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All author's name and
affiliations are given below,
after references

Pharmacological cough suppression: A systematic review

Anjana Rani R, Adhitya AA, Adshaya AR, Devika U, W Jolin Christina,
PN Pooja, Sangeetha S, Seersha DS, Sree Lekshmi DR, Varsha Vincent,
Alana Kalam S, Nithin Manohar R and Prasobh GR

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Abstract

Cough is a prevalent and debilitating symptom affecting millions worldwide, significantly impacting quality of life and healthcare utilization. This comprehensive review examines the pharmacological management of cough, encompassing antitussives, expectorants, combination products.

Keywords: Cough, pharmacological management, antitussives, expectorants

Introduction

Cough, a universal and multifactorial symptom, affects millions globally, impairing quality of life, sleep and daily functioning. It is the most common symptom prompting medical consultation, accounting for approximately 30 million annual visits in the United States alone. Cough's complex pathophysiology, involving neural pathways and various receptors, renders its management challenging.

Definition and Epidemiology

Cough is defined as a protective reflex facilitating airway clearance, categorized into acute (Less than three weeks), subacute (Three to eight weeks) and chronic (More than eight weeks) forms. Its prevalence varies: 12% in the general population, 20% among smokers and 40% in patients with chronic obstructive pulmonary disease (COPD).

Types of cough

Coughs are classified based on duration, severity and etiology. Here are the primary types:

Classification by Duration

- **Acute cough:** Lasts less than three weeks, often due to viral infections like the common cold or flu.
- **Subacute cough:** Lasts three to eight weeks, typically resolving with treatment.
- **Chronic cough:** Persists beyond eight weeks, indicating underlying conditions.

Classification by Severity

- **Mild cough:** Minimal disruption to daily life.
- **Moderate cough:** Some disruption, potentially impacting sleep and daily activities.
- **Severe cough:** Significant impact on quality of life.

Classification by Etiology

- **Infectious cough:** Caused by bacterial, viral or fungal infections.
- **Allergic cough:** Triggered by allergens like pollen, dust or pet dander.
- **Irritant cough:** Caused by environmental factors like smoke, pollution or chemicals.
- **Gastroesophageal reflux disease (GERD) cough:** Resulting from stomach acid reflux.
- **Asthmatic cough:** Associated with asthma.
- **Chronic obstructive pulmonary disease (COPD) cough:** Related to COPD.

Corresponding Author:
Anjana Rani R
Pharm. D Internship Students,
Department of Pharmacy
Practice, Sree Krishna College
of Pharmacy and Research
Centre, Parassala
Thiruvananthapuram, Kerala,
India

- **Psychogenic cough:** Habitual or psychological.

Specialized Classifications

- **Dry cough:** Non-productive, lacking mucus.
- **Productive cough:** Produces mucus or phlegm.
- **Barking cough:** Harsh, high-pitched sound.
- **Whooping cough:** Characterized by a distinctive whoop.

Pathophysiology

Cough results from stimulation of sensory receptors in the respiratory tract, triggering a brainstem-mediated reflex. Its management is complicated by underlying conditions such as asthma, COPD, gastroesophageal reflux disease (GERD) and upper airway infections.

Treatment of cough

- Pharmacological treatment
- Non-pharmacological treatment

Pharmacological treatment

Cough medications can be categorized based on their mechanism of action, chemical classification.

Based on mechanism of action

a. Antitussives (Cough Suppressants)

- Centrally acting:
- Codeine, hydrocodone, morphine.
- Peripherally acting:
- Dextromethorphan.

b. Expectorants

- Mucolytics: Acetylcysteine, carbocisteine.
- Mucokinetics: Guaifenesin.

c. Combination Products

- Antitussive-expectorant combinations.
- Decongestant-antihistamine combinations.

Chemical Classification

- Opioids:** Codeine, hydrocodone, morphine.
- Non-opioids:** Dextromethorphan, guaifenesin.
- Amino Acids:** Acetylcysteine.
- Glycosides:** Guaifenesin.

