

Oral Health 101

An Overview of Dentistry and Oral
Health for Health Department Staff

Module 1 Terminology, Common Oral Diseases/Conditions and Treatments



Welcome to Module 1 of ASTDD's Oral Health 101 learning series.

Learning Objectives

1. Describe oral structures using technical and corresponding lay terms.
2. Describe the etiology/risk factors, classifications, prevalence and treatment for:
 - Dental Caries
 - Periodontal Disease
 - Oral Cancer
 - Oral-facial Injuries
 - Developmental Conditions



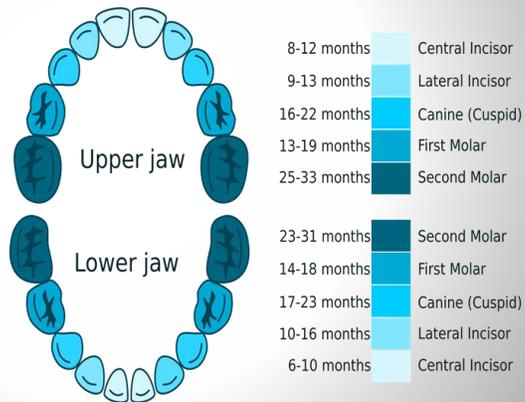
Our learning objectives for this module include participants being able to describe oral structures and the etiology, risk factors, classifications, prevalence and treatment for common oral conditions.

Dental Basics – Children’s Teeth

Children’s Eruption Pattern



Primary (Baby) Dental Chart



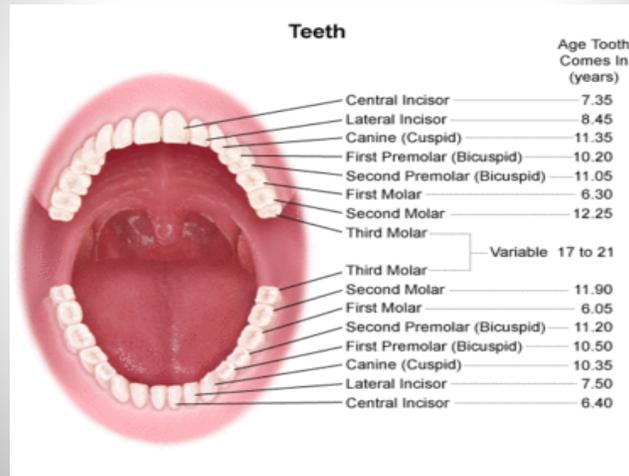
Lets start with some basic information about a normal human dentition.

Humans get two full sets of teeth in their lifetime. Primary teeth – also known as “baby” or “deciduous” teeth develop in the embryonic stages of pregnancy and erupt during the first three years of life. A child with a complete set of primary teeth has 20 teeth--10 on the top and 10 on the bottom. Primary teeth typically fall out on their own as they are pushed out by the erupting permanent teeth.

Although primary teeth are ultimately lost, this does not mean that the health of these teeth should be ignored. The premature loss of primary teeth can cause numerous problems in a child’s development. Primary teeth serve as guides for the eruption of the adult teeth, and are needed for appropriate spacing of teeth in the adult jaw. Even more importantly, children need their primary teeth to adequately chew nutritious foods, develop proper speech, and a healthy smile promotes good social development.

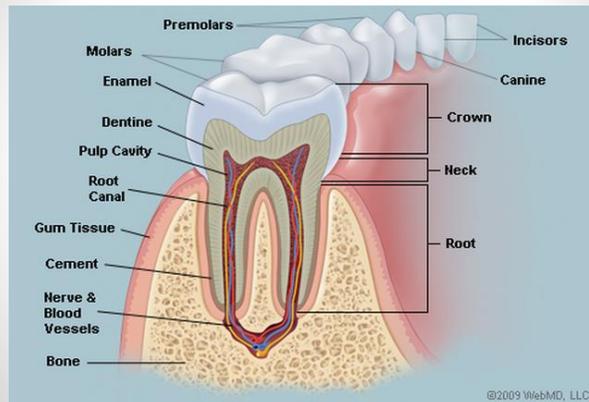
Dental Basics – Adult Teeth

Adult Eruption Pattern



Adult teeth develop during the early years of a child’s life and start erupting into the mouth around age 6. An adult mouth with a complete set of teeth (also known as “the permanent dentition”) has 16 teeth in the upper jaw (maxilla) and 16 teeth in the lower jaw (mandible). Each jaw has 2 central incisors, 2 lateral incisors, 2 canines, 4 premolars (bicuspid) and 6 molars. The last molars erupt in the late teens to early twenties and are also known as “wisdom teeth.”

