The obesity crisis: treating obesity as a disease

Mummy: why am I bigger than my friends?

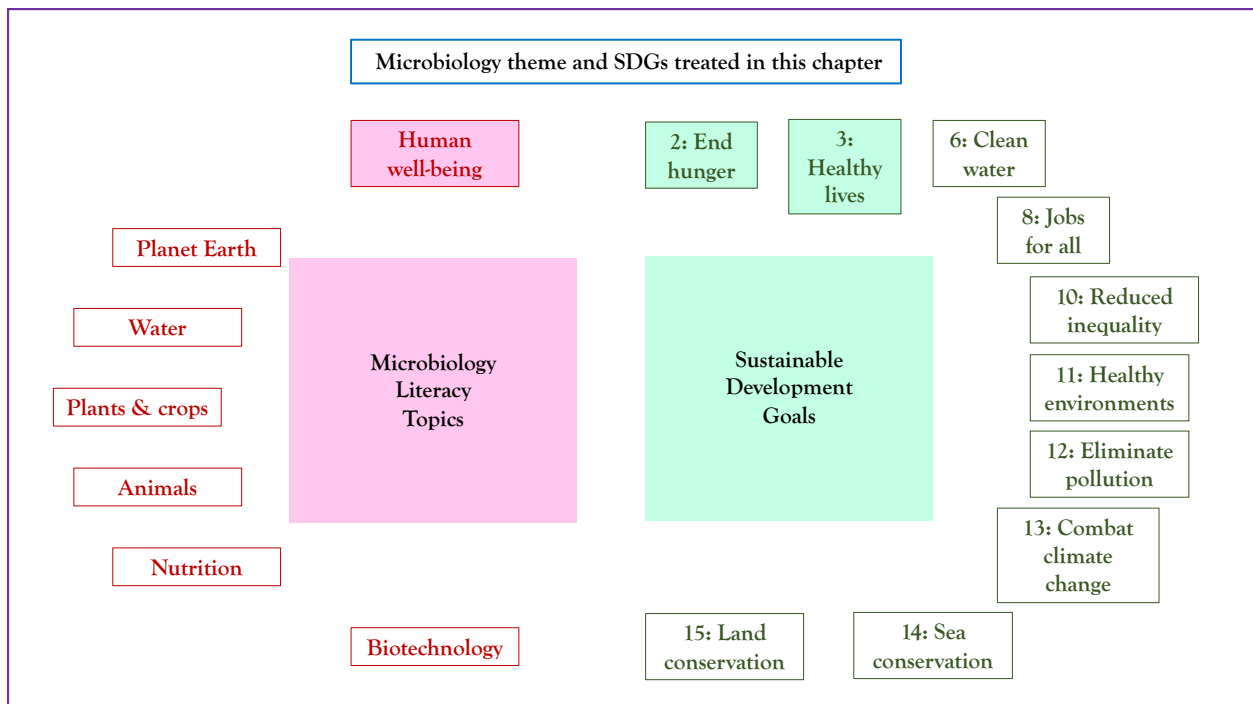Photo by Ketut Subiyanto: https://www.pexels.com/photo/crop-kid-weighing-on-scale-4474052/

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Storyline

Obesity is a disease that causes production of extra fat cells, which in turn trigger complications that negatively impact our health. Obesity is increasing at an alarming rate in the world. Until recently, obesity has been considered to be a facultative personal lifestyle choice, resulting from over-eating and a lack of discipline in food intake, and not a disease *per se*. Now, however, obesity is considered to be a disease resulting from malfunctioning brain control of hunger and satiation, the feeling of having eaten enough. This malfunction has multiple causes, including our gut microbiomes. Classifying obesity of a disease facilitates investigation into the causes, and development of effective therapies.

Microbiology theme and SDGs treated in this chapter		
Human well-being	2: End hunger / 3: Healthy lives / 6: Clean water	
Planet Earth		8: Jobs for all
Water		10: Reduced inequality
Plants & crops	**Microbiology Literacy Topics** / **Sustainable Development Goals**	11: Healthy environments
Animals		12: Eliminate pollution
Nutrition		13: Combat climate change
Biotechnology	15: Land conservation / 14: Sea conservation	

The obesity crisis: treating obesity as a disease

1. ***What is obesity?*** Obesity is defined as a chronic, complex, metabolic disease, characterized by excessive fat accumulation, adipose tissue dysfunction, and abnormal fat mass, resulting in adverse metabolic, biomechanical, and psychosocial health consequences. Current evidence suggests that it is caused by a disruption of our system of control of body weight and a failure to maintain constant body fat mass. Obesity was previously considered a lifestyle or behavioural disorder caused by increased calorie intake or reduced physical activity. Several governments and medical organizations have recently defined obesity as a chronic disease, similar to high blood pressure and type 2 diabetes. A standard measure of obesity is the Body-Mass-Index, or BMI, which relates a person's weight to height.

2.   *Why is obesity a disease?* A disease is defined as "any deviation of the normal structural or functional state of a body part, organ, or system, caused by underlying etiologies, generally characterized by specific symptoms and signs, and resulting in pathological consequences that negatively impact health, feeling, or functioning. Obesity meets all the criteria as a disease, including the symptoms of excess hunger or reduction in fullness, the signs of excess adipose tissue and the more than 200 complications including type 2 diabetes, cancer and cardiovascular disease. However, obesity is not treated as a disease. This may change as our understanding improves, especially as current evidence suggests that obesity is caused by a disruption of homeostatic control of body weight – the maintenance of a constant body weight typical for our body frame – and a failure to maintain constant body fat mass. Obesity is associated with disordered hunger, satiety (the *feeling* of fullness), and satiation (the *state* of fullness), hence individuals with obesity experience symptoms that manifest because of dysregulation of subcortical areas of the brain responsible for regulating our feelings about food intake.

