Obesity as a Disease, Pathophysiology, Bias & Stigma

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Objectives

1. Update the Concept of Obesity as a disease in children and the pathophysiologic mechanisms

2. Review the significance of bias and stigma in Obesity Treatment
Obesity as a Disease
Allen F. Browne, MD

Historical Etiologies

• Personal failing
• Personal choice
• Poor self control
• Poor choices
• Food processors' fault
• Media’s fault
Why

• The disease of obesity is a manifestation of dysfunction of a normal (homeostatic) energy regulation system (ERS) resulting in metabolic derangements and excess energy storage.
• Physiological derangement - ERS gone awry
• Over 230 complications
• Best predictor of your body composition - your identical twin

Why

• Hard to gain weight “voluntarily”

• Bears
So What?

- Prevention needs to be based on physiology
- Treatment needs to be based on physiology

Education

- Needs to be updated
- For patients, parents, healthcare workers, payers, policy makers, and public
Obesity

Valerie O’Hara, DO

Energy Balance Equation

- Hunger
- Satiation
- Nutrient Absorption

- Metabolic Rate
- Thermogenesis
- Activity

Intake vs. Expenditure
The Body Seeks a Stable Fat Mass

Homeostasis:
- Serum Sodium
- Heart rate
- Body Temperature
- Blood pressure
- Body Water

Similar to other regulated tissue

ERS Physiology Drives Behavior

Cognitive Brain

Hedonic Brain
(reward Center)

Leptin
Adipocyte
Insulin
Pancreas

Hypothalamus

Vagal Afferents
SNS Afferents

Intestine

PYY
Ghrelin
GLP-1

Orexigenic Neuropeptides
Anorexigenic Neuropeptides
Hypothalamus

Nuclei of Interest

- Lateral hypothalamus - LH
- Ventromedial hypothalamus - VMN
- Paraventricular hypothalamus - PVN
- Arcuate Nucleus - ARC

Arcuate Nucleus: 1st Order Neurons

**POMC/CART neurons**
- **Anorexigenic**
  - decreases food intake
  - increases energy expenditure via (-) AgRP/NPY & (+) neurons in PVN via MC3R
  - Insulin and leptin receptors

**Serotonin receptors**
- decrease appetite and increase EE

**AgRP, NPY neurons**
- **Orexigenic**
  - increases food intake
  - decreases energy expenditure via
    - (-) anorexigenic neurons in LH & PVN (POMC/CART) via MC3R and MC4R
    - (+) orexigenic neurons in LH and PVN via NPY
  - Ghrelin receptors

POMC: Proopiomelanocortin
CART: Cocaine- amphetamine regulated transcript
AgRP: Agouti-related Peptide
NPY: Neuropeptide Y
Hypothalamus LHA and VMH: 2\textsuperscript{nd} Order Neurons

Paraventricular Hypothalamus:

- MC4R deficiency or mutation leads to obesity
- Decreases appetite
- Increases energy expenditure via SNS stimulation

The Energy Regulatory System (ERS): Hormonal and Neural control, modulated by Environmental factors

Hormonal Control:
- Leptin
- Adiponectin
- Insulin
- Glucagon
- Ghrelin
- GLP-1, GIP
- PYY
- Cortisol

Neural Control:
- Cognitive Brain (Executive)
- Hedonic Brain
- Homeostatic Brain (hypothalamus)

Microbiota
- Inflammation
- Infection
- Obesogens
- Physical Activity

Food type
- Food availability
- Circadian Rhythm
- Thermoregulation (brown Fat)
- Stress

Environmental Modulation
Homeostatic regulation of energy balance: a complex and redundant system

Human Energy Regulatory System (ERS)

- Physiology of normal energy regulation
  - Complex
  - Tightly regulated
  - Dynamic
  - Neural and hormonal control
  - Set Point

Set Point

Defense of a Body Fat Storage “Set Point”

Adapted from Wang S. PACE Journal 1994;3:302-316.
Obesity 1.0
Behavioral-Driven Model (Former)

- “Gluttony and slothfulness”

- Individual’s voluntary behavioral problem

- Correlations
  - OR...
Obesity 2.0
Physiological-Driven Model (Current)

• Energy Regulatory System – dysfunction

• Where there is physiology there can be PATHOphysiology

• Resulting in Set point defending an unhealthy level
  Obesity drives Overeating

Bias and Stigma
Allen Browne, MD
“Biases are the opinions/ideas/judgements/thoughts we make up about people before we know who they actually are”

Adapted from Verna Myers

Cultural Attitudes: Obesity

• Poor choices
• Poor self-control
Cultural Attitudes

• Simple problem
• Eat less and exercise more
• Voluntary behavior
Voluntary behavior

- 95% of energy regulation is subconscious
- Physiology wins over behavior
- Obesity drives overeating

(Berthoud, 2017; Kaplan, 2018)
Cultural Attitudes

- "It’s your/my fault"
- "You/I am to blame"
- "It’s your/my responsibility"

Bias and Stigma

- BIAS - a particular tendency, trend, inclination, feeling, or opinion, especially one that is preconceived or unreasoned

- STIGMA - a mark of disgrace or infamy; a stain or reproach, as on one's reputation
Bias and Stigma - Children

- Lower quality of life than children with cancer
- Psycho-social issues more apparent than clinical issues

(Schwimmer et al., 2003)

Bias and Stigma - Adults

- Mental health problems
- Economic productivity problems
- Internalized bias
Bias & Stigma – Patients (and Parents)

• Recognizing & appreciating their internalized bias

Bias and Stigma - Policy Makers

• Recognizing that they have a cultural understanding of the disease
Bias and Stigma - Payors

Recognize the need to take responsibility for financial support for prevention and treatment of the disease

Bias and Stigma - Public

Open to the concept of the complexity and impact of the disease
Stigma and Bias - Healthcare Providers

Recognition of how historical & cultural influences may impact clinical interactions with patients with the disease of obesity

Responses to Weight Bias & Stigma

- Physiological
  - Stress
  - Weight Gain
- Behavioral Responses
  - Unhealthy eating
  - Body dissatisfaction
  - Decrease physical activity
Results of Bias and Stigma

- ~80 million adults with obesity
- <1% receive a prescription (Rx) for Anti Obesity Medication in a given month
- ~195,000 people per year receive bariatric surgery

Interventions

- Adjust office environment (as needed)
- Professional organization involvement
- Advocacy at community, state, and national level
  - Policy
  - Education
Joint international consensus statement for ending stigma of obesity


People with obesity commonly face a pervasive, resilient form of social stigma. They are often subject to discrimination in the workplace as well as in educational and healthcare settings. Research indicates that weight stigma can cause physical and psychological harm, and that affected individuals are less likely to receive adequate care. For these reasons, weight stigma and