

Taking care of our teeth

Mummy: can I have money to buy sweets at the tuckshop?



Time for some games. Aye Aye Captain, it's your time to kill the enemies.

This Game has three levels/ zone of attacks and different weapons will be unlocked at each level that will help you to kill all the enemies and win the game. But it is important to perform the attack in the morning and evening so that you can win this game easily by killing all your enemies.

Let us take you to the tour of the weapons and levels of the game 'Oral Attack' for quick win.

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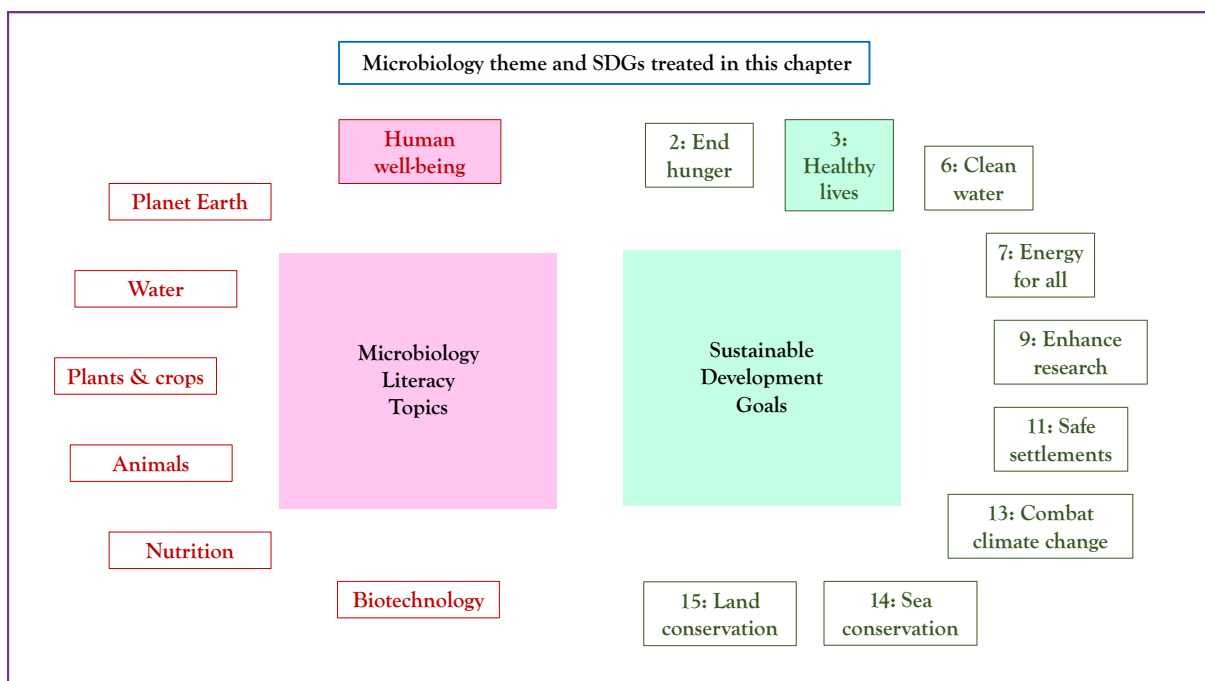
Storyline

What do you think is the most important part of human body? Everything is important and has its definite role but without a mouth how will you eat and survive. This lesson will take you on the journey of mouth life and how important it is to take care of your mouth. The first part of the digestive system is the mouth cavity that plays the primary role in ingesting food and producing saliva. *Can you suggest some other roles played by our mouth???* Apart from the intake of food, the mouth, along with throat, lips and jaws, plays an important role in communication, which is another crucial aspect in the normal functioning of life.

The mouth contains the teeth and is divided into two major regions, the vestibule and the oral cavity, with a distinct transition made from the skin by the lips. The oral mucosa is the mucous membrane epithelium lining the inside of the mouth. But, as we know, our body is not just made of human cells but also microbes comprising the microbiome. Similarly, the oral cavity also harbours its unique set of microbes known as oral microbiota. Taking care of the mouth parts and microbiome is very important for a healthy body. Oral hygiene is the general but crucial practice of maintaining a clean and disease-free mouth, and preventing bad breath, by regularly brushing the teeth. In this lesson, we will deal with all these aspects in detail. Now let's begin our game tour.

