Scientific Section

Papers Presented at the Sixty-First Annual Convention

"LLOYD'S REAGENT"*—PRELIMINARY ANNOUNCEMENT.

JOHN URI LLOYD, PHAR. M.

The writer proposes to contribute to the 1914 meeting of The American Pharmaceutical Association (probably to the *Historical Section*), a paper concerning a newly discovered alkaloidal reagent, known to a few persons only, at this date, under the name "Lloyd's Reagent," the reagent itself being a form of Hydrous Aluminum Silicate. His paper will be devoted, mainly, to its discovery and application as an alkaloidal reagent, together with such connected features as appeal as being of interest, historically and otherwise. This delay of a year is necessary, not alone on the writer's account, but because a few chemists, microscopists and physicians have already instituted experimental processes in connection with special phases of the subject, and to their researches credit should be awarded.

The alkaloidal opportunities of this newly discovered reagent are shown by the specimens, herewith exhibited, of *Gelseminine* (ether soluble), natural alkaloid, and natural Nicotine. The first of these, a fixed alkaloid, is considered rare, and is generally accepted as difficult to obtain in quantity; the second is volatile, and prone, under most processes, to manipulative changes. To neither of these has any heat whatever, or any decolorizing agent been applied, the Nicotine being made without distillation.

With this preliminary note calling brief attention to the subject, the writer voices his hope that when comes the next meeting of this Association, he may be in a position to present a fairly comprehensive, as well as more satisfactory communication than is possible at this date.

REMARKS ON LLOYD'S REAGENT.

Remarks by J. U. Lloyd, on being asked to read the paper of Dr. Gordin and Mr. Kaplan on the Qualities of Lloyd's Reagent[1]:

I am naturally more than interested in what Dr. Gordin and Mr. Kaplan may say in this communication concerning this alkaloidal reagent, that is probably a new one to most members of our Society. I cannot refrain from expressing my thanks to both the authors of the paper and to the Society, in that I am privileged to read this paper, for I feel that I am highly honored in being thus selected. It

* See Dr. Sigmund Waldbott's announcement in the *Journal of the American Chemical Society*, June, 1913, and Dr. M. I. Wilbert's contribution to the Pennsylvania Pharmaceutical Association, reported in *The American Druggist*, July, 1913.

[1] Prof. Lloyd's remarks during the reading of this paper, as various phases of the subject were presented, are herein included.

would please me much were Dr. Gordin present with us, because I feel that the problems presented might lead to advantageous discussions, were he here. His absence, however, renders it permissible, and perhaps necessary, that I make some preliminary remarks concerning the reagent mentioned in the paper that I hold in my hand, as well as take the liberty of introducing, discreetly, a few comments as I proceed. It is with more than a little reluctance that even under these circumstances, I venture to intrude a few personal remarks, in directions that appeal to me as requiring special mention, but in it all I feel the authors will acquiesce.

The reagent to which Dr. Gordin refers in this paper, and which he calls simply, "Lloyd's Reagent for Alkaloids," is a form of hydrous aluminum silicate that I obtain from clay and earths. The most prolific source of supply that I have as yet discovered, is the well known "fuller's earth," which indeed carries in its crude form, most marked alkaloidal qualities. My experiences lead to the inference that the alkaloidal qualities of the material are not, however, due to the inorganic side of the compound, other than when combined with water. In fact, if the water be totally expelled from the hydrous aluminum silicate, all alkaloidal attraction disappears.

Another feature of the reagent that in a preliminary manner I need mention properly before reading this paper, is the fact that the *physical* form of the compound has much to do with its alkaloidal energy. In making and extracting this compound from the forms of clay that I have investigated, I have found it desirable, as nearly as possible, to bring the abstracted and hydrated material into a colloidal condition, in which form, before being dried, it has an intense affinity for alkaloids and alkaloidal salts. Indeed, the nearly transparent, practically colloidal form, is instantaneous in its action, there being scarcely an element of time between the absolute separation of any alkaloid yet investigated, whether in the form of salts or otherwise, from solution in water or acidulated water.

It may not be out of place for me to state that the contents of no two clays or specimens of fuller's earth seem to have the same *structural* qualities and affinities. The variations of the material obtained from different forms of fuller's earth are much greater than would be supposed to exist. The common blue clay of our hills and rivers, likewise carries qualities exceedingly variable.

Nor may it be out of place for me to state in connection with this paper of Dr. Gordin and Mr. Kaplan, that I have been bitterly disappointed in that clays that I, theoretically, supposed would be prolific in the yielding of the purest and strongest alkaloidal "attractives," but which proved to be the very reverse. Thus, the pure white aluminum silicate obtained from the Rookwood Pottery in Cincinnati, so celebrated for its beautiful wares, was found to be almost passive, when it came to the alkaloidal test.

It pleases me much to note in this paper, the comparison between charcoal and hydrate of aluminum, with my reagent. It shows that the length of time required for charcoal attraction, and the absence of alkaloidal qualities as concerns the hydrate of aluminum, agree with my experiences therewith. And also that the hydrated aluminum silicate (Lloyd's Reagent), for many bitters and different substances of drugs, has little, if any, attraction.

In making these remarks, which I feel due both to the writers of the paper and

to myself, as well as a privilege that I enjoy, I would like to add that Dr. Gordin uses the word "adsorption," as explaining the alkaloidal phenomena. Possibly he has accepted the word as employed by me in corresponding with him, and possibly he has made a scientific investigation to prove that it is altogether adsorption, or contact action, and not a chemical combination, after the manner of the usual alkaloidal reagents. Be this as it may, I wish to assume the responsibility of error of application, in case the doctor has used the word as taken from myself, and has thus been lead into accepting that view of the subject without personal investigation. Should it be shown by future experimentation that there is a chemical reaction other than adsorption, he, if the fault be mine, should be absolved from all responsibility therein.

Let me again express my deep regret that Dr. Gordin and Mr. Kaplin are not here to-day, to make a personal presentation of this paper to the Society, and let me again express my personal appreciation of the honor that has been extended me by the personal request that I read to the Society this contribution.

NOTE ON COMPARATIVE ADSORPTION OF DIFFERENT SUBSTANCES BY LLOYD'S REAGENT, ANIMAL CHARCOAL AND ALUMINUM HYDROXIDE.

H. M. GORDIN AND JAY KAPLAN.

Prof. John Uri Lloyd, in a private communication, informed me that he has discovered a reagent which quickly and completely adsorbs alkaloids from the aqueous solutions of their salts. The reagent is a natural aluminum silicate treated by a special method which he has patented in this country and will be patented abroad. Providing me with a liberal supply of the reagent, he asked me to verify his statement about the efficiency of the reagent for the complete removal of alkaloids, and gave me permission to institute upon the reagent any other set of experiments I might consider advisable. Since animal charcoal and freshly precipitated aluminum hydroxide are very much used for the removal of various substances from solution, I set up a series of experiments upon these two adsorbents along with Lloyd's reagent.

The results of my experiments, tabulated in the tables at the end of this note, may be summarized as follows:

1. The reagent resembles animal charcoal in possessing the power of adsorbing alkaloids, glucosides, bitter principles and coloring matter. While in the scope of adsorbable substances charcoal most probably excels Lloyd's reagent, in velocity of adsorption of alkaloids, the reagent by far surpasses charcoal. The complete removal of alkaloids by means of charcoal usually requires digestion with continuous shaking for several hours, while the adsorption by Lloyd's reagent is complete within a few minutes.

2. The removal of alkaloids by either the reagent or charcoal is not influenced by the presence of free acid in the solution. Even alkaloids which in the free