

Sputum parasitic infections

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Sputum production

- **Mucus production in the respiratory tract** is a normal process. It is secreted from goblet cells found in the surface epithelium lining the airways of the respiratory tract and from seromucous glands in the connective tissue layer beneath the mucosal epithelium.

The primary functions of mucus are to:

- Humidify air passing through the respiratory tract;
- Trap dust particles, bacteria and other inhaled debris;
- Destroy bacteria.

- **Sputum** is mucus that is coughed up from the lower airways (the trachea and bronchi), it is made up from secretions from cells lining the respiratory tract, dead cells, foreign matter that is breathed into the lungs, such as tar from cigarettes and air pollutants, and white blood cells and other immune cells. In infections, bacteria may also be present in **sputum**.
- There are many different reasons for the body to produce excess sputum. Below is a list of some of these causes, along with how the sputum may appear.

- **Smoking**

- In smokers, mucus builds up in the lungs, causing a “smoker’s cough.” The sputum produced may be green, yellow, or bloody.

- **Asthma**

- People with asthma have airways that are sensitive to allergens, environmental pollution, and respiratory infections. This sensitivity can lead to the airways becoming inflamed, as well as an increase in mucus production.

- **Cystic fibrosis**

- is an inherited disease caused by a defective gene. It leads to smaller airways becoming blocked by thick mucus, which causes breathing difficulties.
- The thick mucus in cystic fibrosis becomes an ideal environment for bacteria to grow.

- **Respiratory tract infections (RTI)**
- Sputum that is a different color from saliva may be a sign of a lower RTI. With bacterial RTIs, sputum may also have a thick consistency and an unpleasant odor.

- **The color of sputum(phlegm)** can give a lot of information about the possibility of what is going on with the lungs and other organs of the respiratory system.
- **Clear:** Clear mucus is normal. It consists of water, salts, antibodies and other immune system cells. After being produced in the respiratory tract, most of it goes down the back of the throat and is swallowed.
- **Brown:** Brown phlegm may indicate possible bleeding, and if so, is likely to be caused by bleeding that happened a while ago.
- Bright red or pink phlegm means the bleeding has happened more recently.
Black mucus may indicate the presence of a fungal infection.

- **White:** White mucus signals nasal congestion. When the nasal cavity is congested, the tissues are swollen and inflamed, which slows the passage of mucus through the respiratory tract. When this happens, the mucus becomes thicker and cloudy or white.
- **Yellow:** Yellow mucus suggests that immune cells are starting to work at the site of the infection or another type of inflammatory insult.
- White blood cells are the cells of the immune system that are responsible for fighting germs. As they continue to fight the infection, they get picked up by the mucus, giving it a yellowish tinge.
- **Green:** Green phlegm indicates a widespread and healthy immune response. The white blood cells, germs, and other cells and proteins produced during the immune response are what give the phlegm its green color.

- **Red:** Red phlegm signals the presence of blood. There are many reasons for blood in the phlegm. Even just a lot of coughing, such as with a respiratory infection, can sometimes cause small blood vessels in the lungs or airways to break and bleed.
- In other situations, blood in the mucus can indicate the presence of a serious medical condition.
- Phlegm can also take on different textures, ranging from watery to thick and tacky. Thin and watery mucus is usually normal and indicates a healthy respiratory tract.
- During an infection, immune cells, germs, and debris build up in the phlegm, making it thicker, stickier, and cloudier.
- Coughing and sneezing help the body to clear out the excess mucus or phlegm and other things that do not belong in the respiratory tract.
- Illness or infection are not the only things that can cause mucus to become thicker. Being dehydrated or even sleeping can cause the mucus to move slower and become thicker than usual.

