absorber can be mounted on the transporting vehicle,[6] or a sling can be fashioned from 2-inch-wide tape, allowing the person administering ventilatory support to carry the absorber on the shoulder like a purse.

Viegas *et al.* estimate a 5- to 12-h exhaustion time for the portable CO_2 absorber.[6] Their estimate does not consider that, using the portable anesthesia circuit in a semiclosed fashion as we propose, a portion of the patient's CO_2 production will be expelled through the overflow valve. We feel that their estimates of exhaustion time are conservative; however, accurate prediction of the true exhaustion time is not possible.[3] Should exhaustion of the absorber occur during flight, rebreathing can be prevented by increasing fresh O_2 flow rates to 60 $ml \cdot kg^{-1} \cdot min^{-1}$ and increasing ventilation threefold. Such flow rates compare favorably with the Magill and Bain circuits (table 1).

In our experience with the described portable semiclosed circuit, oxygen flow rates of 50% minute ventilation proved adequate for spontaneous, assisted, and controlled ventilation. We have not experienced CO_2 absorber exhaustion during transportations of up to 4 h duration.

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Who Was the Man, A. W. Von Hofmann?

To the Editor:—New words and phrases spring upon professional populations and spread with the same rapidity as they do among teenagers. They often become accepted cliches with a meaning assigned by consensus rather than history. The phrase "Hofmann Elimination" may be such a phrase. Who was the man, A. W. Von Hofmann?

August Wilhelm Von Hofmann was born in Giessen, Germany, April 8, 1818. He studied chemistry at the University of Giessen under Justus Von Liebig and received the degree of Ph.D. Summa Cum Laude in 1841. He continued as assistant to Liebig up until 1845, when he became Assistant Professor of Chemistry at Bonn University. Later in the same year he became first Director of the new Royal College of Chemistry in London. In 1843 Hofmann established the nature of aniline. His research on coal tar led to his discovery of benzine in 1845, along with the development of a technique for preparation of aniline from benzine. After this Hofmann began his famous work on amines.[1]

At the age of 33 years, Hofmann first described the "Hofmann Reaction," named after his method of converting amide to an amine by degradation of quatenary ammonium salts under alkaline conditions with loss of water, and the formation of a tertiary base. A typical reaction is shown by the following:

$$HO^- + HCH_2{-}CH_2{-}N^+R_3 \xrightarrow[100^\circ C]{pH\ 12} H_2O + CH_2{=}CH_2 + NR_3$$

The elimination is bimolecular and leads to removal of one of the beta hydrogens and breaking of the alpha carbon–nitrogen bond. This reaction is promoted by electron withdrawal as a result of the positive charge on the quatenary nitrogen. The course and rate of the

reaction is influenced by both steric and electronic factors. In particular, electron attracting substitutes on the beta carbon (second carbon to the left of the charged nitrogen in the above reaction) further weaken the beta carbon hydrogen bonds, so that elimination is favored at lower pH and temperatures, such as obtained under physiologic conditions (*p*H 7.4 and 37° C).[2]

A point of interest is the fact that during the same year in which Hofmann first discussed this degradation of quaternary ammonium salts (1851), Claude Bernard demonstrated the action of curare at the neuromuscular junction.[3] Von Hofmann continued his brilliant career as a chemist, serving as the director of the new Royal College of Chemistry through 1863. In 1864, he returned to Bonn briefly and then succeeded Eilhardt Mits Cherlick as Professor of Chemistry and Director of the Laboratory at the University of Berlin. He held that post as teacher and investigator until his death in 1892.

In 1868, Von Hofmann founded the German Chemical Society and served as its President for many years. He authored nearly 300 papers and several books, including the *Handbook of Organic Analysis,* 1853, and *Introduction to Modern Chemistry,* 1865.[4] The latter was one of the most popular scientific books of its era. Undoubtedly one of the outstanding organic chemists in the mid-19th century, Von Hofmann was credited with the discovery of allyl alcohol, formaldehyde, hydrazobenzene, quinoline red, and isonitrile. Among the positions and honors bestowed for his achievements were Presidency of the British Chemical Society, Recipient of the Gold Medal of the Societe Pharmacle de Parie, Grand Prix, Paris Exhibition, 1867, and the Copley Medal of the Royal Society of 1875. British Knighthood was bestowed upon him in 1888 for his valuable work. Von Hofmann married Helene Moldenhauger in 1841, Rosamond Wilson in 1856, Elsie Moldenhauger in 1866, and Bertha Tiemann in 1873. He was the father of 11 children.[4]

Study of the chemical constituents of the plant Lieontice leontopetalum Linn 100 years later disclosed that one of the principle nitrogenous constituents underwent an unexpectedly facile degradation in mild alkali by the Hofmann reaction.[5] Similarity of the compound to *d*-tubocurarine suggested the possibility of an entirely new class of short-acting neuromuscular blocking agents capable of rapid biodegradation by this purely chemical pathway at physiologic conditions. A series of bisquatenary compounds were synthesized, incorporating appropriate electron attracting beta substituents to promote biodegradation to inactive (nonquatenary) compounds. The choice of electron attracting substituents balanced rapid degradation *in vivo* with sufficient stability at a tolerable but lower *p*H in room temperature to permit preparation and storage of an injectable solution. Stenlake describes four such series of compounds culminating in atracurium besylate.[6] The Hofmann Reaction had become Hofmann Elimination.

Chemical tricks such as this mild dehydration and the solubilization of midazolam by a *p*H-dependent opening of a ring may be increasingly important in pharmaceutical science. It is entirely appropriate to honor a historic figure such as Von Hofmann with an eponym. I hope this brief biography adds to both the honor of Hofmann and the understanding of the reaction.

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