Dental Basics – Dental Anatomy



The parts of a tooth are the “crown,” “root” and “neck.”

The crown of the tooth is the most visible part when a person smiles. The tooth is anchored in the jaw by the root, which is normally not visible in the mouth. The crown and root meet at the neck of the tooth.

The outer surface of the crown of the tooth is covered with enamel. Enamel is the hardest substance in the human body, and is largely made up of hydroxyapatite, a crystalized form of [calcium](#) phosphate. Enamel is translucent, and it does not have nerves and blood vessels.

While enamel covers the crown of the tooth, cementum covers the root of the tooth. Cementum is also a calcified substance, but unlike enamel, it is a living part of the body that can regenerate. It is part of the periodontium—the structures that anchor the teeth in the jaw. Cementum is attached to connective fibers that attach the root to the bone socket.

The layer under the enamel and cementum is called the dentin. Dentin is less hard and brittle than enamel. Dentin is made of living cells, and, if enamel or cementum is absent, the tooth can be sensitive. Dentin is yellow in color, and due to the translucency of the enamel, impacts the color of the tooth. In the center of the tooth are nerves and blood vessels that connect the tooth to the blood stream.

The bones that surround teeth are covered by tissue called the “gingiva” or more commonly, “the gums.” Gingiva is a soft lining that protects the bone and, when healthy, is pink and firmly attached to the bone.

The teeth are bathed in saliva, a watery substance produced by salivary glands, that assists with eating, swallowing and digestion.

Common Oral Diseases

Caries



Periodontal Disease



Oral Cancer

The most common oral diseases are dental caries (cavities), periodontal disease (gum disease) and oral cancer. People who suffer from these diseases find that the conditions can significantly impact their health and quality of life. Oral diseases are not just an esthetic or nutritional concern; when they go untreated they can cause significant damage to the patient's health and, in the worst cases, they can be fatal.

This section will describe each of these diseases and how health professionals can help to prevent them.

Dental Caries



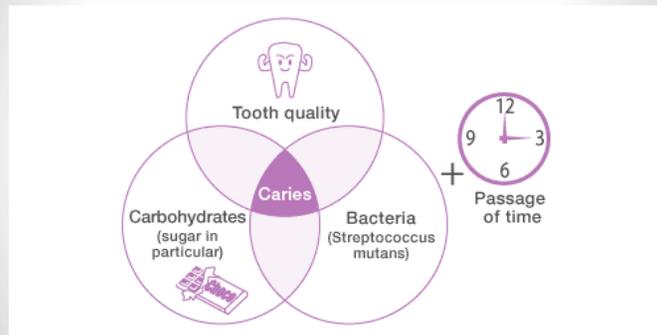
Lets start with dental caries.

Dental caries is a serious chronic, infectious disease that occurs when the tooth structure loses minerals and structure is destroyed.

Dental caries commonly starts as a small spot of demineralized (softened) enamel at the tooth surface, often hidden from sight in the fissures (grooves) of teeth or in between the teeth. The destruction spreads into the softer dentin, which will eventually cause the undermined enamel to collapse, forming a “cavity.” If left untreated, the tooth will be destroyed and the nerve of the tooth will be affected, leading to pain, infection and sometimes even death.

Dental caries is progressive and destructive if not caught early, and impacts both children and adults.

Etiology of Dental Caries



For caries to occur, three things need to be present: a tooth, certain types of bacteria, and sugar. Bacteria in the mouth feed on the sugar, which comes from fermentable carbohydrates in the diet. The bacteria produce acid, which in turn demineralizes the tooth. This demineralization occurs over time and is a fluid process, meaning that the tooth is constantly demineralizing and remineralizing.

Several factors impact the progression of caries.

1. The strength and anatomy of teeth can make them more susceptible or less susceptible to caries. Fluoride incorporated into tooth enamel strengthens it. Dental sealants can be placed over deep fissures and grooves that often harbor bacteria. These two interventions are the cornerstones of prevention and the focus of most state oral health programs.
2. Diet is also important. Healthy diets reduce the amount and frequency of eating or drinking foods and beverages that contain sugar or fermentable carbohydrates that the body can turn into sugar. Fermentable carbohydrates are also present in “healthy” foods such as milk, dried fruits, crackers and bread.
3. Oral hygiene impacts the progression of caries. Toothbrushing and flossing can remove the sticky, colorless film of bacteria on or around teeth called “plaque.”
4. Other factors such as tobacco use, substance abuse, sugary medicines and insufficient salivary flow that leads to dry mouth are also associated with dental caries.

