

*Poison in Paper-Hangings Colored with Arsenite of Copper.\**

By G. PHILLIPS.

In the "*Pharmaceutical Journal*" for February last, it is stated that Dr. Halley, of Harley street, had detected arsenious acid in the atmosphere of his study, the walls of which were covered with green paper, and that the test he employed was "sheets of paper soaked in a solution of ammonia-nitrate of silver," and that upon this paper were deposited numerous well defined crystals of arsenious acid, visible under a low power with the microscope, and that the form of these crystals precluded the possibility of a mistake.

Ammonia-nitrate of silver is a test for arsenious acid, but not in the manner which Dr. Halley seems to suppose, as it does not cause the deposition of crystals of arsenious acid (which are colorless), but produces a bright yellow precipitate of arsenite of silver, provided the amount of ammonia present in the test be very exactly proportioned to that of the nitrate of silver; if such be not the case, no precipitate is produced. These particulars are mentioned because Dr. Halley appears not to have resorted to any other test, but to have concluded merely from the appearance of the crystals formed on his test paper, and without analyzing them, that they must be those of the poison in question.

In the following experiments, made with a view to test Dr. Halley's conclusions, the interior surfaces of two closets were covered with a green paper-hanging. One of the closets had a capacity of 17 cubic feet, and was lined with about 48 square feet of the paper, or 2·8 sq. feet to each cubic foot of space. The other closet had a capacity of 26 cubic feet, and was lined with 53 square feet of paper, or 2·0 square feet to each cubic foot of space.

These closets had no means of ventilation beyond the chinks round the doors; the included air, therefore, would remain much longer in contact with the paper than would be the case in an ordinary room. The surface of the paper to the bulk of air inclosed was not less than 14 times as great as it would be in a room 20 feet square and 12 feet high, thus showing that the conditions of the experiments were highly favorable to the impregnation of the air with arsenious acid, if such were possible. In each of these closets were placed two basins, one containing a solution of potash, the other ammonia-nitrate of silver, and a sheet of paper saturated with the latter re-agent. The smaller closet was kept as much as possible from the influence of common gas; but in the larger closet gas was allowed to burn during the day time, the temperature of the included air being kept by the flame at from 74° to 82° Fahr. The closets were carefully closed for 72 hours, the gas burning during that time 45 hours in the larger closet. The solutions of potash and ammonia-nitrate of silver from each closet were then examined by Marsh's test, which is by far the most delicate known, and found to be quite free from arsenic.

\* From the Lond. Civ. Eng. and Arch. Journ., Aug., 1858.

The sheets of paper saturated with ammonia-nitrate of silver were also free from arsenic, but had on their surface numerous colorless crystals, which, when analyzed, proved to be nitrate of silver, the evaporation of the water from the test paper having concentrated the solution with which the paper was saturated to such an extent as to cause the nitrate of silver to crystallize out. On the test paper was also found an amorphous substance having a dingy yellow color, which speedily became black on exposure to light; the same substance was also observed on the surface of the ammonia-nitrate of silver contained in the basins, being most abundant in that which had remained in the closet in which gas had been burnt. When analyzed it was found to be sulphide of silver, the sulphur no doubt having been derived from the atmosphere of the laboratory, which always contains traces of sulphureted hydrogen. This dingy yellow substance, which, without analysis, might be supposed by some to be arsenite of silver, was formed in a third closet in which no arsenical compounds were present, thus proving that the green paper had no share in its production.

The green paper used in the experiments is colored with what is known as emerald or Schweinfurt green, which is a compound of arsenite of copper and acetate of copper. The paper contains 11·8 grains of arsenious acid to the square foot.

The following conclusions may fairly be drawn from the experiments above described :—

1. That even when a small bulk of air is allowed to remain, for a considerable time, in contact with a large surface of the arsenical paper, and that too at a temperature of 80° Fahr. not the slightest trace of arsenious acid is diffused in the air. Still less might the air of an ordinary room which occupies a large space in proportion to the surface of the walls, and which is being constantly changed by ventilation, be expected to become contaminated by the poison.
2. That the products of the combustion of gas do not facilitate the liberation of arsenious acid from the surface of the green paper.
3. That arsenious acid is not volatilized from the surface of such paper except at temperatures too high for human endurance.

It is probable that persons may have been affected by inhabiting rooms papered with arsenical hangings, not because the arsenious acid has been volatilized, but from the improper and frequent sweeping of the walls, by which minute particles of arsenite of copper might be detached from those portions of the surface of the paper which were not glazed, and becoming dispersed in the air, might be inhaled by persons occupying the room at the time. This only source of danger, which might be obviated by a little management in the cleaning of a room, and caution in the selection of a paper having but little of its surface unglazed, appears not to have presented itself to the mind of Dr. Halley, who seems to have been possessed with the idea that injury to health was to be apprehended solely from the vaporization of the arsenious acid. Dr. Taylor, on the other hand, ascribes the dan-

ger to the fact that the color is "put on very loosely," and, therefore, by inference, easily detached and disseminated through the air, not as vapor of arsenious acid, but as minute particles of arsenite of copper.

The subject under consideration being one of much importance, I have felt it necessary to enlarge upon it, and as Dr. Halley's statement is calculated to create an apprehension of danger which I believe has no existence, I beg to make the following remarks:

Dr. Halley states that on two occasions distinct crystals of arsenious acid were deposited on the surface of his test paper from the air of his room; it is more than probable that if he had analyzed the crystals, and not assumed their composition from their appearance under the microscope, he would have found them to be nitrate of silver. The test paper which he used had no more effect in causing the deposition of crystals of arsenious acid than any other surface in the room would have, and to suppose that crystals of the poison were thus deposited would be to imply that the air was impregnated with arsenious acid to an extent which must be fatal to persons inhaling it for a short time. Notwithstanding his statement that the air of his room furnished crystals of arsenious acid, he subsequently says that at ordinary temperatures with common atmospheric air, even when an aspirator was used, the amount of arsenic given off was "inappreciably small," omitting to mention what test he employed to detect a quantity not appreciable. The purport of his remarks, however, appears to be that arsenious acid to an appreciable extent, is only given off from arsenical paper in rooms in which gas is burnt, and that the products of the combustion of the gas *combine* with the arsenic in the paper. If such be the case, it is difficult to conceive how the arsenious acid can be deposited from the air of the room in a *free* and crystalline state.

It may be proper to mention that I and my family occupied a sitting-room three years, the walls of which were covered with paper heavily laden with arsenite of copper, and that for the same period my bed-room was also papered with arsenical hangings, yet neither I nor any member of my family experienced the slightest ill effect from such paper.

In conclusion, I beg to express my opinion that no danger need be apprehended from such papers, in which but a small proportion of the surface is unglazed, provided ordinary care be used when removing the dust from the walls, and that even if such care were not exercised it is doubtful whether any pernicious effects would be felt by those inhabiting the room.

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### *Unwholesomeness of Lights.*

Recent experiments have proved that lights of equal intensity obtained from different materials, require very different lengths of time to generate the same quantity of carbonic acid. The following is the relative time required by the common materials: Olive oil, 72 minutes; Russian tallow, 75; common (French) tallow, 76; whale oil, 76; stearic