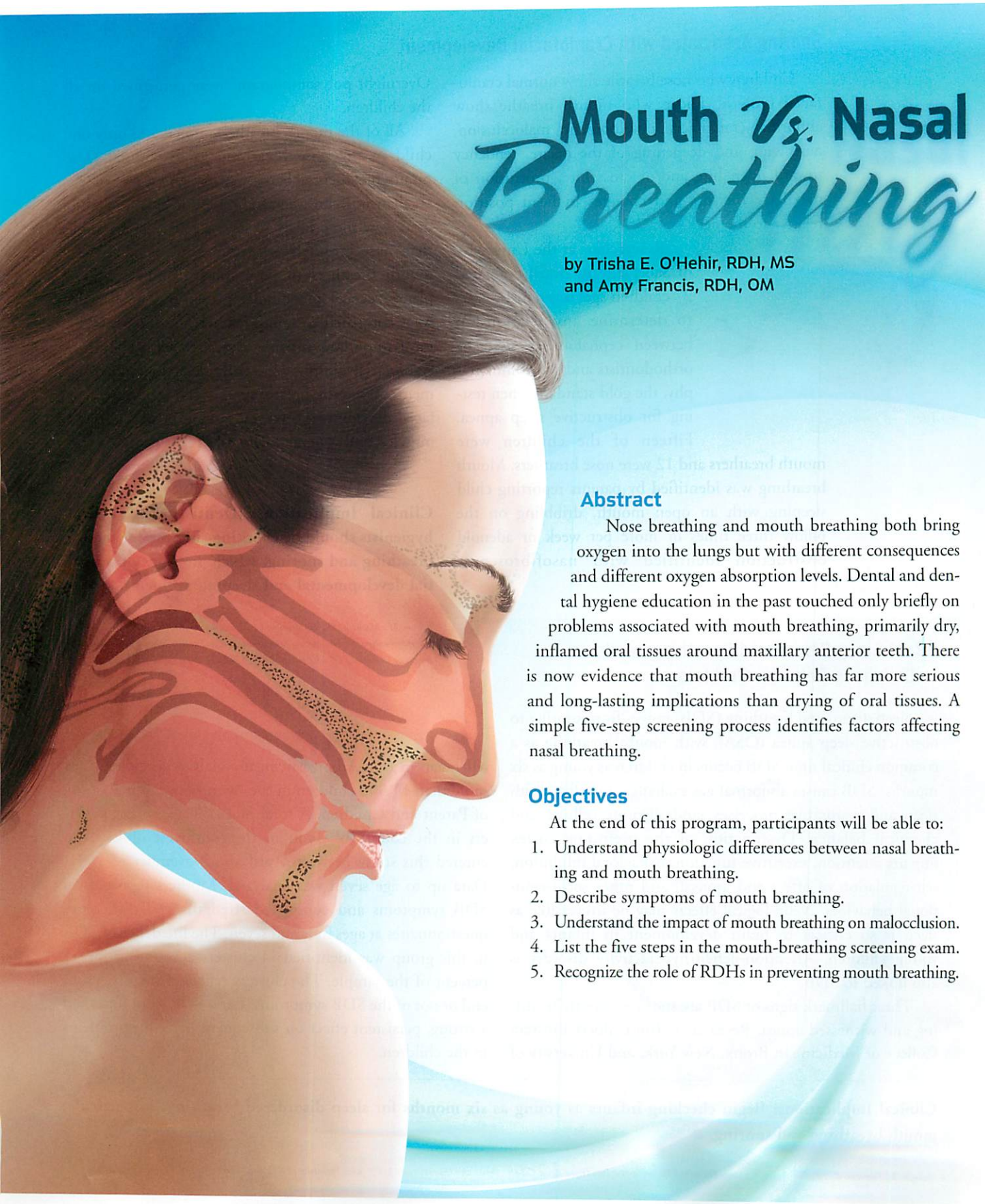

Mouth Vs. Nasal Breathing

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Abstract

Nose breathing and mouth breathing both bring oxygen into the lungs but with different consequences and different oxygen absorption levels. Dental and dental hygiene education in the past touched only briefly on problems associated with mouth breathing, primarily dry, inflamed oral tissues around maxillary anterior teeth. There is now evidence that mouth breathing has far more serious and long-lasting implications than drying of oral tissues. A simple five-step screening process identifies factors affecting nasal breathing.

