

Sinusitis

The sinuses are air-filled sacs in the facial bones of the head. They have several functions, including warming incoming air and helping to form certain sounds. When the sinuses become infected and inflamed, the condition is known as sinusitis. Sinusitis ranges from a minor annoyance to a serious condition that might require surgery.

The four pairs of sinuses are listed below, in order from highest frequency of infection to least:

- Maxillary sinuses, located in the cheekbone, right below the eye sockets
- Ethmoid sinuses, located behind the bridge of the nose
- Frontal sinuses, located in the lower forehead, in the middle of the head just above the eye sockets
- Sphenoid sinuses, located behind the eyes

The sinuses are lined with cells covered with small, hair-like projections called cilia, which help clear mucus from the chambers and keep them bacteria free (Rubin BK et al 2004). When the ability to clear the passageways is blocked, however, the sinuses may become infected. Sinusitis is classified by duration of illness (acute or chronic), by cause (infectious or other), and by the type of infectious agent involved (bacterial, fungal, or viral). According to the National Institutes for Health, approximately 37 million Americans are affected by sinusitis every year. Health care providers report nearly 32 million cases of chronic sinusitis every year (National Institute of Allergy and Infectious Diseases 2005).

Even if it is not considered serious, sinusitis can have a major impact on quality of life (Bhattacharyya N 2003; Chester AC 2003; Linder JA et al 2003). In rare cases, sinusitis can cause infections of the brain and other complications (National Institute of Allergy and Infectious Diseases 2005).

Researchers in Japan have found a link between chronic sinusitis in older people and cognitive impairment (Matsui T et al 2003). A study of an older population found significant differences in Mini-Mental Status Examination. Examination scores between people with chronic sinusitis and those without (Matsui T et al 2003) underscore the importance of treating sinusitis infections appropriately in this age group.

CAUSES AND RISK FACTORS FOR SINUSITIS

Acute sinusitis is almost always caused by bacteria, fungi, or viruses. Bacteria that cause sinusitis include streptococcal and staphylococcal strains, which also cause the common cold. Fungi are known to cause sinusitis, but mainly in immunocompromised people (such as those with HIV/AIDS) or people who are sensitive to fungi (Shin SH et al 2004; Parikh SL et al 2004). People at highest risk for sinusitis are those with allergies, asthma, or an increased immune response to fungi; smokers; or those with compromised immune systems (Kasper DL et al 2005).

Noninfectious risk factors for sinusitis include rapid changes in air pressure (e.g., when diving, flying, or high-altitude hiking) and exposure to chemical irritants (Rubin BK et al 2004; American Academy of Family Physicians 2005). Additional risk factors for sinusitis are conditions that cause sinus obstruction, such as tumors, and conditions that alter mucus clearance, such as cystic fibrosis (Rubin BK et al 2004).

DIAGNOSIS OF SINUSITIS

No single test confirms a diagnosis of sinusitis. In most cases, the diagnosis will be made on the basis of symptoms, which depend on which sinus or sinuses are affected. Common symptoms include:

- Headache
- Pain in the forehead, over the area where the frontal sinuses are located
- Upper jaw pain
- Toothache
- Pain in the eyes
- Swelling of the eyelids or areas around the eyes
- Earache
- Neck pain

- Tenderness on the sides of the nose
- Loss of smell
- Thick or colored nasal discharge

CONVENTIONAL TREATMENT OF SINUSITIS

Decongestants. The major decongestants used in over-the-counter medications are phenylephrine and pseudoephedrine. Decongestants are usually coupled with a pain reliever, such as acetaminophen, ibuprofen, or aspirin. Over-the-counter medications are used to (1) reopen the nasal passages by reducing the volume of mucus, (2) reduce nasal congestion, (3) relieve pain and pressure, and (4) reduce the potential for complications.