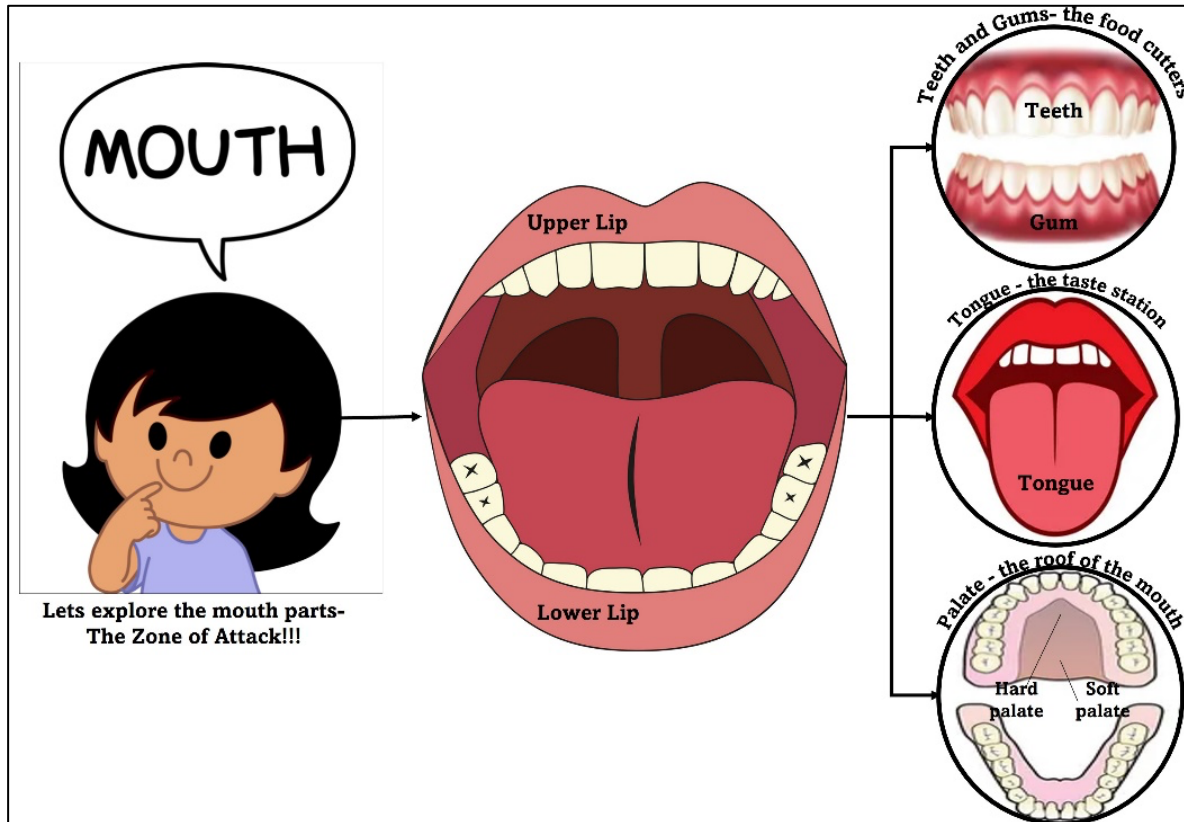
The Microbiology and Societal Context

The microbiology: oral microbiota; microbiota dysbiosis; dental biofilms/plaque. *Sustainability issues:* health



Taking Care of our Teeth: the Microbiology

1. **Zone of enemy attacks.** Let me introduce you to the zones of attack and levels of your game. The mouth has two regions: vestibule and the oral cavity. The vestibule comprises the region connecting the teeth, lips and cheeks whereas oral cavity consists of lips, the inside lining of the lips and cheeks (buccal mucosa), the teeth, the gums, the front two-thirds of the tongue, the floor of the mouth and the bony roof of the mouth (hard palate).

