

paratively free from odor. The fibrous and inert part of drugs must be prevented from entering the medicinal part, and this cannot be successfully accomplished if the capacity of the mill be overtaxed, or if iron mills of high speed be employed. A cause of injury to the drugs during the process of milling is the excessive heat from friction, whereby the volatile constituents of many drugs are driven off and their color and medicinal value are materially impaired. The use of iron mills is prohibited whenever a trace of iron is objectionable.

A most important feature and value in grinding crude drugs is the accuracy of granulation in keeping with the requirements of the United States Pharmacopoeia. In order to obtain a proper granulation for percolation, and to secure the entire medicinal properties from many drugs, it is often necessary to use different mechanical processes; without such care, an irregular granulated powder results, which either clogs up the percolator or allows the menstruum to pass through too freely. Crude drugs should be milled in strict accordance with their nature.

WHAT IS ALOES, U. S. P.?^{*}

BY E. N. GATHERCOAL AND R. E. TERRY.

The U. S. Pharmacopoeia continues to recognize three commercial aloes—the Socotrine Aloes, which from time immemorial has been obtained from the little island of Socotra in the Indian Ocean; Curacao Aloes, obtained from the Dutch West Indies, a few small islands off the coast of South America; and Cape Aloes, indicating several commercial kinds obtained from British South Africa. A very well-known commercial aloes, namely, Barbadoes, similar to Curacao, is now produced in such small quantities that it has been dropped as one of the commercial kinds mentioned in the Pharmacopoeia. Recent importation statistics indicate that the bulk of aloes used in America is from the Dutch West Indies. For instance, in 1919, 1,686,800 lbs. of aloes were imported, of which 1,296,891 came from the Dutch West Indies, 4,767 lbs. from the Barbadoes and 176,132 lbs. from British South Africa. The remainder was imported from other countries, principally England, and included whatever small amount of Socotrine Aloes was received into this country. Furthermore, the range of prices indicates why so much of the aloes is imported from the Dutch West Indies. Thus Curacao is priced in the current wholesale price lists at 20 to 25 cents, Socotrine Aloes is quoted at \$1.34 to \$1.43 and Cape Aloes is quoted at 32 cents, per pound.

As to the therapeutic value of aloes there is a wide divergence of opinion. While Socotrine has a very long history and enjoyed for many centuries a high repute, modern investigators claim that therapeutically it is of no more value than West Indies Aloes or South African Aloes. In reviewing the literature it becomes evident that each of the commercial kinds of this drug has its strong advocates.

From their physical appearances it becomes frequently very difficult to distinguish between these three kinds of aloes. The drug is prepared by evaporating the juice which is exuded from the large thick leaves cut off from the plant. Sometimes the juice is allowed to ferment before or during the process of evaporation. Sometimes the evaporation is spontaneous in the hot sun, sometimes it is hastened

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by heating over slow fires, and sometimes boiling the juice is practiced. Furthermore, these various processes are applied to all three kinds of aloes. The result is that with each kind of aloes different lots may have widely divergent appearances.

Therefore the point arises as to whether it is really worth while for the Pharmacopoeia to continue the differentiation between the three kinds of Aloes.

Working along this line I have the following suggestions to offer:

First, External Color of the Drug.—The present description in the Pharmacopoeia states that Socotrine Aloes varies from yellowish brown to blackish brown; that Curacao Aloes varies from orange to blackish brown, and Cape Aloes from reddish brown to olive-black. I defy anyone to distinguish between these three ranges of color! One might just as well say that *Aloes* is yellowish brown to nearly black in color. It is true that we do have the "hepatic" form of aloes, which is muddier in color and derives its name from its resemblance to freshly cut liver, but hepatic aloes occurs in all three of the commercial kinds of aloes.

