MENTHOL AND PEPPERMINT IN ACUTE CATARRHAL CONDITIONS OF THE RESPIRATORY TRACT *

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The explanation of the action of menthol and peppermint in common colds is unsatisfactory and apparently avoided. Most books on pharmacology and therapeutics simply state that these drugs are used in various neuralgias, in sciatica, pleurodynia and toothache, locally against headache, itching, etc., and omit their more common use. By far the greatest use is in colds, and especially those in which mucous exudation blocks the respiratory passages. The relief in many of these cases, so remarkable and so well known to the laity, accounts for the numerous brands of menthol cough lozenges on the market.

The pathology of the catarrhal conditions in which these drugs are used is well known. During some stage of the condition there is an increase of relatively thick mucous material poured into the respiratory passages, and the walls of the passages are swollen and tend to adhere, thus preventing the entrance of air. Relief can be gained only in two ways: either by removing the material or by changing its form so as to allow air to enter. When menthol is used the offending material is often not expelled, so that its physical state must be changed. One knows from experience that menthol apparently opens respiratory passages and that one can breathe through passages which before were occluded. Since it is not an astringent, the most obvious explanation is that much of the mucous material is in a foamlike consistency. One view or theory of the physical structure of protoplasm is that it is a foam (Bütchli, 1898) and this alveolar or foamlike structure may also be demonstrated in exudates such as mucus. It is also known to physiologists that if a normal lung collapses there is considerable tendency for the walls of the alveoli to adhere; so much so, that if a sufficiently high pressure to tear them apart is applied too quickly, there is great danger of rupturing the walls. This is why in surgery of the chest, when the chest wall is opened, a continuous insufflation of the lung is advised. These facts all sustain the view that the effect of menthol may be due to a change in surface viscosity.

To test the effect of menthol or oil of peppermint on surface viscosity, with a suction filter pump I drew a current of air through solutions of soap, blood, saliva and saponin. Each of these, especially the soap, saponin and blood, foam readily. The merest trace of menthol or spirit of peppermint added to these solutions rapidly destroys the foam. Crystals of menthol may be added of these excessive conditions apparently without much effect. The foam in such conditions is so strong that it readily supports the crystals, and to be effective the drug must be in solution or in a condition in which volatility can act. Menthol, however, dissolved in saliva has a noticeable effect, and in alcohol the effect is still stronger, because of greater solubility. In another experiment in which we had a tracheal cannula in a dog anesthetized with ether through the trachea, marked tracheal râles developed. Râles develop frequently in such cases. A few drops of the spirit of peppermint in the trachael cannula immediately broke the foam and noticeably relieved respiration. We have therefore a reasonable basis for the statement that the efficacy of menthol and peppermint in the respiratory passages is due to changes in the surface viscosity of the mucus and on the membranes producing the exudate.

The most important investigation of menthol was that of Pellacani in 1883,[1] and in that work he does not discuss the action on the respiratory passages. We have thought it worth while, therefore, to call attention to the surface tension and surface viscosity effect of menthol. Surface viscosity holds the foam or bubble-like structure together, while surface tension tends to break them. Soapy water and saponin solutions make good bubbles because surface tension is small and surface viscosity large. Ordinary respiration in catarrhal conditions in a measure simulates the experiments in which we passed a current of air through a soapy solution, and menthol inhaled in such conditions lessens the viscosity and, by changing the surface tension, aids in breaking the foam and clearing the passage way.

An important and well established fact in viscosity is that the viscosity of a liquid is increased about 2 per cent. for each degree that the temperature is lowered. This is of great importance in the treatment of all respiratory cases in which the expulsion of mucus is desired. Warm, moist, respired air will greatly aid the expulsion, while cold air, if respired, will increase the difficulty. What I have said of menthol and peppermint undoubtedly can be extended to other substances of this general class.

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THE ALKALI RESERVE IN ABDOMINAL INFECTION

AND ITS RELATION TO THE LEUKOCYTE COUNT

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The significance of "acidosis" is not clearly understood. Some accord it the importance of a clinical entity, viewing the reduction of the reserve alkali as being, in itself, sufficient to cause the various pathologic manifestations associated with it. This has been by no means proved, however, for there is evidence that the so-called acidosis is merely one of the results of a common cause. Of course, this is well recognized in the acidosis of diabetes and nephritis; but even under these conditions, many hold that good may be accomplished by the administration of sodium bicarbonate in order to give relief to the distressing symptoms of air hunger and coma. Apparently, favorable results do not always follow the use of alkali therapy even in the presence of a marked reduction of the reserve alkali, for such an authority as Joslin disapproves of this procedure in diabetic acidosis, and it has proved unsuccessful in decreasing the toxic action of methyl alcohol for dogs,[1] though its use may keep the reserve alkali at a high level. Indeed, a number of authors have called attention to the dangers that attend the intravenous injection of sodium bicarbonate, so that its administration in this way to patients suffering from acidosis may not only fail to do good but may actually work serious harm or cause death. With these facts in mind, it behooves us to be certain that an acidosis

1. Pellacani: Arch. f. exper. Path. u. Pharmakol. **17**: 376, 1883.
1. Haskell, C. C.; Hileman, S. P., and Gardner, W. R.: The Significance of the Acidosis of Methyl Alcohol Poisoning, Arch. Int. Med. **27**: 71 (Jan.) 1921.