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FAST FACTS AND CONCEPTS #158

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Background Excessive or thick respiratory secretions are common in patients with pulmonary and neurologic diseases and for many patients in the last few days of life. This Fast Fact reviews treatment options for managing distressing secretions.

Pathophysiology Mucus consists of water (~ 95%), glycoproteins, and small amounts of proteoglycans and lipids. The mucus layer of the respiratory tract rests against a periciliary watery layer around cilia, which facilitates upward movement of secretions (1,2). For patients with ineffective mucociliary clearance, poor cough, or excessive/abnormal mucus production, dyspnea, cough, tachypnea, or sensations of choking/gagging may occur.

Pharmacological Treatments

- **Hydration:** Studies of COPD patients have not demonstrated improved mucus production or clearance with added hydration (1,1).
- **Expectorants:** Guaifenesin acts by stimulating gastric mucosa and the gastric nerve to stimulate the cough reflex, and also induces a vagally mediated increase in airway secretion. The evidence for its efficacy is based on a single study in chronic bronchitis patients (3).
- **Drying agents:** Anticholinergic agents such as scopolamine or glycopyrrolate may be very helpful for excessive mucus production. Watch for anticholinergic side-effects (dry mouth, urinary retention), or over-drying, which may cause overly thick mucus and mucus plugging (see Fast Fact #99).
- **Aerosolized solutions:** Nebulized hypertonic saline (3%) has demonstrated effectiveness in cystic fibrosis (CF) patients, but not in COPD. Hypertonic/hypotonic solutions can trigger bronchospasm (1,2). Sodium bicarbonate (2-7.5%) solutions are used in aerosolized forms to elevate the pH of tracheobronchial secretions, which weaken the saccharide structures of the mucus. The effects are additive when used with N-acetylcysteine (3).
- **Antibiotics:** respiratory infection commonly leads to increased mucus production; antibiotics may be indicated depending on the overall goals of care.
- **Bronchodilators:** Beta-adrenergic agonists and drugs containing aminophylline improve mucus clearance by increasing ciliary activity (1).
- **Disulfide disruptor:** Nebulized N-acetylcysteine (Mucomyst) severs the disulfide bonds of glycoproteins in mucus, and lowers its viscosity. Some studies have demonstrated effectiveness with this treatment. It does have an unpleasant smell and can cause bronchospasm; therefore, co-administration of a beta-adrenergic agonist should be considered (1,2,4).
- **Enzymatic agents:** In CF, DNA is released by leukocytes, increasing mucus viscosity (1). Recombinant human DNase (dornase alfa or Pulmozyme) cleaves DNA and has been shown to be effective.

Non-pharmacological Treatments

- **Suctioning:** For many patients with a weak cough reflex, gentle suctioning can be very helpful. However, deep suctioning should be avoided and can be very irritating.
- **Postural Drainage/Chest Physiotherapy (CPT):** CPT loosens secretions and facilitates cough or suctioning (1).
- **External Oscillation Device:** This device achieves the same degree of efficacy as CPT. It is a small, lightweight, plastic, pipe-shaped device that is inexpensive (~\$50) and easy to use (4).

- **Devices:** such as PEP (positive expiratory pressure) masks and external compression vests may also be appropriate for certain patients.

Initial Management Recommendations

- Assess quantity and quality (thick/thin) of secretions.
- Consider providing immediate relief through suctioning, postural drainage, or nebulization before long term maintenance therapy, such as antibiotics.
- Select agents based on the balance of benefits vs. undesirable effects (examples: guaifenesin may worsen nausea [undesired]; scopolamine dries/thickens secretions, causes dry mouth [undesired], and sedation, which may or may not be desirable.

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