Mechanisms of Action of Cough Medications

Antitussives (Cough Suppressants)

a) Centrally Acting Antitussives

Codeine: Binds to opioid receptors in the brainstem, reducing cough reflex sensitivity. It has mild CNS depression, hence drowsiness can occur. It causes constipation by decreasing intestinal movements. It should be avoided in children and asthmatics. It has mild analgesic effect and less addiction liability than morphine.

Hydrocodone and Morphine

Similar mechanism to codeine.

b) Peripherally Acting Antitussives

Dextromethorphan: Blocks cough receptors in the lungs and airways. It is a centrally acting antitussive agent. It has no analgesic property and does not cause constipation. It may cause sedation and hallucination.

Expectorants

a) Mucolytics

Acetylcysteine: open disulfide bonds in mucoproteins of sputum and the sputum becomes thin and less viscid and cough becomes less tiring and productive. Side effects: nausea, vomiting, bronchospasm.

Carbocisteine: Enhances mucus clearance by modulating mucus properties. It may cause gastric irritation, hence should be avoided in patients with peptic ulcer.

b) Mucokinetics

Guaifenesin: Increases volume of bronchial secretion and reduces viscosity of the sputum.

Combination Products

- Antitussive-Expectorant Combinations:** Combine centrally acting antitussives with mucolytics or mucokinetics.
- Decongestant-Antihistamine Combinations:** Add decongestants (e.g., pseudoephedrine) and antihistamines (e.g., diphenhydramine) for multisymptom relief.

Future directions for cough management

Emerging Therapies

- Neurokinin Receptor Antagonists:** Novel antitussive agents targeting neurokinin receptors.
- P2X3 Receptor Antagonists:** Targeted therapies for chronic cough.
- Personalized Medicine:** Tailored treatment strategies based on genetic profiles, biomarkers and cough etiology.

Non-pharmacological treatments for cough

Lifestyle Modifications

- **Hydration:** Drinking plenty of fluids helps thin out mucus, making it easier to expel.
- **Rest:** Adequate rest helps the body fight infections.
- **Elevated Head Position:** Sleeping with the head elevated reduces congestion.
- **Avoid Irritants:** Stay away from smoke, dust and pollution.
- **Warm Liquids:** Consuming warm liquids like tea or broth soothes the throat.

Environmental Changes

- **Humidifiers:** Add moisture to dry air, relieving dry cough.
- **Air Purifiers:** Remove allergens and irritants from the air.
- **Temperature Control:** Maintain a comfortable temperature.

Throat and Chest Care

- **Saline Gargles:** Soothe the throat with saline solution.
- **Honey:** Natural cough syrup alternative.
- **Throat Lozenges:** Provide temporary pain relief.
- **Chest Compresses:** Apply warm compresses to loosen mucus.

Alternative Therapies

- **Acupuncture:** Traditional Chinese medicine technique.

- **Herbal Remedies:** Echinacea, slippery elm and marshmallow root.
- **Steam Inhalation:** Inhale steam from bowls or showers.
- **Yoga and Breathing Exercises:** Improve lung function.

Conclusion

Cough management has evolved significantly, offering various pharmacological interventions, clinical guidelines and emerging therapies. This review synthesizes the current landscape, emphasizing personalized medicine, interdisciplinary collaboration and continuous education. Antitussives, expectorants and combination products effectively manage cough symptoms. Medications have varying efficacy and safety profiles, necessitating cautious prescribing. ACCP, NIH and ERS guidelines provide evidence-based treatment frameworks. Emerging therapies, research priorities and collaborative efforts promise improved cough management. Effective cough management demands a comprehensive approach, merging pharmacology, clinical expertise and patient education. Ongoing research and collaboration ensure continued advancements.

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Anjana Rani R

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Adhitya AA

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Adshaya AR

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Devika U

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

W Jolin Christina

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

PN Pooja

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Sangeetha S

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Seersha DS

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Sree Lekshmi DR

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Varsha Vincent

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Alana Kalam S

Pharm. D Internship Students, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala Thiruvananthapuram, Kerala, India

Dr. Nithin Manohar R

Professor & HOD, Department of Pharmacy Practice, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India

Dr. Prasobh GR

Principal, Sree Krishna College of Pharmacy and Research Centre, Parassala, Thiruvananthapuram, Kerala, India