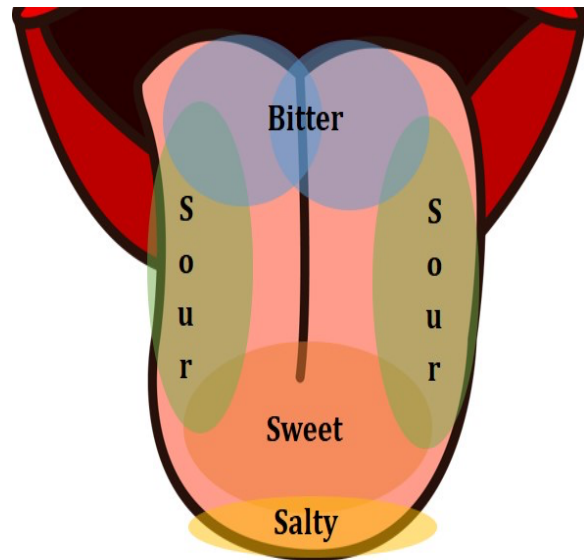


a. **Level 1: Teeth.** So your first level is teeth. Teeth are the mechanical organ of our body that helps us chew and break down food into smaller pieces easier to swallow and digest. There are four type of teeth present in the human mouth: incisors, canines, premolars, and molars. Each of the teeth types performs a specific set of functions. The incisors shear food into pieces, the canines further cut the food and the other two sets, molars and premolars crush the food. When we eat, especially when we eat tough foods like raw carrots, our teeth are subject to considerable mechanical stress. They can tolerate this because they are held in place by their roots which are firmly anchored in the bones of the upper and lower jaws, which themselves are protected by our gums.

During our lifetimes, our body provides us with two sets of teeth, primary (also called deciduous or milk teeth) and permanent. The primary teeth emerge in the infant 5-6 months after birth, and consist of ten teeth in the upper jaw and 10 in the lower jaw. The 20 primary teeth are replaced by 32 permanent counterparts at around 10-12 years of age, with 16 in the upper jaw and 16 in the lower one.

The hardest part of the teeth is the enamel which also represents the highest (densest) mineralized part of the body. The lower teeth are rooted in the largest and strongest bone of the face, called the mandible or jaw bone. It is the only movable bone of the skull.

b. **Level 2: Tongue.** The next level of attack is the tongue. The major reason you can speak is because of tongue. It is a muscular organ that orchestrates food movement in the mouth in order to present it to the teeth for mastication, prior to swallowing it. Apart from its role in food handling, it also plays an important role in the gustatory system, our sensory system responsible for perception of taste and flavour. The upper side of the tongue harbours taste buds housed in papillae. The taste buds for sweet flavors are on the tip of the tongue; those for salty flavor are on the front of the tongue; those for sour taste are on sides of the tongue; and the bitter taste buds are at the back of the tongue.



Task for fun: When eating 'bitter' food item or medicine, try to swallow it without touching the back-most region of the tongue!!!! Note down the taste you feel.



On the under-surface of the tongue lies a frenulum that is made up of fold of mucous membrane. The major salivary glands that produce saliva lie on either side of the frenulum beneath the tongue.

c. **Level 3: Buccal mucosa.** The buccal mucosa is the inner lining of the cheeks and the back of the lips and covers the entire surface of the inside of the mouth. The entire buccal surface is coated by a layer of saliva which keeps it moist and lubricated. Saliva also plays crucial roles in moistening dry food that we eat so that it is easily swallowed, and mobilizing food particles stuck in the mouth. Can you feel saliva in your mouth? Some people have dry mouths, a condition called xerostomia, which create problems. The lower the amount of saliva in the mouth, the more food particles get stuck and the more easily bacteria grow on stuck food particles. This can, for example, produce bad breath.

Importantly, the buccal mucosa also acts as barrier and protector of the underlying nerves, blood vessels and muscles from damage by ingested food and its mastication. They also house stem cells that replenish mucosal epithelial cells lost each day as a result of all the physical abrasion that occurs through eating.

2. **What is Oral health?** It is very important to maintain the oral cavity in good health as it plays an important role in the body. The most common and accepted statement for “good oral health” can be the condition of an oral cavity free from any diseases. It is also considered to be an indicator of general good health, wellbeing and body management. Oral health can also have a major impact on our behaviour, since it is deeply associated with our ability to speak, eat, attract, protect, defence, etc. Most importantly it is a crucial part of our emotional expression i.e. our “smile”. Poor oral health can have devastating effects on our lives and make us less confident in our interactions with others.

