

which I desire to mention. The first is the addition of directions for assay of various alkaloidal salts, the purity of which is sometimes questionable. Most of these can be assayed by extraction from ammoniacal solution with subsequent titration. An alternative method (*J. A. O. A. C.*, 11, No. 1, 49) for cocaine provides for saponification and determination of the benzoic acid formed.

The second point has reference to the standards for acid insoluble ash as a measure of foreign inorganic matter in crude drugs. As you know, the U. S. P. IX relied on total ash as an index of foreign material of this type. On account of the limitations of this figure, a change was made in the present revision to the acid-insoluble ash figure. Limestone and similar acid-soluble extraneous matter will not be detected by this determination, and it, therefore, seems advisable to recommend a combination of total ash and acid-insoluble ash as standards. This combination is used largely in judging spices and similar food products under the Federal Food and Drugs Act, and has given reasonable satisfaction.

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#### STABILITY OF SOLUTION OF POTASSIUM ARSENITE.\*

BY ELIZABETH PICKERING.

The U. S. P. X assay for solution of potassium arsenite detects only its content of trivalent arsenic. Since during the aging of this solution it undergoes gradual oxidation to potassium arsenate or pentavalent arsenic, there results an apparent loss in strength although the total arsenic remains the same. Trivalent arsenic is much more active therapeutically and of higher toxicity than pentavalent arsenic. Oxidation of potassium arsenite solution therefore reduces both its toxicity and therapeutic effect. For this reason, both the therapeutic activity and assay, as determined by the U. S. P. X method decrease on aging, although not in the same proportion. It has been suggested that the U. S. P. assay should be so changed as to include all forms of arsenic, if solution of potassium arsenite undergoes oxidation to a noticeable extent.

Arsenious acid is oxidized by air when the solution is warmed (1), and this reaction is accelerated in the presence of ether (2) or copper salts (3). A solution 0.5 Gm. arsenious oxide is completely oxidized by boiling for 26.5 hours in 5 cc. of water and 3 cc. of 95% ethyl alcohol (4).

Literature published on alkaline arsenites is not in agreement as to their stability to the oxidizing effect of air but the majority of authors believe such oxidation to occur slowly. Solutions of potassium arsenite are said to be more stable than those of sodium arsenite, remaining "practically" unchanged for six or eight months when made from carbonate and bicarbonate, respectively (5). Cooper and Freak have reported (6) the partial oxidation of the alkaline sodium arsenite dipping solution to the arsenate and its increased rapidity in the presence of wood tar and cresylic acid, especially on exposure to sunlight. In agreement with the earlier statement that the oxidation of arsenious acid is accelerated by ether or copper salts, Reinders and Vles, found that alkaline arsenites are not oxidized by oxygen in the absence of catalysts, such as copper or carbon. Even in the presence of such catalysts, oxidation is immeasurably small in acid and neutral solution, but

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\* Scientific Section, A. P. H. A., Portland meeting, 1928.

reaches a maximum on the addition of potassium hydroxide at a concentration of about 0.5 *N* (7).

Similar stability in the alkaline and acid solutions has been found by Winkler (8) and Danckwortt (9). The former found that the arsenite content of an alkaline arsenite solution, as titrated by *N*/10 potassium bromate fell from 48.81 cc. to 48.10 cc. in three months, while a similar solution faintly acidified with sulphuric acid remained stable at 48.81 cc. According to Danckwortt the potassium arsenite solution prepared from arsenious acid and potassium bicarbonate is stable for one year, while that prepared from potassium carbonate is only slightly stable, the stability decreasing with increase in alkalinity. The addition of organic colloids, such as starch or caramel, or of glycerin or sodium chloride, does not change the stability of the former solution. The addition of charcoal either with or without benzoic acid or tincture of valerian produces oxidation of  $\frac{1}{10}$  to  $\frac{1}{4}$  of the arsenite in one month, and of  $\frac{6}{10}$  to all of the arsenite in five months (9).

Discrepancies in the standard of Fowler's Solution found by various Health Boards has been generally attributed to the fact that the arsenic in the trivalent state is oxidized to arsenic in the pentavalent state. In order to find at what rate the oxidation of the arsenite takes place, Englehardt and Winters estimated both the arsenious acid and the total arsenic (10). A sample of the solution was prepared strictly according to the U. S. P., one quart being kept in an amber, cork-stoppered bottle on a shelf under ordinary conditions, while another part of the sample was filled into one-ounce flint glass, cork-stoppered bottles. The samples were assayed at intervals of one month. The arsenious acid was estimated in the regular way with iodine and the total arsenic by modifications of Heywood's Method. The results showed that the arsenious acid in Fowler's Solution is oxidized only to a very slight degree when the solution has been properly prepared and has been kept under ordinary conditions. A sample kept under the conditions similar to those found in the drug store did not deteriorate as rapidly as might be expected.

In a recent article (11), Trease has ascribed the progressive oxidation of the *Liquor Arsenicalis* of the British Pharmacopœia 1914 to the catalytic action of Compound Tincture of Lavender. It is interesting to note, however, that the British preparation is prepared from equal parts of arsenious oxide and potassium carbonate, which has been specifically stated by the German authorities to be less stable than the preparation made from potassium bicarbonate.

The U. S. P. X contains double the amount of potassium bicarbonate specified in the earlier editions of the Pharmacopœia, the change having been made in the U. S. P. VII. Haskins (12) reported a precipitate in the solution of the U. S. P. VII which he believed to be due to the presence of red saunders and to excess of alkali. Although the Compound Tincture of Lavender has been changed, both in the number and proportion of constituent essential oils, it still contains red saunders.

The cause of gradual deterioration of solution potassium arsenite U. S. P. X is at present unsettled and may be due either to excess alkalinity, to the catalytic action of Compound Tincture of Lavender or to some other causes. Our Research Laboratories are at present investigating the deterioration of Fowler's Solution with a view to preparing a stable preparation.

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 THE EDUCATIONAL VALUE OF DRUG STORE EXPERIENCE.\*

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Modern pharmaceutical education, like other living things, has come to its present condition by the process of evolution and still bears the vestigial remnants of earlier stages of development, the present utility of which is, at least, questionable. Originally the art was acquired by personal association with some master of its mysteries, but with the growing complexity of civilization this apprenticeship method of training became inadequate; consequently there were started colleges for the purpose of supplementing the practical knowledge received from the tutelage of the practicing apothecary by instruction in the underlying principles.

There has been for many years a manifest tendency to emphasize more and more strongly the importance of the academic education as a prerequisite for pharmaceutical licensure but the advantage of actual experience in the drug store has never been entirely forgotten. To-day nearly every state board of pharmacy requires, in addition to graduation from a recognized college, a specified number of years of employment in a drug store.

We must not lose sight of the fact that the ostensible purpose of the latter requirement is its educational value. I ask you, however, is the professional skill derived from the mixing of soda-water or the sale of cigarettes of sufficient value to justify the loss of three years from a man's producing span of life?

Of course there are pharmacies, here and there, through this fair land of the free in which the proprietor feels an educational responsibility towards his student clerks, but I fear that they do not constitute a majority of our drug stores, especially in the large cities. There are hundreds of our present pharmacy students tediously toiling to fulfill the letter of the law in stores where there is scarcely the remotest possibility of their learning anything even vaguely akin to professional skill.

The other evening I met one of my students in the street not far from my home and said to him casually, "What are you doing around here?" "Oh," said he, "I work at X's." Now I lived near enough to know the kind of shop that X is

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