Objectives

At the end of this program, participants will be able to:

1. Understand physiologic differences between nasal breathing and mouth breathing.
2. Describe symptoms of mouth breathing.
3. Understand the impact of mouth breathing on malocclusion.
4. List the five steps in the mouth-breathing screening exam.
5. Recognize the role of RDHs in preventing mouth breathing.

Humans are designed to be nose breathers, but for a variety of reasons the switch can be made to mouth breathing, with serious consequences. The nose and mouth have different functions. Each nostril functions independently and synergistically to filter, warm, moisturize, dehumidify and smell the air. It's like having two noses in one. Breathing through the mouth provides none of these benefits of nose breathing and a lengthy list of adverse effects. The problems associated with mouth breathing begin in the mouth by changing the tongue rest position, thus changing the normal growth pattern of the palate, both maxillary and mandibular jaws and the airway.[1] Inadequate skeletal growth leads to crowded teeth, a high-vaulted palate and abnormal occlusion, called the Long Face Syndrome. In mouth breathers, the tongue rests down and forward, not in the palate as it should, leading to tongue thrust, abnormal swallowing habits and speech problems. A significant problem with mouth breathing is reduced oxygen absorption leading to a cascade of sleep, stamina, energy level and ADHD problems. Dryness of the oral and pharyngeal tissues from mouth breathing leads to inflamed tonsils, tonsil stones, dry cough, swollen tongue, halitosis, gingivitis and caries. Mouth breathers chew with their mouths open, swallowing air, leading to gas, bloating, flatulence and burping. Lips become flaccid with mouth breathing because they don't close regularly to provide the necessary lip seal.

Dental and dental hygiene education in the past touched only briefly on problems associated with mouth breathing, primarily dry, inflamed oral tissues around maxillary anterior teeth. Adding to that knowledge, there is now evidence that mouth breathing has far more serious and long-lasting implications than drying of oral tissues.

Many misconceptions about mouth breathing persist today. In some circles, mouth breathing and nose breathing are thought to be equivalent and in athletics, mouth breathing is still assumed to be better than nose breathing. Assuming that mouth breathing and nose breathing are no different ignores basic physiologic facts about the exchange of oxygen and carbon dioxide. Today professional athletic teams are being coached to train with their mouths closed, focusing on nose breathing to increase endurance, stamina and muscle memory. Another misconception is assuming more oxygen is absorbed with a big inhale through the mouth doesn't take into consideration the fact that oxygen is absorbed on the exhale, not the inhale. Sleep medicine writings assume mouth breathing and sleep apnea are not connected, which is not supported by scientific evidence. Mouth breathing and obstructive sleep apnea (OSA) are connected.[4]

Dental professionals are in a perfect position to evaluate mouth and nose breathing, check for tongue rest position and intervene early with young children to assure normal skeletal development and help mouth breathers of all ages become nose breathers. Understanding the physiology of breathing and implementing a simple five-step screening system raises awareness of the significance of this problem and provides an opportunity to implement far-reaching changes in patients' lives.

Mouth Breathers are prone to:

nasal congestion	burping
watery, itchy eyes	flatulence
runny nose	hiccups
allergies	acid reflux
asthma	heartburn
enlarged tonsils	poor palate development
bad breath	crooked teeth
tonsil stones	recessive chin
dry cough	Long Face Syndrome
snoring	speech problems
sleep disturbances	weak, flaccid lips
fatigue	fibromyalgia
low energy level	chronic fatigue syndrome
ADHD	silent aspiration
tongue thrust	pneumonia
abnormal swallowing habits	bronchitis
aerophagia	bed wetting
bloating	frequent urination at night

Physiology of Breathing

The purpose of breathing is to deliver oxygen to the cells of the body and to remove excess carbon dioxide. The body requires approximately two to three percent oxygen and the atmospheric level is 21 percent so there is no need to store oxygen. The body's requirement for carbon dioxide is 6.5 percent and the atmospheric content is 0.03 percent, so the body has to produce and store carbon dioxide in the lungs and blood. Carbon dioxide is produced as a byproduct of exercise and digestion of food. Carbon dioxide has several functions in the body: facilitate release of oxygen from hemoglobin, trigger breathing, maintain blood pH by buffering with bicarbonate or carbonic acid and prevent smooth muscle spasms. All of these functions are reduced or impaired in mouth breathers.

