ASputum: is produced when a person's lungs are diseased or damaged. Sputum is not saliva but the thick mucus - sometimes called phlegm - which is coughed up from the lungs.

The term mucus may sometimes be used instead of sputum, but sputum refers to that mucus *specifically* secreted in the respiratory tract, whereas mucus may also be produced in the gastrointestinal tract, urological tract, and genital tract.

Contents

Sputum is made up from secretions from cells lining the respiratory tract, dead cells, foreign matter than 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. Blood may also be present in the sputum with lung cancer, trauma to the respiratory tract, damage to the airways, and pulmonary edema

Function

The thickness of sputum serves to trap foreign material so that the cilia in the airway can clear it from the lungs by moving it up through the mouth where it can be swallowed or coughed out. Sputum also contains immune cells that can serve to kill or engulf bacteria so that they are unable tor remain in the lungs and cause infections.

Sputum Colors

- **Clear sputum:** Clear sputum is usually normal, although it may be increased in some lung diseases.
- **White or gray sputum:** White or grayish tinged sputum can also be normal, but may be present in increased amounts with some lung diseases or precede other color changes associated with other conditions.
- **Dark yellow/green sputum:** A type of white blood cells known as neutrophils have a green color to them. These types of white blood cells are attracted to the scene of bacterial infections, and therefore bacterial infections of the lower respiratory tract, such as

pneumonia, may result in the production of green sputum. yellow-green sputum is common with cystic fibrosis as well.

- **Brown sputum:** Brown sputum due to the presence of tar, is sometimes found in people who smoke. Sputum may also appear brown or black due to the presence of old blood. Brown sputum is also common with "black lung disease." These diseases, called pneumoconioses, occur from inhaling substances like coal into the lungs.
- **Pink sputum:** Pink, especially frothy pink sputum may come from pulmonary edema, a condition in which fluid and small amounts of blood leak from capillaries into the alveoli of the lungs. Pulmonary edema is often a complication of congestive heart failure. Pink or blood tinged sputum is commonly caused by tuberculosis worldwide.
- **Bloody sputum:** Bloody sputum, even just a trace of blood tinged sputum, should *always* be evaluated. Coughing up blood (hemoptysis) can be serious, and is the first sign of lung cancer in 7 percent of people. Bloody sputum may also occur with a pulmonary embolism, a condition in which a blood clot in the leg breaks off and travels tot he lungs. Even 1 teaspoon to 2 teaspoons of coughed up blood is considered a medical emergency, and coughing up a fourth of a cup of blood is considered massive hemoptysis and carries a poor prognosis.

Possible micro organisms that cause bronchial infection

A. Bacteria :

1.gram positive :

Streptococcus pneumoniae

Streptococcus pyogenes

Staphylococcus aureus

Bacillus anthracis

Actinomyces sp.

2.Gram negative :

Neisseria meningitidis

Klebsiella pneumoniae

Escherichia coli

Pseudomonas aeruginosa

Acinetobacter sp.

Hemophilus influenzae

Bordetella pertussis

Proteus sp.

Serratia sp.

3.Mycobacteria

Mycobacterium tuberculosis

Legionella pneumophila

Mycoplasma pneumoniae

Chlamydia pneumonia

B. Fungi :

Pneumocystis jirovec

Cryptococcus gattii

C. Parasites

Echinococcus granulosus **(**hydatid cyst**)**

Dirofilaria immitis

Paragonimus westermani

Entamoeba histolytica

Ascaris lumbricoides

D. Viruses:

H1N1 influenza

severe acute respiratory syndrome (SARS) coronavirus

Middle Eastern respiratory syndrome coronavirus (MERS-CoV)

Collecting of sputum samples

1.Before collecting sputum the mouth should be pre-rinsed and this removes contaminants from oral cavity.

2.Give the patient a clean dry wide necked leak-proof container and request him or her to cough deeply to produce a sputum specimen.

3.For best results early morning freshly expectorated sputum specimen should be collected.

4.Label the container, and complete the request form.

5.When Pneumonia or Bronchopneumonia is suspected, deliver the sputum to the laboratory as soon as possible because organisms such as S. pneumoniae & H. influenzae require culturing as soon .

Microscopic examination :

Zhil Nelson (Acid-fast stain)

*****Make sure to use a pair of gloves when handling biological fluids like sputum.

- Carefully open the container (that contains the sputum sample) and using a laboratory burning stick (dry) obtain and spread a small amount at the central part of a microscope glass slide - Use rotational movement to create a good smear
- Place the slide on a drying rack and allow to dry for about 30 minutes or use a dryer to dry the smear faster
- Pass the slide over the Bunsen burner flame 3 to 4 times to heat fix while avoiding to overheat
- Place the slide on the staining rack and pour the Carbol fuschin stain (to cover the smear) and heat until it starts evaporating - do not overheat
- Allow the slide to stand for between 4 and 7 minutes then wash wish water
- Pour 20 percent sulphulic acid on the smear and allow it to stand for a minute. Repeat this until the smear appears pink in color
- Wash the slide with water and cover the slide with malachite green stain or methylene blue and allow the slide to stand for about 2 minutes
- Wash the slide with water and allow the slide to dry on the drying/draining rack - use a tissue paper to clear the slides and back of the slide
- Observe the slide under the microscope using 100x oil immersion objective

Gram stain

- Using a burning stick or cotton swab, obtain a small amount of the sample and make a smear at the center of the glass slide - try making a thin slide

- Place the slide on drying rack and allow to dry
- Pass the slide over the flame several times, but avoid overheating. Simply pass it over the flame several times - heat fix
- Flood the smear with crystal violet and allow to stand for about a minute
- Tilt the slide and rinse with distilled water
- Flood the slide with Gram's iodine for about one minute
- Tilt slide and rinse with water
- Tilt the slide and apply the alcohol drop by drop until it runs clear (95 percent ethyl alcohol/acetone)
- Rinse with water
- Flood the slide with safranin for about a minute
- Tilt slide and rinse with distilled water
- Blot the slide dry
- View under the microscope under high power (oil-immersion

Culture of sample

Depending on the type of microorganism suspected to be present, the following are some of the growth media used in sputum culture:

- Blood agar
- Cysteine Lactose-Electrolyte-Deficient
- Chocolate agar

Selective media for:

- Pseudomonas species
- Fungi and yeasts

- B. cepacia complex

***** Once the microorganism starts to grow, it is identified using a microscope.