The Global Burden of Disease Study 2017 reported that oral-related disorders affect 3.5 billion people across the world, with dental caries being among the most prevalent noncommunicable diseases. The International Agency for Research on Cancer has reported that oral cancer was one of the top three cancers in some Asian-Pacific countries in 2018 (WHO, 2018). *How to achieve and maintain good oral health?*

3. Oral Hygiene. The regular maintenance of the proper health of our teeth and oral cavity is called “Oral Hygiene”. Technically, it’s the practice of keeping our mouths clean and healthy, free from diseases and oral problems, by regular dental hygiene habits (cleaning of teeth). *The balance of oral health and oral hygiene is the most important in our daily life practices.* Establishment of a strict daily routine with optimal timing is important. Oral hygiene includes not only maintaining oral cavity in good condition, but also the oral microbiome.

4. Oral Microbiome. After the gut, the oral cavity harbors the second largest and diverse human microbiota, with approximately 700 species of bacteria, fungi and viruses. The microbes colonize both the hard surfaces of the teeth as well as the soft tissues of mucosa. With the constant intake of food, production of saliva and varying oxygen levels, the environmental conditions of the oral cavity change constantly. As a result, the microbiota of the mouth also changes, as does its interactions with itself and with the buccal cavity. Any disbalance in this community can result in the development of dental plaque – a sticky film (biofilm) containing bacteria on the tooth surface. When the natural buccal cavity microbiome composition is disrupted, the good bacteria can be replaced by pathogenic bacteria that cause disease. Thus it is important to maintain a good microbiome and the food we consume plays an important role in constructing and maintain it

5. Teeth biofilms and dental plaque. There are different ways that the bad (pathogenic) bacteria in the mouth can affect our teeth and eventually result in tooth decay. Two of the most common are teeth biofilm and dental plaque.

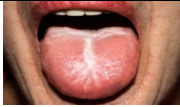
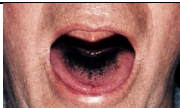
Like we build our own personal environment for comfort and constant conditions, so microbes create their own micro-environments for living, namely biofilms, slimy layers on surfaces. The tooth surface is covered by salivary pellicle, a layer of proteins provided by saliva and that is important for oral health. The salivary pellicle is the outer surface of the tooth to which the first attacking, intruding bacteria attach, grow and colonize, eventually forming a dental biofilm. If the biofilm is not removed by brushing with toothpaste, it serves as a base for recruitment of other bacteria, the late colonizers, which build up multiple layers of biofilm to form dental plaque. Dental plaque is a dental biofilm but not all dental biofilms become dental plaque. *Try running your tongue over your teeth before brushing them: do they feel the fuzzy. That’s plaque. It’s a constantly developing layer that is easily removed with brushing.*

The bacteria present in the biofilm degrade the sugars formed from starchy or sugary foods, like milk, rice, soft drinks, bread, chocolates, etc., that we take in to produce acids that cause decay of the tooth enamel, tooth cavity and various gum diseases. If not cleaned regularly, plaque is further converted into hard and brown pale tartar. Though biofilm and dental plaque are relatively easy to remove by brushing, due to their slimy texture, tartar can be much more difficult to remove and usually requires the services of a dental hygienist. If tartar builds up and covers the gum region, it can cause inflammation and pain. So watch out if you eat too many sweets!

6. **Common diseases you don't know!!** As mentioned above the mouth can be home to diseases including plaque, tooth decay, and many more. Debris stuck in the mouth can cause bad breath; gargling is the best solution to this problem.

There is a proven relationship between oral and general health, and research has suggested that oral health is directly or indirectly linked to issues like cardiovascular disease, cancer, chronic respiratory diseases and diabetes. Oral health risk factors include unhealthy diets high in free sugars, which are increasing globally. There is a direct link between consumption of high sugars and diabetes, obesity and dental caries, and diabetes is linked with the development of periodontitis.

7. **The tongue as a health indicator.** The color of the tongue also helps in determining the health status of the body, see table:

Colour of Tongue	Description	*NeedToDo	Image
White patchy	Fungal infection or medicine-induced dysbiosis of gut microbiome	Needs attention on diet	
Brown/ hairy tongue	Proteins turn into into long strands, trapping food and bacteria	Can be easily scraped off with tongue cleaner	
Black	Can happen due to antacid intake	Harmless and will resolve	
Bright red	Inflammation of blood vessels	See a doctor; increase vitamin B3 in diet	
Glossy smooth	Deficiency of some nutrients in diet	Increase nutrients like iron, folic acid, or B vitamins	
Bumps/ soreness	Happens if tongue get irritated or early stage of cancer	Consult doctor	

8. **Weapons.** So it is important to kill these mouth enemies. For this we need weapons. In the tour of the game so far, it is clear that three targeted zones needs attention and protection from harmful microbes for a healthy life and winning the game. Here, we discuss the important weapons to be unlocked for playing the game. There are different items to be used that include, tooth brush, tooth paste, floss, and tongue cleaner.