Breathing is subconscious with each inhale determined not by the need for oxygen, but by the level of carbon dioxide in the alveoli of the lungs and blood. As carbon dioxide builds up in the body, the pH of the blood drops. This pH change is monitored by chemoreceptors in blood vessels that will signal the brain to trigger the next breath. Normal respiration follows a gentle wave pattern with 10 to 12 breaths per minute, providing five to six liters of air per minute. Mouth breathers often have a respiration rate above 12 breaths per minute and those with asthma and serious medical conditions have rates of 20 respirations per minute or higher.

Breathing through the nose controls the amount of air taken in and, more importantly, controls the amount of air exhaled.

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Oxygen is absorbed on the exhale, not on the inhale. The back-pressure created in the lungs with the slower exhale of nose breathing compared to mouth breathing allows more time for the lungs to transfer oxygen to the blood. The exchange of oxygen in the blood requires the presence of carbon dioxide. Approximately 98 percent of oxygen is carried in hemoglobin. Carbon dioxide levels need to be at five percent in the alveoli and arterial blood before the oxygen molecules are released from hemoglobin to reach brain and muscle cells. Lower than five percent carbon dioxide levels lead to an elevation in blood pH and the oxygen "sticks" to the hemoglobin, this is the Bohr Effect, first described in 1904 by physiologist Christian Bohr.

Nitric oxide is released in the nasal cavity and inhaled with nose breathing. Nitric oxide increases the efficiency of oxygen exchange. With nitric oxide, blood oxygen increases by 18 percent. Mouth breathing bypasses the nitric oxide.

Seventy-five percent of the inhaled oxygen is exhaled. During strenuous exercise, 25 percent of the oxygen inhaled is exhaled. Mouth breathing to take in more air does not increase the level of oxygen in the blood, which is already 97-98 percent saturated. Mouth breathing with big breaths actually lowers the carbon dioxide level in the lungs and the blood leading to lower levels of oxygen released from the hemoglobin to body cells. Taking in more air doesn't deliver more oxygen to the cells of the body. A balanced pH of the blood is achieved with proper oxygen-carbon dioxide exchange. Nasal breathing will increase oxygen in the lungs, blood and cells. Excessive carbon dioxide loss through mouth breathing decreases oxygen levels in the lungs, blood and cells.

Signs of Mouth Breathing

Determining if someone is a mouth breather is not always easy. Some people admit they always breathe through their mouth. Others believe they are nose breathers, but if you watch them, their mouth is open most of the time. Sitting still, they might have their mouth closed, but if they get up and walk across the room, their mouth is open. Telltale signs of mouth breathing are an addiction to chap stick or lip balm. An open mouth leads to drooling, both awake and asleep, causing chapped lips and a tendency for mouth breathers to lick their lips frequently. Closed mouth lip seal is efficient at keeping saliva in and air out but chronic mouth breathers find it very difficult to hold their lips together. Mouth breathing at night causes drooling and dries the oral tissues so the mouth, teeth, tissue and throat are all dry upon waking. If someone wakes with a dry mouth, he or she is likely a mouth breather at night, which means he or she is also mouth breathing during the day.

The tongue normally rests against the palate, without touching the teeth. With mouth breathing, the tongue drops down and forward. It might in fact be that the down and forward tongue position triggers mouth breathing. Mouth breathing is impossible with the tongue resting against the palate. A simple tool to self-test for mouth breathing is the square plastic bag closers used on plastic bread bags. Place the square plastic chip between the lips and have the person go about their daily activities. If the chip falls out, they are mouth breathing.

Mouth Breathing – What Goes Wrong

Several things go wrong with mouth breathing, beginning with oxygen/carbon dioxide exchange, the change in tongue rest position and swallowing air. The low carbon dioxide levels associated with mouth breathing trigger the activation of breathing faster than usual, leading to over breathing or hyperventilation. With less oxygen being delivered to the brain, muscles and all the cells of the body, the body functions less than optimally. Sleep is often disturbed and of poor quality, leaving the mouth breather tired in the morning and feeling fatigued mid-afternoon. Attention-deficit hyperactivity disorder (ADHD) is also linked to mouth breathing.[11] This dryness and lack of air filtration in mouth breathing causes enlarged and inflamed tonsils and adenoids and increased risk of upper respiratory tract infections. Lower levels of carbon dioxide cause smooth muscle spasms associated with gastric reflux, asthma and bedwetting. Smooth muscle is found throughout the body in the respiratory system, digestive system, circulatory system, all hollow organs and all tubes and ducts.