- Frothy sputum is mucus that is foamy and contains bubbles. Whitish-gray and frothy mucus can be a sign of chronic obstructive pulmonary disease (COPD) and should be mentioned to the doctor, especially if this is a new symptom.
- Pink and frothy phlegm can mean that someone is experiencing severe left-sided heart failure, especially when combined with any of the following symptoms:
 - shortness of breath
 - sweating
 - chest pain

● **Principles of sputum specimen collection**

- The aim of sputum collection is to identify the bacterial, parasitic, viral or fungal causes of a suspected infection and its sensitivities to antibiotics. A specimen is indicated if patient has:
 - Clinical signs of infection including a productive cough and purulent sputum;
 - Signs of systemic infection;
 - Pyrexia of unknown origin
- ❑ It is difficult to accurately assess the amount of sputum produced but it may be described by its colour and consistency. It is important to consider the characteristics of sputum as part of an overall patient assessment.

- Sputum may be described using the following terms ,which can aid diagnosis of the cause:
- Mucoid – containing or resembling mucous;
- Purulent – containing pus;
- Mucopurulent – containing pus and mucous;
- Frothy – visible froth;
- Viscous – thick and sticky;
- Blood-stained – visible blood present.

Sputum samples

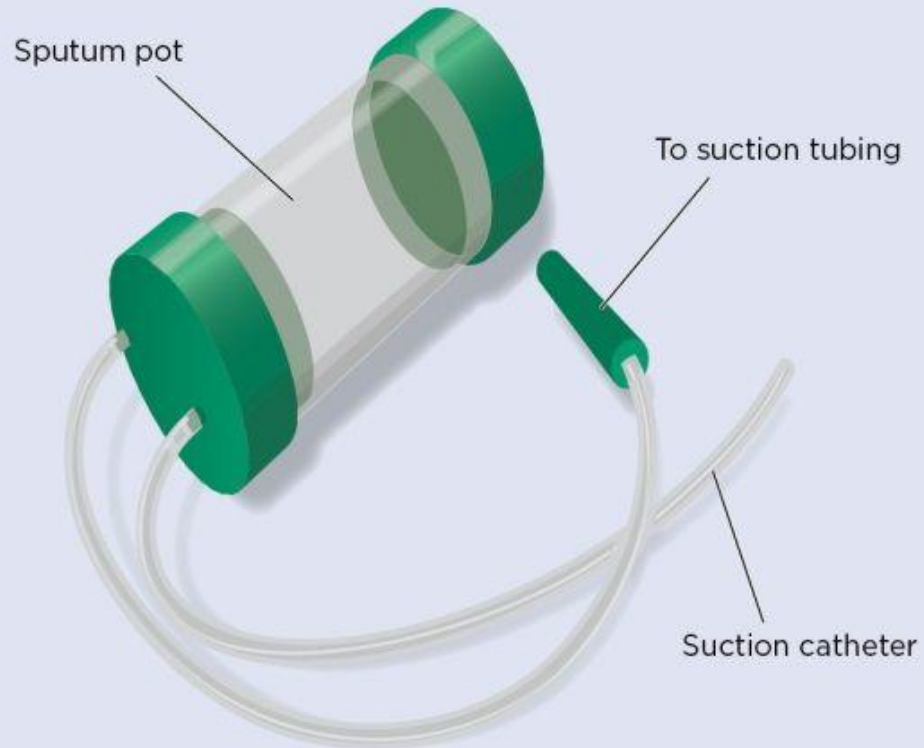
- **Amount to Collect:** The necessary amount of sputum for most tests is 5 ml . However, multiple tests are often ordered so more specimen may be needed. Some testing is best done on serial specimens, so you may be asked to collect for three days in a row.
- **When to Collect:** It's best to collect sputum specimens first thing in the morning, when you get up. Collect specimens only at that time unless instructed to do otherwise by hospital personnel or your physician.
- **Collection Container:.** These are sterile and should be opened only when putting in specimen. After the specimen is obtained, replace the lid tightly on the cup and return to the laboratory within two hours.
- If you're asked to collect sputum for multiple days (i.e. two or three), each day's specimen must be delivered to the laboratory within the two-hour time frame.

