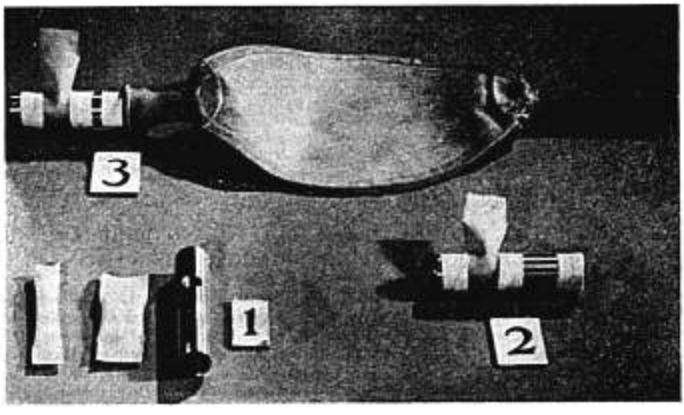

1. Unassembled valve.
2. Valve assembled and secured with adhesive tape.
3. Valve attached to gas reservoir bag and ready for attachment to the standard Magill curved slip joint endotracheal catheter connection.

the reservoir bag should be kept moderately full but not distended. The valve has the additional advantage of being able to operate in any position. Controlled or assisted respiration is accomplished by compressing the visible flaps with two fingers or pressing the flaps over the hole in the metal tube.

After each use the valve should be washed, dried and powdered. Before use gases should be passed through the valve to avoid sticking of the rubber flaps. The valve is cleansed very easily, and if necessary, the rubber parts can be replaced in a few minutes.

This type of valve has very satisfactorily filled our need for an inexpensive and easily made valve for the nonrebreathing technique. The valve was not made to replace the original types of nonrebreathing valves, but can be used when the other valves are not available. It may, incidentally, be used with trichloroethylene in the nonrebreathing technique.

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RAY T. SMITH, M.D.,*
U. S. Naval Hospital,
San Diego, California

* Present address: 1555 Ridgeview Avenue, Lancaster, Pa.

CORRESPONDENCE

To the Editor:

In a recent publication, Keats and Beecher [Anesthesiology 14: 140–142 (March) 1953] reported a study on the effect of the addition of 0.1 per cent sodium bisulfite, a commonly used antioxidant, to morphine sulfate solution in order to investigate whether or not this

combination affects the degree of analgesia obtained with this opiate in human beings. Earlier experimental investigations in this laboratory to which Keats and Beecher referred had demonstrated a greater toxicity and faster onset of the effect of certain drugs, as procaine or epinephrine solutions, when sodium bisulfite was added. Keats and Beecher were unable to find any difference in the degree of analgesia obtained with morphine sulfate with or without the addition of sodium bisulfite. In the discussion the authors list three possibilities for these negative results: (a) differences in dosage (therapeutic vs. toxic), (b) the absence of a "bisulfite phenomenon" when combined with morphine or (c) a magnitude of change too small to be detected by this technique.

It is realized that their paper was not primarily concerned with the basic principles of the "bisulfite phenomenon" and the following comments are not intended as a criticism but for clarification of the background of this phenomenon. According to our present interpretation the "bisulfite phenomenon" is caused by a specific ability of the bisulfite ion to increase greatly the speed of absorption from the subcutaneous or intramuscular capillary bed. In order to observe a positive "bisulfite phenomenon" as, for instance, an increase of toxicity as measured by lowering of the fatal dose, it is necessary that (a) the fatal dose of the drug given subcutaneously must be many times larger than by the intravenous route (b) that the rate of detoxification of the drug either by destruction, excretion or distribution into inert tissue must be rapid. These conditions are met by epinephrine, procaine and a number of other drugs. Morphine does not belong in this class and, therefore, it is not surprising that the degree of analgesia obtained with or without sodium bisulfite remains the same. It should be mentioned, however, that the "bisulfite phenomenon" is not confined to toxic doses in animals. Robertson *et al.* (Proc. Soc. Exper. Biol. and Med. 77: 164, 1951) have demonstrated that in human beings a subcutaneous injection of therapeutic doses of epinephrine hydrochloride produces a more rapid and higher rise of systolic blood pressure in the presence of sodium bisulfite. Stimulated by the paper by Keats and Beecher we have carried out studies in dogs, using morphine sulfate with and without the addition of 0.3 per cent sodium bisulfite. Since onset or degree of analgesia is difficult to determine with sufficient accuracy we followed the rise of blood sugar and the depression of respiration following the subcutaneous injection of morphine sulfate with and without 0.3 per cent sodium bisulfite in 4 dogs. The same animals were tested in one week intervals with plain morphine sulfate solution and with an identical one containing sodium bisulfite. There was no noticeable difference in the speed or degree of rise of the blood sugar; however, maximal respiratory depression occurred within twenty to thirty minutes in 3 out of 4 dogs and in one within sixty minutes when the solution containing sodium bisulfite was used. Only one animal showed maximal respiratory depression within twenty minutes while in the 3 others, sixty to ninety minutes elapsed with the use of plain morphine sulfate solution. The degree of respiratory depression was significantly greater in 3 of the 4 dogs with the addition of sodium bisulfite.

We believe that the results reported by Keats and Beecher can be explained on the basis of a combination of the following facts. Morphine sulfate does not meet sufficiently the criteria necessary to give an impressively positive "bisulfite phenomenon" and measurement of the degree of analgesia would under these conditions be unlikely to reveal an effect, especially with the low doses (0.1 per cent) of sodium bisulfite used. Our results on dogs indicate that, under special experimental conditions, a more rapid absorption of morphine sulfate by the addition of sodium bisulfite can be demonstrated. It is believed that in the field of clinical therapeutics any importance of the "bisulfite phenomenon" will be confined to drugs which meet more fully the criteria set forth above.

R. K. RICHARDS, M.D.,
Department of Pharmacology,
Abbott Laboratories,
North Chicago, Illinois