Antibiotics. Antibiotics are used to treat bacterial sinusitis (Rubin BK et al 2004). In very serious cases, intravenous antibiotics may be recommended (Rubin BK et al 2004). They are ineffective in viral sinusitis.

Pain relievers. Pain relievers are often used in conjunction with decongestants. Acetaminophen, ibuprofen, and aspirin are all commonly used in sinusitis.

Corticosteroids. Steroids are used to suppress inflammation. They may be used in topical nasal sprays.

Nonpharmacological therapies. Sinusitis sufferers sometimes use the following therapies, sometimes in combination with pharmaceuticals.

- Steam treatment
 - A warm, moist towel to the face
 - A humidifier
- Nasal saline wash
 - If symptoms are mild to moderate, some healthcare providers will delay treatment with medications in favor of nasal saline solution. However, if symptoms continue for seven days or longer, more aggressive treatment is implemented.
- Surgery
 - Surgical treatment to debride abscesses or to remove impacted mucus is used for very serious cases of sinusitis.

NUTRIENT AND SUPPLEMENTAL THERAPY

Because most cases of sinusitis are caused by bacterial or viral infection, such infections should be treated aggressively—at the first sign of infection—to prevent them from spreading into the sinuses. In addition to getting plenty of rest and drinking a lot of fluid, sufferers may take the following supplements, which have been shown to inhibit infection with viral or bacterial agents that cause the common cold and influenza:

Dehydroepiandrosterone (DHEA). Aging humans gradually lose youthful levels of DHEA, an adrenal hormone and precursor to other important hormones in the body (Shealy CN 1995). Numerous studies have shown that DHEA causes powerful immune-enhancing and antiviral effects (Ben-Yehuda A et al 1998; Corsini E et al 2002; Danenberg HD et al 1995, 1997; Degelau J et al 1997; Padgett DA et al 1997, 2000). The administration of 50 mg DHEA daily to older men resulted in the following immune enhancements compared to placebo :

- 35 percent increase in the number of monocyte immune cells
- 29 percent increase in the number of B immune cells
- 62 percent increase in B cell activity
- 40 percent increase in T cell activity
- 50 percent increase in interleukin (IL)-2
- 22 percent to 37 percent increase in natural killer (NK) cell number
- 45 percent increase in NK cell activity

One reason influenza can be so lethal to older people is that their immune systems are weak. A deficiency in DHEA appears to be partially responsible for the age-related decline in immune function (Fulop T Jr et al 1999; Khorram O et al 1997). One study showed that a metabolite of DHEA augmented activation of helper T cells and protected mice from a lethal influenza virus infection (Padgett DA et al 1997).

Lactoferrin. Lactoferrin has well-documented antiviral, antimicrobial, anticancer, and immune enhancing effects. Lactoferrin secretion is increased during sinusitis, leading researchers to conclude that it is a potent part of the body's natural defense

mechanism against sinusitis.

Lactoferrin has been found to directly and indirectly inhibit viruses such as respiratory syncytial virus, human HIV, cytomegalovirus, and herpes simplex type I infection (Puddu P et al 1998; Superti F et al 1997; Harmsen MC et al 1995; Swart PJ et al 1996, 1998; Sano H et al 2003). Specifically, lactoferrin has been shown to increase NK cells (Yamauchi K et al 1998; Swart PJ et al 1998; Waarts BL et al 2005).

Lactoferrin may stimulate macrophages, which in turn may help to induce cell-mediated immunity. Although many of the studies of lactoferrin's functioning have involved animals, lactoferrin is naturally present in many mucous membrane secretions in people, suggesting an innate human antimicrobial function (Nishiya K et al 1982; Zimecki M et al 2002).

A recent study showed that human lactoferrin interferes with the ability of certain viruses to bind to cell receptor sites (Waarts BL et al 2005).

