Information about Mucus Plugs

By Lee Guion, MA, RRT, FAARC

What is mucus?

Mucus is a gel substance naturally secreted by the lungs’ cells and glands that lines the surface of airways. The lungs respond to inhaled irritants by increasing the production of mucus.

Mucus is mostly water (95%) mixed with proteins, carbohydrates and lipids. A healthy person produces up to 100 milliliters of mucus every 24 hours. Most of this is reabsorbed into the bronchial lining. Only 10 milliliters, or 2 teaspoons, reaches the back of the throat throughout the day and is inadvertently swallowed.

What is the role of mucus?

Mucus is essential to maintaining lung health. Professional scavenger and antimicrobial substances are naturally present in the secretion lining of the lungs. Mucus traps, engulfs, and removes inhaled particles, cellular debris, and dead and aging cells.

Microscopic hairs called cilia beat rapidly creating a wave action that propels mucus and any trapped particles toward the back of the throat where it is swallowed or expectorated.

What is a mucus plug?

As the name implies, mucus that accumulates in the lungs can plug up, or reduce airflow in, the larger or smaller airways. In the smallest airways, mucus plugs lead to collapsed air sacs, or alveoli. If enough alveoli are blocked, a person’s oxygen levels will be negatively impacted over time. If the mucus plugs are in the larger, upper airways, a person may feel short of breath or like they are choking.
What causes mucus plugs?

Many things may contribute to mucus plugging in people with ALS. Among them:

- **Being sedentary.** Reduced movement and lack of exercise leads to shallow breathing and reduced airflow from lower airway to upper airway.
- **Weak diaphragm and abdominal muscles.** Inability to fully expand the lungs and activate abdominal muscles impairs cough effectiveness.
- **Impaired or absent glottic function.** If the vocal cords are impaired due to bulbar muscle weakness, or bypassed due to a tracheostomy tube, a person will not be able to generate enough thoracic pressure to create an effective cough.
- **Dehydration.** Inadequate fluid intake, by mouth or through a feeding tube, can contribute to thicker mucus.
- **Tracheostomy tube.** Presence of an artificial airway can stimulate the lungs to produce more mucus. In addition, when a person breathes through a trach tube, it bypasses the nose, whose function is to warm, humidify, and filter inhaled air.

Prevention strategies

- **Adequate hydration.** If a person breathes with the assistance of a mechanical ventilator and a tracheotomy tube, adequate humidity is even more important. Use a heat-and-moisture exchanger (HME or artificial nose) during the day for portability and a heated humidifier when the person sleeps at night.
- **Mechanical lung expansion and coughing exercises.** Incorporate use of a Cough Assist® or Vital Cough® machine at least once or twice a day. They can be used in the automatic mode to deliver a sigh breath on inhalation followed rapidly by a negative pressure breath that can move mucus towards the mouth or trach tube opening. In the manual mode, a person can coordinate with a caregiver to take a series of smaller stacked breaths to expand the lungs followed by a separate series of smaller mechanical coughs. Some people find this later technique more comfortable and effective. *Mechanical lung expansion and coughing devices can, and should, be used with a tracheostomy tube.*
- **Manually assisted cough** (abdominal thrusts or seated Heimlich). This low-tech maneuver can be used along with mechanical coughs or independently. Technique: Be in a slightly reclined position. Have the caregiver place both hands over the person’s abdomen just below the navel in a “V” shape. Use the fat pad below the thumb as it is softer. Coordinate with one another so the person with ALS is making a coughing attempt while the caregiver is delivering a series of quick and forceful thrusts.
- **A portable suction unit** should be available to capture any mucus that has been moved into the trach tube or back of the throat.
• **Manual sigh or stacked breaths** can be delivered using a self-inflating manual ventilation bag ("Ambu" bag). Manual techniques with a bag and abdominal thrusts can be quickly used anywhere if a person feels they are choking on a mucus plug.

### Develop a routine

Some professionals recommend using mechanical lung expansion and coughing at night to clear the lungs before bed and again in the morning as mucus often pools in the airways at night. A mid-morning and mid-afternoon treatment can keep mucus from accumulating to the point of discomfort throughout the day. **Find a routine that is successful for the person living with ALS.**

Movement. Even if a person uses a wheelchair or must be sedentary much of the day, make sure they change positions. If a person’s extremities are weak or paralyzed, passive range of motion with a caregiver will help the lungs too. Coordinate deep inhalations and slow exhalations breathing along with stretching.

> Knowing a person has skills and practiced techniques at their disposal will give them more confidence that they can reduce and manage accumulated mucus and plugs.

### Notes about over-the-counter mucus thinning agents

Guaifenesin (Mucinex, Mucus Relief) is marketed as an expectorant and mucus thinning medication. It may be recommended for people with thick mucus or mucus plugs. However, large analyses of published studies have not shown consistent benefit. Other more natural treatments such as papain, papaya nectar, pineapple, or lemon juice have not been studied and therefore cannot be recommended here.

The American Association for Respiratory Care (AARC) recommends against instilling saline solution into the airway via a tracheostomy tube as it does not thin mucus and has the potential to introduce bacterial into the unprotected airway.

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