U.S. Prevalence of Dental Caries

- 91% of adults have had dental caries*
- 27% of adults have untreated decay*
- 37% of children aged 2-8 had dental caries **
- 23% of children 2-5 had dental caries**
- Hispanic and Black children had higher caries prevalence**
- Children aged 5 to 19 years from low-income families are twice as likely (25%) to have decay, compared with children from higher-income households (11%) ***

*Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and tooth loss in adults in the United States, 2011–2012. NCHS data brief, no 197. Hyattsville, MD: National Center for Health Statistics. 2015.

**Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012. NCHS data brief, no 191. Hyattsville, MD: National Center for Health Statistics. 2015

***Dye BA, Xianfen L, Beltrán-Aguilar ED. *Selected Oral Health Indicators in the United States 2005–2008*. NCHS Data Brief, no. 96. Hyattsville, MD: National Center for Health Statistics, Centers for Disease Control and Prevention; 2012.

Although dental caries is preventable, it is still extremely common in the U.S. More than 90% of adults have experienced dental caries, and more than 25% are currently suffering from untreated caries. Caries impacts all ages, from very young children to seniors.

A population of special interest to state oral health and maternal and child health programs is young children. Early childhood caries (ECC) is a severe form of dental caries in children under the age of six. It is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth. Prevention programs often target young children because the long-term consequences of ECC include a higher risk of new cavities in both the primary and permanent teeth, possible hospitalizations and emergency room visits, increased dental treatment costs, and the possibility of delayed physical development. Children with caries also miss more school, and have difficulty concentrating, which could lead to more challenges in their ability to learn. Caries disproportionately impacts minority groups and those in low socioeconomic circumstances. Public health programs commonly try to reach children from low-income families by developing fluoride varnish programs in Head Start and WIC sites and dental sealant programs in schools with a high percentage of children on free and reduced lunch programs.

*Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and tooth loss in adults in the United States, 2011–2012. NCHS data brief, no 197. Hyattsville, MD: National Center for Health Statistics. 2015.

**Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012. NCHS data brief, no 191. Hyattsville, MD: National Center for Health Statistics. 2015

***Dye BA, Xianfen L, Beltrán-Aguilar ED. *Selected Oral Health Indicators in the United States 2005–2008*. NCHS Data Brief, no. 96. Hyattsville, MD: National Center for Health Statistics, Centers for Disease Control and Prevention; 2012.

Dental Caries in Adults and Seniors

- Among adults aged 20–64, 91% had dental caries and 27% had untreated tooth decay.
- Untreated tooth decay was higher for Hispanic (36%) and non-Hispanic black (42%) adults compared with non-Hispanic white (22%) and non-Hispanic Asian (17%) adults aged 20–64.
- Adults aged 20–39 were twice as likely to have all their teeth (67%) compared with those aged 40–64 (34%).
- About one in five adults aged 65 and older had untreated tooth decay.
- Among adults aged 65 and older, complete tooth loss was lower for older Hispanic (15%) and non-Hispanic white (17%) adults compared with older non-Hispanic black adults (29%).

Dye BA, Thornton-Evans G, Xianfen L, Iafolla TJ. Dental Caries and Tooth Loss in Adults in the United States, 2011–2012. NCHS Data Brief, no 197. Hyattsville, MD: National Center for Health Statistics; 2015.

Adults, including older adults, also suffer from dental caries. Some of the challenges that adults face in maintaining their oral health include:

- Medically compromised adults often take numerous medications that reduce salivary flow, or contain sugar which increases the risk of dental caries.
- Seniors may have exposed root surfaces due to gum recession. With no enamel to protect them, roots are highly susceptible to caries.
- Disabled, homebound, or institutionalized adults may have mobility or cognitive issues that impede their ability to care for their teeth, making them reliant on others to provide appropriate home care.
- Many older Americans do not have dental insurance because they lost their benefits upon retirement, and the federal Medicare program does not cover routine dental care.

State oral health programs often collaborate with Healthy Aging Programs and Area Agencies on Aging (AAAs) or various community-based programs to address oral health issues in senior populations.

Dye BA, Thornton-Evans G, Xianfen L, Iafolla TJ. Dental Caries and Tooth Loss in Adults in the United States, 2011-2012. NCHS Data Brief, no 197. Hyattsville, MD: National Center for Health Statistics; 2015.