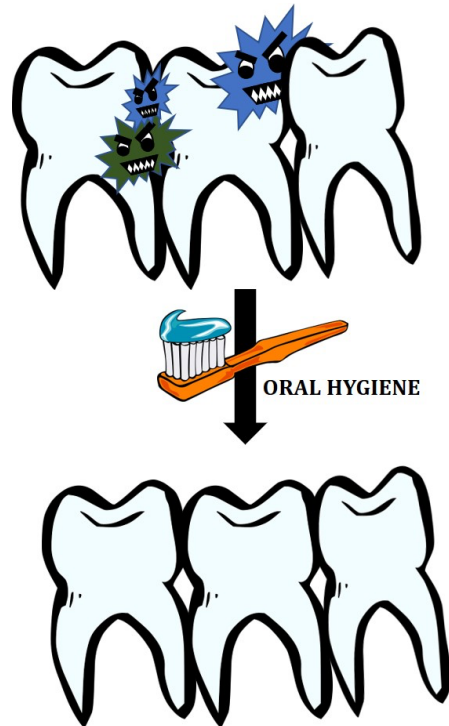
a. **Toothbrush.** The principal method of preventing oral diseases is regular brushing of the teeth. The toothbrush is a dental tool that consist of a set of nylon bristles attached to a long handle to allow easy manual action of brushing. Advances in the technology has yielded various electrical toothbrushes that work on battery and that provide automatic rotation of the bristles required to clean the regions between teeth properly.

Proper brushing technique is important and involves the following steps:

- keeping the toothbrush at a 45-degree angle to the gums.
- Gentle movement of the brush involving back and forth strokes.
- proper brushing of the outer and inner surfaces, and the chewing surfaces of the teeth
- Tilt the brush vertically to clean the inside surfaces of the front teeth, and make several up-and-down strokes.

The major reason to follow the correct procedure for brushing is because while consuming and chewing food, particles get stuck between the teeth where they decay. This can result in infections and oral problems, especially plaque. It is important to change the toothbrush every 3 to 4 months, if the bristles fall out or wear out: a damaged toothbrush is not good for cleaning your teeth. Some children need braces to correct the shape and structure of the developing denture. Braces consist of elastic bands, wire, and pins. Teeth with braces require extra care during brushing and hygiene care:

- Elastic, bands, or removable parts of braces should be removed carefully.
- Wires and pins should be cleaned properly
- Wire should be removed and cleaning should be done in all directions.
- Brushing should be done twice for 2 minutes each.
- Rinse, and then check your teeth for any stuck food particle



b. **Toothpaste.** Selection and choice of toothpaste also plays an important role in maintaining good oral hygiene. The American Dental Association (ADA) recommends important ingredients of a good toothpaste. It must contain fluoride, which strengthens tooth enamel and thereby increases resistance to decay. Toothpastes sometimes contain other constituents that help to reduce tooth aging, fragility, yellowing, tartar accumulation and tooth erosion. Toothpastes also contain an abrasive, like silica or alumina, that help to remove plaque, and a detergent, like sodium lauryl sulfate or sodium N-lauryl sarcosinate, which help to loosen stuck food particles. The taste of toothpaste is also important for kids to enjoy the brushing routine, so many will have an ingredient that provides flavour or sweetness, like the artificial sweetener saccharin, which is not a sugar and has a no caloric contribution effect on health. Other ingredients include natural gums, cellulose, etc., as binders and thickening agents. Peroxide compounds may also be added to help whiten or brighten teeth and reduce intrinsic stains.

c. **Tongue cleaner.** Tongue cleaners or tongue scrapers are an additional tool for maintaining good oral hygiene. As discussed above, intake of sugar or medicines can result in development of a surface layer over the tongue. This layer can also be due to bacterial accumulation, debris and dead cells. Thus it is important to scrape the layer off to avoid bad smell and sense of taste of the mouth. This technique also improves the appearance of tongue thus improving confidence level.

Tongue cleaning can be done with scraper especially designed for the purpose or a toothbrush can also be used. To perform tongue scraping, follow these steps:

- Face a mirror and stick out your tongue.