The tongue resting in the palate provides passive pressure, stimulating stem cells located in the palatal suture and within the periodontal ligaments

Five-step screening for mouth breathing

1. Lips together at rest – yes or no?
2. Nasal breathing – yes or no? (check each nostril for air intake)
3. Tongue posture at rest – up, down, middle?
4. Frenum length – adequate or tight? (mouth open wide should measure three fingers stacked vertically, with the tongue on the roof of the mouth, opening is two fingers. Less than that indicates a tight lingual frenum.)
5. Palatal width – adequate or narrow? (measure with a cotton roll, cross-arch on the palate between bicuspids.)

around all the teeth to direct normal palatal growth. When the tongue rests in the palate, the teeth erupt around the tongue, producing a healthy arch form. The lateral pressures from the tongue counters inward forces from the buccinator muscles. When the tongue is down and forward, the buccinator muscles continue to push unopposed, causing the upper arch to collapse. Children who mouth breath have an underdeveloped, narrow maxilla with a high vault.[2] They develop a retrognathic mandible and generally have a long face. Harvold et al. surgically blocked noses in monkeys and they all developed malocclusions from mouth breathing.[3] Mouth-breathing-related problems of skeletal development will set children up for obstructive sleep apnea later in life.[4]

It might seem logical that mouth breathing occurs because the nose is congested, but that is not always the case. The brain of a mouth breather thinks carbon dioxide is being lost too quickly from the nose and stimulates the goblet cells to produce mucous in the nose to slow the breathing.[5] This creates a viscous circle of mouth breathing triggering mucous formation, nasal passage blocking, leading to more mouth breathing. So in fact, mouth breathing can cause nasal congestion leading to more mouth breathing.

In some cases, mouth breathing is caused by ankyloglossia, or a tight lingual frenum keeping the tongue from effectively moving in the mouth to assist in chewing and swallowing and comfortably resting on the palate.[6] Unless a frenectomy is done, mouth breathing will continue. Ankyloglossia can be diagnosed and treated in the first few days after birth.[7] However, many cases are ignored until significant problems have developed. Early intervention prevents subsequent problems.[8]

Changing from Mouth to Nose Breathing

Bringing a person's mouth breathing to his or her attention starts the process of breaking the habit. Some people will change back to nose breathing when made aware of it. To remind people to keep their lips together, paper tape is often used by breathing coaches. It may sound strange, but easy-to-remove paper tape helps people experience the many benefits of nose breathing for themselves. Be sure they can breathe through their nose before taping. Best to test this during the day before trying it overnight while sleeping. Try the tape yourself before suggesting it to a patient. A variety of oral appliances are available that position the tongue to the roof of the mouth, close the lips and encourage nose breathing.[9] In many cases, the tongue might need to be exercised since it's been laying on the floor of the mouth and doesn't have the stamina to rest on the palate all day or all night. Orofacial myofunctional exercises are important at this stage. These exercises are essential for those receiving a frenectomy to treat ankylosglossia. In adult cases of life-long mouth breathing, orthodontics to expand the palate may be necessary to make room for the tongue.[10]

Screening for mouth breathing is easy and takes very little time with the five-step process. The first three steps are easily answered with observation and questions to the patient. First, are the lips together, second, can the person breathe through their nose and third, where is their tongue at rest? The next two steps require measurement, first the mouth opening and second the mouth open with the tongue touching the roof of the mouth. Most people can open the width of three fingers stacked vertically. With the tongue on the roof of the mouth, they should be able to open at least two fingers. Less than that and there is a problem with the lingual frenum, either ankyglossia or a tight lingual frenum. The last screening step is to measure the maxillary cross arch distance between the bicuspids. The distance should be equal to a standard cotton roll.

The earlier mouth breathing is recognized and converted to nose breathing, the fewer and less serious the problems will be. Dental hygienists are the ideal dental professionals to screen for mouth breathing. Despite the fact that people are more often asked to open their mouths in a dental office, checking for a closed mouth is essential to oral and general health. ■

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Author Bios

Trisha O'Hehir is currently the Editorial Director for Hygienetown.com and Perio Reports. She received her education at the University of Minnesota and her four-decade career has included roles as clinician in the USA and Zurich, Switzerland, faculty at the Universities of Minnesota, Washington, Arizona and Louisville, international speaker, writer, instrument designer, inventor and entrepreneur.

Amy Francis is both a dental hygienist and an orofacial myologist, teaching people how to breath, chew and swallow. Amy was working in clinical practice when she went on for more training by completing her orofacial myology certification program in 2010 in Los Angeles. Amy spoke at the 2011 Townie Meeting on the importance of nose breathing. Amy lives and works in Lake Havasu, Arizona.