Treatment of Dental Caries

- Fillings –
Amalgam and Composite Restorations



- Crowns – Gold, Porcelain



- Atraumatic Restorative Technique (ART) and Interim Therapeutic Restorations (ITR)

Once dental caries destroys tooth structure, it cannot be regenerated naturally. To restore the tooth to full function, a dental professional must replace the missing enamel and dentin with other types of restorative materials. Depending on the amount of tooth structure lost, this can be done with a filling or a crown. Filling materials include amalgam, which is a mixture of metals, or composite, a tooth colored acrylic. Crowns also can be made of metal or be tooth colored. The decision to place a filling or crown and what type of restorative material to use is based on the location of the tooth, the amount of remaining tooth structure, the need for durability and patient preference.

Once dental caries is diagnosed, dentists generally recommend that the tooth be restored with a filling or a crown. This can be problematic when a patient is unable to successfully undergo the treatment in a dental office due to lack of access or disability. In some cases a dental professional may choose to remove some of the decay with an instrument rather than using a motorized handpiece to reduce the number of oral bacteria and then place a temporary restoration that has anti-cariogenic properties. This procedure, sometimes called ART or IRT, is intended to control the spread of decay in the tooth. Depending on the individual situation, this filling may be the final restoration, and in others it may be replaced with a permanent filling when the patient is able to have a filling or a crown.

Dental Infection

- Abscesses



- Treatment: Root Canal



If caries is not treated, it can progress past the enamel and dentin and reach the pulp of the tooth. Once the bacteria is in the pulp, infection or “pulpitis” can occur causing swelling, infection and pain; abscesses often appear in the mouth at the site of the infection. These infections can be very dangerous if left untreated due to the proximity of the mouth to the brain and airway. Severe infections can lead to hospitalizations and, in the worse cases, death.

A dentist can treat an infected pulp by performing a root canal or endodontic treatment. This procedure removes the pulp tissue, and then cleans, shapes and fills the interior of the tooth and root. Once the root canal treatment is complete, the tooth can be restored using a filling material or a crown.

Periodontal Disease



Healthy
Gingiva



Gingivitis



Severe Periodontitis

Periodontal (or gum) disease is another common disease of the oral cavity. As noted previously, the periodontium refers to structures that support the teeth in the mouth, including the gingiva, the cementum on the root, the attachment fibers, and the bone that surrounds the teeth.

The most common and earliest form of periodontal disease is gingivitis, an infection that attacks the gingiva and the surrounding supporting structures around the teeth, leading to inflammation. People with gingivitis have gums that are red, swollen, and may bleed easily. Gingivitis can usually be reversed with good oral hygiene from toothbrushing and flossing.

Periodontitis is the more severe and advanced form of periodontal disease. At this stage, bone around the teeth can be lost; as it becomes more severe the teeth may become loose. Periodontitis requires professional care.

Gingival recession is another common periodontal condition where the gums move away from the crown of the tooth exposing the root. Recession can cause the teeth to be more sensitive, and exposed roots are more susceptible to decay.

Causes of Periodontal Disease



Like dental caries, periodontal disease is caused by bacteria. Bacteria present in the mouth reside in plaque that develops on teeth. If plaque is not removed by toothbrushing and flossing, it will harden into calculus, also known as tartar. Calculus must be removed by a dental professional using instruments to scale the teeth.

Plaque and calculus cause inflammation, first in the gums (gingivitis), and then in surrounding structures (periodontitis). Bleeding, painful and infected gums and loose teeth are all symptoms of periodontal disease, and it is a common reason teeth are lost in adults.

U.S. Prevalence of Periodontitis*

- 47.2% of adults aged 30 years and older have some form of periodontal disease
- 70.1% of adults 65 years and older have periodontal disease
- 8.9% had severe periodontitis
- More common in males
- Some racial differences: Hispanics (63.5%), Blacks (59.1%), Asians (50.5%), Whites (40.8%)

*Paul I. Eke, Bruce A. Dye, Liang Wei, Gary D. Slade, Gina O. Thornton-Evans, et.al, Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012, Journal of Periodontology, May 2015, Vol. 86, No. 5 , Pages 611-622

How common is periodontitis? Almost half of American adults above the age of 30 have periodontitis, and it becomes more common as we age. It is more prevalent in Hispanic, black and Asian-Americans than in white Americans. It is more common in men than women (56.4% vs 38.4%), those living below the federal poverty level (65.4%), and those with less than a high school education (66.9%).