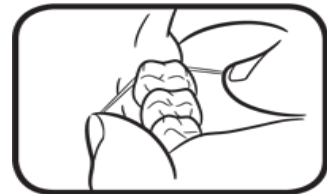
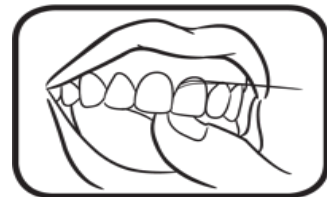
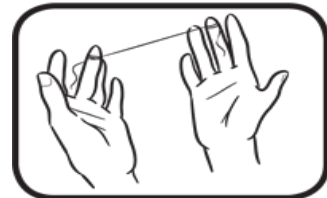
A child-centric microbiology education framework

- Place the rounded end of the tongue scraper on the back of your tongue. If this causes you to gag, you can start from middle of tongue. As you get used to it, you can start further back.
- Slowly and gently and pull the scraper forward over your tongue; never use the scraper in the reverse direction, i.e. from front to back.
- After each run over the tongue, clean the scraper using a washcloth or tissue
- Repeat until you feel the tongue is clean. It may take some days for you to become familiar with the practice.
- Properly wash and disinfect the scraper with soap or disinfectant.

d. **Floss.** Just brushing is not enough to clean your teeth. Plaque which builds up between your teeth cannot be removed by brushing and eventually becomes a very hard and rough substance called calculus (or tartar). This calculus accumulates along your gum line and can lead to gum disease. Accumulated calculus between the teeth can only be removed by a dental hygienist. In order to reduce the accumulation of plaque between your teeth, it is necessary to floss at least once a day, preferably after meals, as follows:

- take 18 inches of floss and wind it round one of your fingers. Wind the remaining floss round the opposite hand finger. This is done to create a good grip of the floss. Then hold the floss between thumb and forefinger

- Slide the floss between your teeth using a gentle rubbing motion making a C shape. Avoid touching the gum



e. **Mouthwash.** The gargling or rinsing of the mouth with a suitable mouthwash after flossing helps to remove loosened debris. Rinsing with an antiseptic mouthwash may also help to kill bacteria that cause bad breath. Thus, with the mouthwash, a complete oral hygiene is completed resulting in a healthy and happy oral cavity.

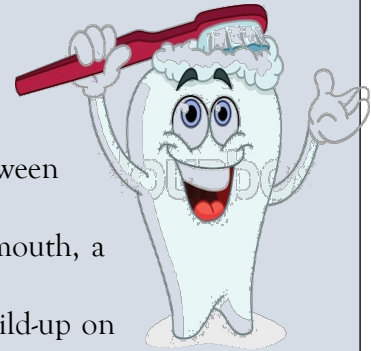
9. ***Is all this necessary?*** All dentists and the American Dental Association suggest that the entire oral hygiene procedure must be followed twice a day for two minutes each time. The first time, early morning after getting up from sleep, is important as microbial growth and decay is highest during the night, and thus removing these microbes and formed plaque is crucial. Also, swallowing these microbial communities with breakfast can be unhealthy. Even more important is brushing teeth just before going to bed because, if we do not do this, the food particles that accumulated from meals during the day remain in our teeth to form plaque. and tartar during the night.

10. ***And dentures?*** Though they're not "real teeth," they can harbor harmful and pathogenic bacteria and decayed food, which ultimately leads to bad breath. So it is advised to remove at night your denture (if possible) for cleaning by brush using a disinfecting solution.

Take Home Message

You can help maintain and even improve your overall oral health if you:

- Use a fluoride-based toothpaste and mouthwash to help fight decay.
- Brush your teeth and gums at least twice a day.
- Make sure you brush for at least two minutes. Set a timer or play a song on your phone to help ensure that each session is long enough.
- Floss at least once a day to remove tough-to-reach debris between your teeth.
- Drink plenty of water throughout the day to reduce dry mouth, a common cause of bad breath.
- Avoid using tobacco products, which can contribute to build-up on the tongue.



You should also see your dentist for regular check-ups and cleanings. Most dentists recommend cleanings twice a year, but you may need to go more frequently depending on your overall dental health.

With this, we end the tour of this extraordinarily important game; now let's play the game and see how many enemies we can kill.

