

## THE USE AND ABUSE OF DRUGS

### 1. The Role of Expectorants

J. W. CRANE, London, Ontario\*

(Reprinted from "The Canadian Medical Monthly" for May, 1926)

Expectorants as defined by Bastedo (1) are remedies that facilitate the expulsion of mucus from the respiratory organs. Several factors play a role in this process, the ciliated epithelium, the act of coughing and a peristaltic-like movement (2) of the smaller bronchioles.

Of these, the ciliated epithelium is the most important. These specialized cells are found in the trachea, bronchi and in patches even in the terminal bronchioles (3). The contraction of the cilia follow in a definite, orderly manner and are co-ordinated. This increases greatly their effectiveness in performing work. Thus, in spite of their extremely minute size, an area of a square centimeter ( $2/5$  inch by  $2/5$  inch), according to Howell (4), is capable of moving a load of 336 grams (10.5 oz.). To accomplish this amount of work, it is essential that the cilia move rapidly. Henderson and Taylor (5) have demonstrated that cilia carried mucus at the rate of 5.3 cm. (2.1 inches) per second.

The efficiency of the cilia is increased when the viscosity of the mucus is lessened, and this can be accomplished either by increasing the water content or by "salt action," for example of ammonium chloride, on mucus. Emetics, according to Whitla (6), "cause the tubes to sweat." There is an outpouring of fluid into the bronchial tract, thinning the mucus and lessening its viscosity. Miller (7) has demonstrated that the nausea and vomiting produced by emetics are accompanied by an increase in the rate and depth of respiration. This increased pulmonary ventilation will also favorably assist in the expulsion of mucus. The nauseating, or the so-called stimulating, expectorants include such drugs as antimony, ipecac, apomorphine, squills, senega, sanguinaria, ammonium carbonate. Antimony has the advantage over the others in that it is slowly absorbed and so induces a prolonged nausea of slight degree.

Ammonium chloride and sodium iodide are two drugs that are excreted by the bronchi unchanged, and have a solvent or "salt action" on the mucus. Coleman (8) in the report of his investigation of the clinical value of ammonium chloride as an expectorant, points out that the salty taste of the drug can be recognized in the sputum within one-half to one hour after administration. The ammonia nitrogen was increased, proving that the salty taste was due to the ammonium chloride. The subjective symptoms were relieved, but when the

(\*Department of Pharmacology, Western University Medical School.)

drug was stopped, the sputum became less abundant and more tenacious with a sensation of dryness or tightness in the chest. These symptoms were relieved when the drug was again administered. If the dose is large enough, it will act as a nauseant and increase the secretion of water in the bronchi.

The use of alkalies in the treatment of bronchitis is recommended especially by the older writers. Lauder Brunton (9) observed the presence of moist rales after the administration of alkalies, especially around the margins of a tuberculous cavity. "When these (alkalies) are continued until the expectoration has been free for a day or two and the rales diminish, acids may be given with advantage, so as to dry up the expectoration still more." It is questionable, according to Cushny (10), whether alkalies are excreted by the bronchi.

Coughs are divided into two classes, useful and useless. The larger percentage of coughs is useless or ineffectual, and so, harmful, hence the universal use of opium in bronchitis. The act of coughing, by increasing air currents carries upwards the secretions in the trachea and larger bronchial tubes, but has no effect on the bronchioles. The patient who tries to "raise the phlegm" which is in the bronchioles, by coughing, is doing himself more harm than good. The cough, not only of bronchitis, but also of pneumonia and tuberculosis, should be minimized. It is well on this account to tell your patient the less he coughs the less he has to cough. If he can control the cough without opium it is better for him to do so. The dose should be sufficient to diminish the irritation to the point that the cough will just suffice for removal of secretion.

When the sputum is abundant, as in chronic bronchitis, terpin hydrate, creasote, cubebs, copaiba are said to be indicated. Of these, terpin hydrate is probably the most popular. It is a white powder, insoluble in water and not very soluble in alcohol, hence it is advisable to give it as a tablet or powder rather than in the form of an elixir. Cadbury (11) reported a case where 7.5 cc. (less than two drachms) of Elixir Terpin Hydrate and Heroin produced symptoms of mild alcoholic intoxication. It is well not to use the drug indiscriminately in the treatment of bronchitis of the old, especially if a nephritis is present. Cubebs and copaiba have passed the zenith of their glory and are found in the scrap heap of the modern therapist.

In acute bronchitis, where the sputum is thick and tenacious, expectorants are serviceable. The nauseating expectorants, e.g., Vinum Antimoniale, will thin the mucus by causing an outpouring of water. Drugs having a "salt action," e.g. ammonium chloride and sodium iodide, will produce the same effect by their solvent action on mucus. Either type of drug, then, will increase the efficiency of the cilia in the effect to expel the secretions from the bronchial tract. Opium should be used only when the cough is uncontrollable or so troublesome as to interfere with sleep. If the drug is prescribed separately, the dose can be increased or decreased, e.g. at night; it can be stopped entirely when its further use is not indicated.

