal systems that initially limit obesity. However, when these fragile feedback mechanisms become overwhelmed and fail, hormone resistance actually favors weight gain.

Article one also examines the multitude of comorbidities associated with obesity. These include type II diabetes, atherosclerosis, hypertension, congestive heart failure, pulmonary disease, several forms of cancer; renal disease, liver and gall bladder diseases, polycystic ovarian syndrome, coagulation disorders, sleep apnea, stroke, osteoarthritis, gynecological problems, and ocular diseases. But just *how* does obesity affect physiological changes that promote such a wide array of diseases?

## FOCUS: OBESITY AND METABOLIC SYNDROME

The second article explores metabolic syndrome (MSX), an array of symptoms that are known to increase the risk of cardiovascular disease. These include insulin resistance, hyperglycemia, elevated lipid levels, and increased abdominal fat deposition, all factors known to compromise metabolic and cardiovascular health. The article describes numerous biochemical changes that damage cellular function, collectively termed lipotoxicity, which often translates into organ failure when obesity becomes extreme.

The next article in this series, which appears in a subsequent issue, will illustrate the clinical lab results

(lipid panels, hormone levels, etc.) expected from several obese patients whose weight gain has resulted from different physiological or psychological conditions. A fourth and final article describes how a previously healthy individual's lifestyle choices have contributed to the development of obesity and metabolic syndrome. In this case, we follow the progression from an athletic teenager with normal metabolic and endocrine function to an obese middle aged patient who has developed leptin and insulin resistances, glucose intolerance, abdominal obesity, hyperlipidemia, hypertension, and atherosclerosis.



## Eastern Michigan University

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