Melatonin. Melatonin, a hormone produced by the pineal gland, has immunity-enhancing benefits in addition to its well-known role as a sleep aid. Melatonin enhances the production of key immune system components, such as NK cells, IL-2, IL-4, IL-10, and gamma interferon (Lissoni P et al 1989, 1994, 1995; Maestroni GJ 1999; Bubenik GA et al 1998). Melatonin has been specifically shown to decrease viral load and prevent death in mice infected with certain viruses. One study of melatonin concluded, "The immunomodulatory, antioxidant, and neuroprotective effects of melatonin suggest that this indole must be considered as an additional therapeutic alternative to fight viral diseases" (Maestroni GJ 1999).

Another study reviewed animal research that examined the immune function benefits of melatonin and found that melatonin activated IL-2 and gamma interferon, the body's natural hormone-like agents that facilitate helper T cell production (Bonilla E et al 2004).

Garlic. With all the high-tech advances occurring in medicine, garlic might be expected to be a relic of the past. Yet the scientific literature documents that garlic has powerful effects against certain viruses.

For instance, one study tested one capsule daily of an allicin-containing garlic supplement (like Pure Gar) on a group of 146 volunteers (Josling P 2001). Over several months half the group received the garlic while the other half got a placebo. The placebo group had 63 percent more common cold infections than the garlic group. Even more significant, those in the garlic group who did catch a cold had symptoms for an average of only 1.52 days, compared with 5.01 days for the placebo group. The doctors who conducted this garlic study concluded, "An allicin-containing supplement can prevent attack by the common cold virus."

Ribavirin is a prescription drug that has potent antiviral effects (Cattral MS et al 1996; Christie JM et al 1999; da Silva LC et al 2002; de Ledinghen V et al 2002; Di Bisceglie AM et al 1995; Fried MW et al 2002; Galban GE et al 2000; Kumada H 2002; Murphy ME et al 2000; Reichard O et al 1998; Schalm SW et al 1997a,b,1999; Schvarcz R et al 1995). Yet, a Chinese study has found that (at least in the test tube) garlic is more effective than ribavirin in inhibiting viruses that attack the intestinal tract (Luo R et al 2001). Since 1983 the Life Extension Foundation has recommended ribavirin to treat various viral infections, but in this particular study, garlic was shown to be superior.

A number of published studies indicate that both high-allicin garlic (such as Pure Gar) and aged garlic (such as Kyolic aged garlic) support healthy immune function while exerting antiviral effects (Guo NL et al 1993; Josling P 2001; Kyo E et al 2001; Liu ZF et al 2004; Moon DG et al 2000; Tsai Y et al 1985; Weber ND et al 1992). Garlic may be nature's most powerful weapon against certain viruses.

Essential fatty acids. Maintaining the proper ratio of omega-3 to omega-6 fatty acids can maximize the production of anti-inflammatory prostaglandins E1 and E3 while suppressing proinflammatory prostaglandin E2 and leukotriene B4. Most people consume too much omega-6 relative to omega-3 fatty acids. The main omega-3 fatty acids are docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). DHA and EPA exert anti-inflammatory and antithrombotic effects, partly by competing with pro-inflammatory chemicals (Calder PC 2005; Conner WE 2001). Studies suggest that fish oils reduce the production of pro-inflammatory cytokines such as interleukin-1 beta and tumor necrosis factor. Additionally, they can suppress B- and T-lymphocyte synthesis (Kelley DS et al 2000; Endres S et al 1993; Burns EA et al 2004).

Green tea. Green tea, which is rich in antioxidants, has demonstrated the ability to inhibit bacteria (Sakanaka S et al 2000; Stapleton PD et al 2004) and viruses (Song JM et al 2005) and has also been shown to have a protective effect on immune function (Yamamoto Y et al 2004).