*Paul I. Eke, Bruce A. Dye, Liang Wei, Gary D. Slade, Gina O. Thornton-Evans, et.al, Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012, Journal of Periodontology, May 2015, Vol. 86, No. 5 , Pages 611-622

Risk Factors for Periodontitis

- Poor oral hygiene/lack of professional treatment
- Smoking
- Diabetes
- Medications that reduce salivary flow
- Diseases impacting immune system: HIV+/AIDS, cardiovascular disease, arthritis
- Genetics

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In addition to poor oral hygiene and lack of professional treatment, several other factors can increase the risk of periodontal disease. 64.2% of smokers have periodontal disease, and people who take medications that reduce salivary flow can also be more susceptible. Other medical conditions that are associated with periodontitis are diabetes, immunosuppression and hormonal changes that are associated with pregnancy or oral contraceptives. Stress, heredity, crowded teeth that are hard to clean, and defective or rough restorations can also contribute to periodontal problems.

Tooth Loss and Replacement

Tooth replacement – Bridges, Implants



Dentures



Both dental caries and periodontal disease can lead to tooth loss.

Dentists can replace missing teeth in a number of ways. A bridge is a permanent restoration where the teeth adjacent to the missing tooth are crowned, and a false tooth is attached between the two crowns. A patient could also choose to have an implant, where a false tooth is surgically implanted in the bone where the tooth was lost. There are also removable prostheses, more commonly called full or partial dentures.

Dental restorations and prostheses are very expensive, even for those who have dental insurance. Patients with dental restorations must continue periodic dental visits, as crowns/bridges/implants can be complicated to clean, and removable dentures must be adjusted to fit properly. Even people without teeth need to see a dental professional on a regular basis to check for oral cancer or infections or sores under their dentures.

Oral/pharyngeal Cancer

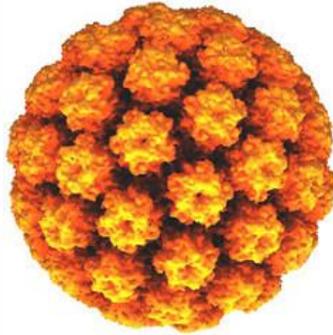


Oral and pharyngeal cancers include any type of cancer that occurs in the mouth or throat. They can be primary cancer – meaning it originated in the mouth, or a metastasis, meaning it came from a different place of origin.

There are several types of oral cancers, but around 90% are [squamous cell carcinomas](#), originating in the tissues that line the mouth and lips. Oral cancer most commonly involves the [tongue](#), and can also occur on the [floor of the mouth](#), cheek lining, [gingiva](#), lips, or [palate](#) (roof of the mouth). Early oral cancer often goes unnoticed, and may be first discovered by a dental professional or physician. Early stage symptoms can include persistent red or white patches, a non-healing [ulcer](#), progressive swelling or enlargement, unusual surface changes, sudden [tooth mobility](#) without apparent cause, unusual oral bleeding and prolonged hoarseness.

In 2013 oral cancer resulted in 135,000 deaths, about 8% of all malignant growths. Men are affected twice as often as women, particularly men older than 40. Around 75% of oral cancers are linked to modifiable behaviors such as tobacco use and excessive alcohol consumption. Other factors include poor oral hygiene, irritation caused by ill-fitting dentures and other rough surfaces on the teeth, poor nutrition, and some chronic infections caused by fungi, bacteria or viruses.

Oral Cancer and Viruses



Human Papilloma Virus (HPV)

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Some oral cancers are associated with viruses, including the human papilloma virus (HPV) and HIV.

HPV is the most common sexually transmitted virus and infection in the US, and is the leading cause of oropharyngeal cancers, which are cancers in the very back of the mouth, base of the tongue, and throat. Because of the prevalence of HPV, the fastest growing segment of the oral and oropharyngeal cancer population are otherwise healthy, non-smokers in the 25-50 age range.

Two vaccines known as Gardasil and Cervarix protect against the strains of HPV that cause cervical cancers in women. Although there have not been studies on the vaccines' impact on oral cancers, the same strains of HPV are the cause of both cervical and oral cancer, so oral health programs should be working with their partners in sexually transmitted disease prevention programs to encourage vaccinations of pre-teens against HPV.

Although the numbers of HPV related cancers are increasing, most people who have HPV will not develop cancer and in most cases HPV goes away on its own without any health problems.

Other viruses also are related to oral cancers. Kaposi's sarcoma, a skin cancer seen in HIV positive immunosuppressed patients, is often seen in the mouth as well.