Relevance for Sustainable Development Goals and Grand Challenges

Oral hygiene is an important element of lifestyle practices to maintain good health and thus is relevant to SDG 3:

- **Goal 3. Ensure healthy lives and promote well-being for all at all ages.** Poor dental hygiene is associated not only with plaque build-up and tooth decay, but also with more serious health conditions, that include periodontitis, cardiovascular disease and cancer.

Potential Implications for Decisions

1. *Individual*

- a. Should I brush my teeth regularly? If so: how often? How often should I floss? Should I use a tongue scraper?
- b. How often should I go to the dentist for a check-up?
- c. How often should I go to the dental hygienist for teeth cleaning ?

2. *Community policies*

- a. Education campaigns on the benefits of good dental hygiene
- b. Education campaigns to encourage regular dental check-ups

3. *National policies*

- a. Fluoridation of drinking water
- b. Assuring an adequate supply of dentists and dental hygienists for the health system
- c. Assuring a good dental practice network that provides everyone with adequate access to dental care.

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Pupil Participation

1. *Class discussion of the health issues associated with oral hygiene*

2. *Pupil stakeholder awareness*

- a. Bad breath can be unpleasant for social interactions: what can you do about it?
- b. When is it best to clean your teeth and why?

3. *Exercise: Quiz Time*

1. Eating more apples and oranges can improve your breath

Yes

No

2. Halitosis is:

A Blood Disease

Medical name for bad breath

Skin rash

3. Garlic can make your breath smell bad even after you've brushed your teeth and rinsed with mouthwash

Yes

No

4. How long a piece of dental floss should you use?

6 inch

12 inch

18 inch

5. If you brush, floss, and rinse every day, you probably won't have bad breath.

True

False

6. Eating hamburgers and steak can worsen your breath.

True

False

Answers

1. Yes Eating more fruits and vegetables may decrease bad breath. Fruits and vegetables contain a lot of water, which can help keep your mouth moist. Saliva is nature's way of keeping your breath fresh.
2. Medical name for bad breath. If you have a chronic problem with bad breath ~ are a lot of people mentioning it to you lately? ~ it might be time for a trip to your dentist.
3. Yes. After being digested, a smelly substance in garlic is absorbed into your bloodstream and then transferred to your lungs, where it is expelled as a gas ~ making your breath smell! Brushing your teeth and rinsing with mouthwash only temporarily hide the odor.
4. 18 inch. The American Dental Association recommends using 18 inches of floss, wound around one of your middle fingers, with the rest wound around the middle finger of your other hand, to best floss your teeth

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5. False. Bad breath can be a symptom of a medical condition, including a respiratory infection, diabetes, or liver or kidney disease. If your dentist looks at your mouth and your bad breath isn't coming from a problem with your teeth or gums, you might have to see your doctor about one of these or some other medical condition.
6. True. Eating red meat can worsen your breath; eating less meat may improve your breath. The decay of the leftover bits of proteins in meats and cheese can create odors in your breath.

The Evidence Base, Further Reading and Teaching Aids

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Glossary

Tooth/Teeth: A tooth/teeth (singular/plural) is whitish/sturdy structure made from a calcification process. It is found in the oral cavity or jaw in many vertebrates. It has multiple use like food tearing, chewing, prey capturing etc.

Deciduous teeth: also called primary teeth and commonly identified as "baby teeth" in human beings. Primary teeth are 20 (usually) in number and followed by permanent teeth.

Denture: It's a prosthetic or artificial tooth/set of teeth used as a substitute for teeth lost naturally or through disease.

Enamel: It is the outer most cover of the tooth. It is the hard, mineralized surface material of the tooth situated above the gum.

Floss: a thread-like material used to clean between the contact areas of teeth; flossing is part of a good daily oral hygiene plan.

Gingiva: The pink soft tissue layer of that covers the base of teeth. It forms the strong foundation of teeth.

Permanent teeth: these are the fixed or permanent or adult teeth that replace the deciduous or primary teeth. Humans usually have 32 permanent teeth in a complete dentition.

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Plaque: Insufficient dental care leads to the formation of a sticky colourless film on teeth composed of remaining food mixed with saliva and microbes.

Saliva: whitish/clear fluid in the mouth that lubricates the mouth parts. It has many constituents like blood cells, digestive enzymes, water, mucus, microorganism like bacteria, viruses etc.

Salivary glands: Glands are the special organs which have secretory structures that produce secretions. Salivary glands are in lower parts of cheek and produce saliva.