The choice of expectorants has been largely empirical, and it has been easy to use such a "shotgun" prescription as Syrup of White Pine (*Syr. Pinus Alba*). The accusation of Hatcher and Wilbert (12) is not without an element of truth when they state that "there is a striking similarity between the composition of nostrums advertised to physicians in numerous medical journals and that of the patent medicines, so-called, which are advertised directly to the public. It is obvious that it matters little, so far as the consequences are concerned, whether the patient doses himself with Ayer's cherry pectoral or Jayne's expectorant, or has compound syrup of cocillana or glyco-heroin (*Smith*) prescribed for him by the physician."

If the sputum is scanty and tenacious three drugs, ammonium chloride, sodium iodide and tartar emetic are recommended, better alone than in a combination. The following prescriptions may be of service:—

Rx

Ammonii chloridi . . . . .	3iiss-iii . . . . .	6.0 — 12.0
F1. Ext. Glycyrrhizæ . . . . .	3ii . . . . .	8.0
Syrupi simplicis . . . . .	3i . . . . .	30.0
Aquam ad. . . . .	3iv . . . . .	120.0
Misce. Signa. 3i q. 2-3 h. in aq.		

or

Sodii iodidi . . . . .	3i-iii . . . . .	4.0 — 12.0
Elixiris simplicis . . . . .	3i . . . . .	30.0
Aquam ad. . . . .	3iv . . . . .	120.0
Misce. Signa. 3i q. 3-4 h. in aq.		

or

Vini Antimonialis . . . . .	3ii-iii . . . . .	8.0 — 12.0
Elixiris simplicis . . . . .	3i . . . . .	30.0
Aquam ad. . . . .	3iv . . . . .	120.0
Misce. Signa. 3i q. 3-4 h. in aq.		

If the cough is uncontrollable or interferes with sleep, opium is useful, e.g.:

Rx

T.T. Codeinæ gr. 1/4. . . . . 0.015

Signa. Take one as directed by the physician.

If the sputum is abundant, terpin hydrate is recommended, especially if nephritis is not present.

Rx

T.T. Terpinæ hydratis grs. ii. . . . . 0.12

Signa. Take one four times a day.

## SUMMARY

1. The most important factor in the removal of mucus is the mechanical action of the ciliated epithelium.
2. The chief value of expectorants is in thinning the mucus.
3. Ammonium chloride and sodium iodide by "salt action," antimony by its emetic effects, opium by its sedative effect on cough, and terpin hydrate by its action in checking excessive secretion are the most useful expectorants.
4. Opium should be used only when the cough cannot be controlled voluntarily. It should be given alone and not in a mixture with other expectorants.
5. Terpin hydrate may do harm if the bronchitis is associated with a nephritis.
6. Syrup of White Pine is among the "best sellers" and is a typical "shot-gun prescription."
7. It is essential for progress in therapeutics that one drug be given at a time, accurate observation made and careful records kept.

## BIBLIOGRAPHY.

- (1) *Bastedo, W. A.: Materia Medica, Pharmacology and Therapeutics, p. 563, 2nd Ed., 1918, Saunders*
- (2) *Müller, J. L.: The Clinical Value of Expectorants, Am. J. Med. Sci. 148:469-1914*
- (3) *Bohm, Davidoff and Huber: Text-book of Histology, p. 279, 1900, Saunders*
- (4) *Howell, H. W.: Text-book of Physiology, p. 59, 5th Ed., 1913, Saunders*
- (5) *Henderson, V. E. and Taylor, A. H.: Expectorants, J. Pharm. Exp. Therap. 2:153-Oct. 1910*
- (6) *Whitla: Dictionary of Treatment, p. 112, 5th Ed., 1912, Bailliere, Tindall & Co.*
- (7) *Müller, F. R.: On Gastric Sensation, J. Physiol. 41:409-Dec. 31, 1910*
- (8) *Coleman, W.: The Expectorant Action of Ammonium Chloride, Am. J. Med. Sci. 152:569-1916*
- (9) *Brunton, Lauder: Pharmacology, Therapeutics and Materia Medica, p. 452, 3rd Ed., 1887, Macmillan*
- (10) *Cushny, A. R.: Pharmacology and Therapeutics, p. 541, 6th Ed., 1915, Lea & Febiger*
- (11) *Cadbury, W. W.: Idiosyncrasy to Alcohol, J. Am. Med. Assn. 73:1935-Dec. 27, 1919*
- (12) *Hatcher, R. A. and Wübert, M. I.: The Pharmacology of Useful Drugs, p. 327, 1915, Am. Med. Assn.*