Oral-facial Injuries



Some of the causes of oral injuries include accidental falls, sports and recreation related injuries, and domestic abuse. Examples of public health programs that address these injuries include the fabrication of sports mouthguards and face shields, creating safe playgrounds, fall prevention for seniors, and training professionals to identify and report child, domestic and elder abuse. Dental professionals in every state are mandatory reporters, meaning that they are legally required to report suspected cases of child abuse and neglect to authorities.

Treatment of oral-facial injuries depends on the location and involvement of the teeth or soft tissues. First aid training should include oral injuries, and prompt referral for dental professional assessment and appropriate treatment is important to prevent further complications.

Developmental Conditions



- Cleft lip and palate
 - Occurs when a baby's lip or mouth do not form properly during pregnancy
 - Cleft lip can be on one or both sides of the lip
 - Children with a cleft lip also can have a cleft palate
- Enamel defects occur during tooth formation
 - Pitted, discolored teeth
 - Increased susceptibility to caries

Public health professionals working in Title V (or the Maternal and Child Health program) are concerned with birth defects and oral developmental conditions.

Examples of birth defects that affect the oral cavity are cleft lip and cleft palate. These occur when the tissues that make up the lip and/or palate do not join completely before birth. CDC estimates that each year in the United States about 2,650 babies are born with a cleft palate and 4,440 babies are born with a cleft lip with or without a cleft palate. Surgery is required to repair these clefts. These surgeries usually occur in the first few years of life, and many children will need additional surgical procedures as they get older. Public health programs sometimes assist parents of children with special needs financially or by instructing them in adaptive feeding and other child care techniques.

Other developmental anomalies may occur due to genetics or environmental factors that affect the fetus such as interrupted oxygen or insufficient nutrients. Children with craniofacial syndromes or premature babies may have increased dental related anomalies such as malformed, pitted or missing teeth. Some of these conditions may increase their risk for developing dental caries or gingival disease.

Resources

- Open Wide Oral Health Training for Health Professionals. Glossary. <http://mchoralhealth.org/OpenWide/glossary.htm>
- Open Wide Oral Health Training for Health Professionals. Modules 1-4. <http://mchoralhealth.org/OpenWide/index.htm>
- Smiles for Life: A National Oral Health Curriculum. Modules 2-8, <http://www.smilesforlifeoralhealth.com/buildcontent.aspx?tut=555&pagekey=62948&cbreceipt=0>

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Here are some additional resources you may wish to review.

Resources cont.

- Oral Health Basics
<https://www.cdc.gov/oralhealth/basics/index.html>
- HPV and Oropharyngeal Cancer
https://www.cdc.gov/cancer/hpv/basic_info/hpv_oropharyngeal.htm
- Facts About Cleft Lip and Cleft Palate
<https://www.cdc.gov/ncbddd/birthdefects/cleftlip.html>
- Oral Injury <https://www.mchoralhealth.org/highlights/oral-injury.php>

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And here are a few more.

Suggested Learning Activities

- Visit a dental office or community-based program to observe dental professionals doing screenings, examinations or dental care with individuals of different ages. Ask them to review with you the names of the various structures in the mouth and to point out signs of oral diseases or conditions and evidence of dental care. If you're in a treatment setting, observe how various procedures are performed.
- Review some of the online resources for additional information or videos.

One suggested learning activity is to visit a dental office or community-based dental program to observe dental professionals at work. Ask them to point out various structures in the mouth and examples of different types of dental diseases or conditions, and examples of different types of dental treatment.

We also encourage you to review the previously listed other resources.

Photo Credits

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Slide 18: Picture 3: Vijayalakshmi E, Nirmal V, Austin RR, Saravana S. Myoepithelioma in the floor of the mouth: A rare case report with immunohistochemical findings. *SRM J Res Dent Sci* [serial online] 2014 [cited 2017 Oct 25];5:114-7. Available from: <http://www.srmjrd.com/text.asp?2014/5/2/114/132086>

Slide 20, Picture 3:

[http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1834-7819](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1834-7819)

Slide 20, Picture 5: Neville BW, Damm DD, Allen CM, et al: *Oral and Maxillofacial Pathology*, ed 3, St Louis, 2009, Saunders.

Slide 21, Picture 3: *National Oral Health Information Clearinghouse, National Institute of Dental and Craniofacial Research: Oral conditions in children with special needs: A guide for health care providers, March 2011.*

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We'd like to finish by acknowledging the sources of some of the pictures we have used.

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