Vitamin C. Vitamin C is a potent free radical scavenger and antioxidant derived from citrus fruits and green vegetables. It protects tissues from oxidative stress and enables the actions of vitamin E. Vitamin C in high doses may reduce symptoms associated with viruses and respiratory infections such as colds and flu, which are associated with sinusitis (Gorton HC et al 1999; Hemila H 2004). Multiple studies have found that high doses of vitamin C alleviate common cold and flu symptoms, indicating that the vitamin does

indeed have physiologic effects on colds (Hemila H 1997, 2004; Gorton HC et al 1999). In a five-year clinical trial of 50 mg versus 500 mg vitamin C daily, the high-dose group reported fewer colds than the low-dose group (Sasazuki S et al 2005). From a meta-analysis of four double-blind, placebo-controlled trials, Linus Pauling found a 45 percent decrease in the incidence of colds when 1000 mg ascorbic acid (vitamin C) was used daily (Pauling L 1971). Some studies, however, show that vitamin C does not affect the frequency or duration of a common cold.

Zinc. Zinc supports the actions of antiseptic agents and kills microbes directly (Zeelie JJ et al 1998; Sheng J et al 2005). Zinc deficiency is closely associated with susceptibility to infection (Bogden 2004). A number of published studies show that, if zinc lozenges are taken within 24 hours of the onset of common cold symptoms, the severity and duration of cold miseries are significantly diminished (Hulisz D 2004; Prasad AS et al 2000; Marshall S 1998; Mossad SB et al 1996).

Rhinoviruses attach to specific cell receptor sites in sinus and throat tissues, become lodged in the nose and throat, and then replicate out of control. By binding to the same cell receptor sites as do cold viruses, zinc inhibits the ability of rhinoviruses to take hold in the body (Gwaltney JM 2002).

A meta-analysis of all the published literature on zinc lozenges was conducted in 2004 and concluded, "Clinical trial data support the value of zinc in reducing the duration and severity of symptoms of the common cold when administered within 24 hours of the onset of common cold symptoms. Additional clinical and laboratory evaluations are warranted to further define the role of ionic zinc for the prevention and treatment of the common cold and to elucidate the biochemical mechanisms through which zinc exerts its symptom-relieving effects" (Hulisz D 2004).

Patients seeking to relieve cold symptoms by means of zinc should suck on two 24-mg zinc lozenges at the very first symptom of a cold and take two more lozenges every two hours while awake. Once rhinoviruses bind to their receptor sites in the nasal tissues and begin replicating, zinc lozenges lose their efficacy. Considering how inexpensive zinc lozenges are, it makes sense to keep them on hand so that they are available immediately if cold symptoms appear.

One caveat is that chronic use of zinc in doses of more than 100 mg daily may suppress immune function (Chandra RK 1984). If someone takes two zinc lozenges every two hours over the course of a day, the total zinc intake could easily exceed 300 mg daily. This does not appear to be a problem in the short term. If your cold symptoms do not subside after a few days of taking zinc lozenges, it would be best to stop taking them. Remember that less than 100 mg zinc daily can improve immune function, but taking more than 100 mg daily concerns some doctors.

For more Information

The Immune Enhancement Chapter may be of additional interest.

Propolis. Before the discovery of antibiotics, honey was used in the fight against bacteria. The antibacterial effects of this folk remedy have since been confirmed by scientific study (Lusby PE et al 2005). In addition, *in vitro* and *in vivo* studies have shown that bee propolis has antiviral and anti-inflammatory properties and an inhibitory effect on the growth and adherence of streptococci bacteria (Cohen HA et al 2004; Duarte S et al 2003; Mirzoeva OK et al 1996; Serkedjieva J et al 1992; Szmeja Z et al 1989). One study demonstrated that propolis decreased the duration of the common cold to just a few days. This study showed that cold symptoms in the propolis treatment group improved 2.5 times faster than in the placebo group (Szmeja Z et al 1989).

Warning: Raw honey should NEVER be given to a child under one year of age because it presents a significant risk of potentially fatal botulism. This risk vanishes in older children and adults.