Once excess deposition of fat in adipose tissue has occurred, then more than 200 complications of obesity may negatively impact health, such as high blood pressure, excess fats in the blood (dyslipidemia) which increases the frequency of circulatory problems like clogged arteries, heart attacks, stroke, type 2 diabetes, cardiovascular risks, non-alcoholic fatty liver disease, certain types of cancers (e.g. endometrial, colon, breast cancer), sleep disturbances, depression, neurocognitive disorders and osteoarthritis. Thus, obesity predisposes us to a range of potentially serious diseases, and is therefore a disease itself, requiring treatment to keep us healthy.

3.   *Why is obesity a crisis?* The World Health Organization declared obesity to be the largest global chronic health problem in adults, which is increasingly turning into a more severe problem than malnutrition. This means that the scale of personal suffering and detrimental economic, educational and productivity consequences of obesity constitute a global crisis. Just to give an impression of the scale of the problem: in the USA, obesity-related healthcare costs are $ 190 billion annually, or 21% of total medical spending, and people living with obesity spend 42% more on healthcare. Obesity also results in $ 4.3 billion losses in employment absenteeism.

4.   *What causes obesity?* The causes of obesity have not yet been definitively identified. However, rather than obesity being a single disease with multiple causes, doctors now consider that obesity may in fact be the outward appearance of several different diseases, each with its own set of causes. Certainly genetic factors play a dominant role in causes for obesity. However, the way the environment interacts with our physiology is also important. This is especially important as we understand better how the gut talks to the brain.

5.   *What does obesity have to do with microbes?* Food intake not only stimulates gut hormones and bile acid signals but also affects gut microbiota. Moreover, these factors – gut microbiota, bile acids, and gut hormones – interact with each other to influence gut motility, inflammation, and those parts of the brain involved in sensing hunger and fullness. Moreover, comparisons of the gut microbiota of people with or without obesity has revealed significant differences, with people living with obesity having a microbiota that provides us with more calories by fermenting non-digestible food to compounds that we absorb.

6.   *How can doctors treat obesity?* Obesity is a chronic disease and rather than thinking that overeating causes obesity we are now realizing that obesity may be the cause of overeating. Since we cannot specifically treat the cause, the medical objective becomes one of managing obesity as a chronic disease to achieve health gain, rather than focusing on weight loss alone. The first step is to

alleviate the symptoms of excess hunger or reductions in fullness. Once that is achieved, the treatments need to prevent or address the complications of obesity while simultaneously improving the patient's quality of life. Once we know more about the involvement of microbes in obesity, we may in the future be able to treat some cases by changing the composition of the gut microbiome.

7. ***Can my pet dog become obese?*** Of course, not only humans, but also animals, including our pets, like dogs, cats, guinea pigs, etc., can develop obesity and therefore become more susceptible to other diseases. If we give unlimited food to our pets then some will develop obesity and others will not – similar to humans. This again emphasizes the point that food doesn't cause obesity but rather obesity causes overeating. And, as owners, we should understand whether our pet is prone to overeating and gaining excess fat. If this is the case then we have a duty of care to protect them from harm, including obesity. So we must not only ensure that they get plenty of exercise and good, healthy food, but also that they do not eat too much and are not given high sugar "treats". We may also have to accept that our pets will live in a constant state of hunger and thus always be looking for food. This may be very difficult to reconcile, but it should also allow us to have more sympathy with pets and humans who have obesity as a disease.

Relevance for Sustainable Development Goals and Grand Challenges
Obesity impacts at least two SDGs:

- **Goal 2. End hunger, achieve food security and improved nutrition.** Food security is key to ending hunger. Many nations of the world waste food, in part though acquisition of more than is needed, in part through consumption of more than is needed for a healthy diet. In so doing, they reduce food availability for those nations lacking adequate food supplies, and hence contribute to hunger. Reduction in obesity through appropriate changes in personal attitudes and lifestyles, and intensified clinical care of obese patients, would reduce food wastage and diversion from nations lacking enough.

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages** (*improve health, reduce preventable disease and premature deaths).* Obesity is a leading cause of predisposition to disease, including the major killers, like cardio-vascular disease and cancers. Therefore, a reduction in obesity will lead to a reduction in these global diseases.

Potential Implications for Decisions
1. *Individual*
    a. Should I eat hamburger and chips or a healthy salad tonight?
    b. Should I have chocolate or biscuits with my afternoon tea/coffee?
    c. Should I drink so-called "high energy" sugar-rich drinks, or rather water?
    d. Should I "treat" my pet dog to chocolate from time to time?

2. *Community policies*
    a. Local education and campaigns about the importance of healthy lifestyles, exercise and healthy eating

3. *National policies*
    a. National education and campaigns about the importance of healthy lifestyles, exercise and healthy eating

b. Taxes and other incentives/disincentives to consume less unhealthy/more healthy foods
c. Declaring obesity a national medical priority and providing resources for increased obesity healthcare

Pupil Participation

1. *Class discussion of the issues associated with obesity*

2. *Pupil stakeholder awareness*
   a. Obesity has negative consequences for the SDGs. Which of these are most important to you personally/as a class?
   b. How can we personally reduce a tendency to become obese?
   c. What can we do to help members of our family and our friends become obese?
   d. What can we do to prevent our pets from becoming obese?

The Evidence Base, Further Reading and Teaching Aids

https://www.youtube.com/watch?v=D-AtATgfyM
https://www.youtube.com/watch?v=kz6t46ZoDjU&feature=emb_err_woyt

J. L. Scully (2004) What is disease? Disease, disability and their definitions. EMBO Rep 5: 650-653 (https://doi.org/10.1038/sj.embor.7400195)