- **How to Collect** :Gargle and rinse your mouth with water just after you get up and before you collect the specimen. (This helps to eliminate accumulated cells and normal bacteria that may interfere with your test results.) Inhale repeatedly to the full capacity of your lungs and exhale the air with an explosive cough. This should produce mucus from the lungs that is to be expectorated into the container. The specimen **MUST BE FROM THE LUNGS**. "Spit" from the mouth is inadequate and will give incorrect results to your physician.
- **After the Specimen is Collected**
- Transport specimen within two hours to the lab and give directly to lab personnel. When more than one specimen has been ordered, collect specimens on consecutive mornings. Transport each specimen as collected to the laboratory.

- **Sputum induction** is a procedure used to collect adequate lower respiratory secretions from patients who have trouble producing sputum to aid the diagnosis of TB.
- In particular, patients with suspicion of miliary tuberculosis and/or tuberculous pleural effusion are often targeted using this adjuvant procedure. In such settings, the patient inhales **nebulized hypertonic saline solution** to liquefy airway secretions. This solution stimulates the patient coughing and promotes expectoration of airway secretions. The medical professionals prepare a 20 ml 3% hypertonic saline solution and inject it into the nebulizer cup filled with water. Similar to the non-adjuvant procedure, the patients are always required to wash their mouth thoroughly.

- | Method | Description |
|--|---|
| <ul style="list-style-type: none"> • Spontaneous sputum sample..... | <ul style="list-style-type: none">Patient coughs up sputum into a sterile container |
| <ul style="list-style-type: none"> • Sputum Induction..... | <ul style="list-style-type: none">Patient inhales a saline steam which can cause a deep cough |
| <ul style="list-style-type: none"> • Bronchoscopy..... | <ul style="list-style-type: none">Bronchoscope is passed through the mouth or nose directly into the diseased portion of the lung, and sputum or lung tissue is removed |
| <ul style="list-style-type: none"> • Sputum samples can be obtained using a non-invasive or invasive method and ideally should be collected before antibiotics are started. Invasive methods include oropharyngeal or endotracheal suctioning; | <ul style="list-style-type: none"> these are used with patients who are intubated. A sputum trap is connected to the suction catheter to collect the sputum (Fig 1) |

Fig 1. **Sputum trap**



A sputum trap is connected to the suction catheter to collect the sputum using oropharyngeal or endotracheal suctioning

Pulmonary parasites

- This increase in diagnosis in countries with low prevalence with parasitic infections has been attributed to an increase in the numbers of:
- immunosuppressed individuals due to various reasons,
- organ transplantations
- global travel .

The parasites can cause a wide spectrum of lung diseases varying from mild self-limiting bronchitis to life-threatening acute respiratory distress syndrome ,In addition, parasitic lung diseases may mimic diseases such as bacterial pneumonias, pulmonary tuberculosis, bronchial asthma, lung cancer, interstitial lung disease, and pulmonary hypertension. Both protozoal and helminthic parasites can cause lung diseases and helminthic lung infections are important causes of eosinophilic lung diseases .

- 1. Pulmonary amebiasis
- 2. Pulmonary leishmaniasis
- 3. Pulmonary malaria
- 4. Pulmonary babesiosis
- 5. Pulmonary toxoplasmosis
- 6. Pulmonary Helminths: (a) **Cestodes** 1. Pulmonary hydatid disease
(b) **Trematodes** 1. Pulmonary schistosomiasis
2. Pulmonary paragonimiasis
(d) **Nematodes**
- 1. Pulmonary ascariasis
- 2. Pulmonary ancylostomiasis
- 3. Pulmonary strongyloidiasis
- 4. Tropical pulmonary eosinophilia (pulmonary filariasis)
- 5- Pulmonary dirofilariasis
- 6. Visceral larva migrans
- 7. Pulmonary trichinellosis