Beta-carotene and vitamin E. Beta-carotene has been shown to have a powerful effect in boosting NK cell activity in older men. In a controlled, double-blind study, the effects of 10 to 12 years of beta-carotene supplementation on NK cell activity were evaluated. Although no significant difference was seen in NK cell activity in the middle-aged groups, older men supplemented with beta-carotene had significantly greater NK cell activity than the control group of men of comparable age (Santos et al 1996).

The best-publicized study of the use of vitamin E to boost immune function appeared in 1997 (Meydani et al 1997). The double-blind, placebo-controlled study looked at healthy humans at least 65 years of age. Supplementation with vitamin E for four months improved certain clinically relevant indices of cell-mediated immunity. These results show that a level of vitamin greater than that currently recommended by the Food and Drug Administration enhances certain clinically relevant *in vivo* indices of T-cell-mediated immune function in healthy older persons.

N-acetylcysteine. N-acetylcysteine (NAC) is an acetylated ester of the amino acid L-cysteine. NAC raises levels of glutathione, a potent internal antioxidant (Roes EM et al 2002). For many years, NAC has been used to treat bronchitis and other lung conditions as an expectorant or mucus thinner as well as an anti-inflammatory.

Rosmarinic acid. Rosmarinic acid is a plant polyphenol found in plants of the *Lamiaceae* genus, which includes basil, sage, mint, rosemary, and perilla leaf (al Sereiti MR et al 1999). Oral supplementation with extracts of rosmarinic acid has been shown to suppress allergic reactions in mice and, more recently, in humans (Makino T et al 2001; Takano H et al 2004). Rosmarinic acid relieves allergy symptoms by preventing the activation of immune responder cells and by inducing apoptosis, or cellular suicide, in already activated immune responder cells (Hur YG et al 2004). Natural flavonoids like rosmarinic acid kill only excess allergy-activated immune cells while leaving the vast bulk of responder cells to fight off bacteria and other foreign invaders, thus possibly preventing the progression to allergic sinusitis.

LIFE EXTENSION FOUNDATION RECOMMENDATIONS

People with sinusitis often benefit from steam treatments and nasal saline wash. In addition, the following supplements are suggested to prevent infection:

- **DHEA** —15 to 75 milligrams (mg) for three to six weeks, followed by blood testing to make sure optimal levels of this hormone are maintained. If symptoms of an infection are just beginning, 200 to 400 mg may be taken as soon as possible.
- **Lactoferrin** —900 mg daily with meals, or 1200 mg at the first sign of infection
- **Melatonin** —3 to 10 mg prior to bedtime, or up to 50 mg at the first sign of infection
- **Pure Gar garlic** —9000 mg once or twice daily (eat other food immediately after ingesting the garlic to minimize stomach or esophageal burning.)
- **Kyolic aged garlic extract**—3600 mg daily
- **Essential fatty acids** —700 to 1400 mg of EPA and 500 to 1000 mg of DHA daily with food
- **Zinc**—Suck on two 24-mg lozenges every two hours while awake, beginning at the first sign of symptoms. This should be continued for only a few days to avoid toxic side effects. Continue with 30 mg of orally ingested zinc daily.
- **Beta-carotene**— 25,000 international units (IU) daily
- **Vitamin C**—2.5 to 6 grams (g) daily
- **Vitamin E** —400 IU of alpha-tocopherol and 200 mg or more of gamma-tocopherol daily
- **NAC**— 600 mg twice daily with vitamin C
- **Propolis** —500 to 1500 mg daily
- **Green tea** —725 mg green tea powder extract. Use a decaffeinated formula if you are sensitive to caffeine.
- **Rosmarinic acid**—100 mg daily

SINUSITIS SAFETY CAVEATS

An aggressive program of dietary supplementation should not be launched without the supervision of a qualified physician. Several of the nutrients suggested in this protocol may have adverse effects. These include:

Beta-Carotene

- Do not take beta-carotene if you smoke. Daily intake of 20 milligrams or more has been associated with a higher incidence of lung cancer in smokers.
- Taking 30 milligrams or more daily for prolonged periods can cause carotenoderma, a yellowish skin discoloration (carotenoderma can be distinguished from jaundice because the whites of the eyes are not discolored in carotenoderma).

DHEA

- Do not take DHEA if you could be pregnant, are breastfeeding, or could have prostate, breast, uterine, or ovarian cancer.
- DHEA can cause androgenic effects in woman such as acne, deepening of the voice, facial hair growth and hair loss.

EPA/DHA

- Consult your doctor before taking EPA/DHA if you take warfarin (Coumadin). Taking EPA/DHA with warfarin may increase the risk of bleeding.
- Discontinue using EPA/DHA 2 weeks before any surgical procedure.

Garlic

- Garlic has blood-thinning, anticlotting properties.
- Discontinue using garlic before any surgical procedure.

- Garlic can cause headache, muscle pain, fatigue, vertigo, watery eyes, asthma, and gastrointestinal symptoms such as nausea and diarrhea.
- Ingesting large amounts of garlic can cause bad breath and body odor.

Green Tea

- Consult your doctor before taking green tea extract if you take aspirin or warfarin (Coumadin). Taking green tea extract and aspirin or warfarin can increase the risk of bleeding.
- Discontinue using green tea extract 2 weeks before any surgical procedure. Green tea extract may decrease platelet aggregation.
- Green tea extract contains caffeine, which may produce a variety of symptoms including restlessness, nausea, headache, muscle tension, sleep disturbances, and rapid heartbeat.

Melatonin

- Do not take melatonin if you are depressed.
- Do not take high doses of melatonin if you are trying to conceive. High doses of melatonin have been shown to inhibit ovulation.
- Melatonin can cause morning grogginess, a feeling of having a hangover or a “heavy head,” or gastrointestinal symptoms such as nausea and diarrhea.

NAC

- NAC clearance is reduced in people who have chronic liver disease.
- Do not take NAC if you have a history of kidney stones (particularly cystine stones).
- NAC can produce a false-positive result in the nitroprusside test for ketone bodies used to detect diabetes.
- Consult your doctor before taking NAC if you have a history of peptic ulcer disease. Mucolytic agents may disrupt the gastric mucosal barrier.
- NAC can cause headache (especially when used along with nitrates) and gastrointestinal symptoms such as nausea and diarrhea.

Propolis

- Propolis, when ingested, can cause hypersensitivity reactions such as rhinitis, conjunctivitis, rash, and bronchospasm.

Vitamin C

- Do not take vitamin C if you have a history of kidney stones or of kidney insufficiency (defined as having a serum creatine level greater than 2 milligrams per deciliter and/or a creatinine clearance less than 30 milliliters per minute).
- Consult your doctor before taking large amounts of vitamin C if you have hemochromatosis, thalassemia, sideroblastic anemia, sickle cell anemia, or erythrocyte glucose-6-phosphate dehydrogenase (G6PD) deficiency. You can experience iron overload if you have one of these conditions and use large amounts of vitamin C.

Vitamin E

- Consult your doctor before taking vitamin E if you take warfarin (Coumadin).
- Consult your doctor before taking high doses of vitamin E if you have a vitamin K deficiency or a history of liver failure.
- Consult your doctor before taking vitamin E if you have a history of any bleeding disorder such as peptic ulcers, hemorrhagic stroke, or hemophilia.
- Discontinue using vitamin E 1 month before any surgical procedure.

For more information see the Safety Appendix

disease. The information provided on this site is for informational purposes only and is not intended as a substitute for advice from your physician or other health care professional or any information contained on or in any product label or packaging. You should not use the information on this site for diagnosis or treatment of any health problem or for prescription of any medication or other treatment. You should consult with a healthcare professional before starting any diet, exercise or supplementation program, before taking any medication, or if you have or suspect you might have a health problem. You should not stop taking any medication without first consulting your physician.