Second, Size and Shape.—Aloes sometimes appears on the market in a semi-fluid condition, frequently in a plastic condition, but most often hard and brittle, the latter forming angular masses of varying size and shape. Socotrine sometimes comes in monkey skin containers, and Curacao occasionally comes in gourds, but the great mass of aloes is imported in boxes or cases holding up to one hundred or more pounds.

Third, Fracture.—There seem to be but slight differences in the appearance of the fracture surfaces of the various aloes. In the hepatic varieties the surface is much less glistening and glassy than in the non-hepatic forms.

Fourth, Odor and Taste.—Socotrine has an odor somewhat different from either Curacao or Cape Aloes. If one warms slightly a fragment of Socotrine Aloes, one can usually detect a rather agreeable aromatic or saffron-like odor, while with Curacao and Cape Aloes the odor is decidedly disagreeable and not aromatic. It is true, however, that Socotrine Aloes, especially when not aged, does not always develop the saffron-like odor but is disagreeable and sour in odor. The taste of all varieties of aloes is very bitter.

Fifth, Color of the Powder.—Mention is made in the present pharmacopoeial description of the color of the powder. Socotrine is described as dark brown, Curacao as deep reddish brown and Cape as greenish yellow. The eleven samples of Curacao Aloes we examined, when reduced to a fairly uniform, moderately fine powder, and viewed in reflected light in even layers on papers, gave a wide variation of color, from a gray-yellow-orange to a dark brown. The two samples of Socotrine Aloes were of a bright yellow-orange and a dark yellow-orange. The four samples of Cape varied from a dark yellow to a dark brown. One cannot distinguish between the three classes of aloes by the color of the powder. The present description also states that the powder when mounted in expressed oil of almond and examined under the microscope shows, in the case of Socotrine Aloes, yellowish to reddish brown irregular or angular fragments; in the case of Curacao Aloes, blackish brown angular fragments; and in the case of Cape Aloes, bright yellow angular fragments. We found that with all varieties of aloes the color of the fragments when so mounted and viewed under the microscope varied from a real light amber-yellow to a dark brownish, according to the thickness and bulk of the fragment, and that it seemed to be impossible to distinguish between the powders by this means.

Sixth, Solubility.—The present Pharmacopoeia states that Socotrine Aloes is soluble to the extent of not less than 50% in cold water; Curacao and Cape Aloes not less than 60%. The result of the examination of two samples of Socotrine Aloes is 40.7% and 58.6% soluble; of eleven samples of West Indies Aloes (Barbadoes and Curacao) is from 49% to 76% soluble, and of five samples of Cape Aloes is from 38.5 to 77.4% soluble. Of the Cape and West Indies Aloes seven samples were less than 60% soluble.

Seventh, Color of the Aqueous Solution.—Mention is made of the color of the aqueous solution in the present pharmacopoeial description, the statement being that Socotrine Aloes yields a solution of yellowish color, Curacao a solution of purplish red color and Cape Aloes a solution of pale yellow color. This statement in the Pharmacopoeia is quite indefinite because no specifications are made as to how the color shall be determined, and, of course, the concentration of the aloes in the liquid and the depth of the liquid make a wide variation of the color. For determining these colors we prepared solutions by shaking for two hours 1 gram of the powdered aloes in 25 cc of water, filtering and making up to 100 cc in a volumetric flask and viewing by transmitted white light through the bulb of the flask. The two samples of Socotrine Aloes gave a dark yellow solution. The solutions of the eleven samples of Curacao varied from a dark yellow-orange to a dark red-orange. Of the four samples of Cape Aloes, two gave solutions that were yellow and two dark yellow. All samples of aloes are almost entirely soluble in alcohol, especially if the alcohol is warm, if they be free from impurities.

Eighth, Color Produced by Nitric Acid.—The Pharmacopoeia mentions that nitric acid added to powdered Socotrine Aloes yields a yellowish to reddish brown solution; added to Curacao Aloes yields a deep red liquid; added to Cape Aloes yields a liquid that is reddish brown in color, changing to purplish brown and finally greenish. These tests were tried out on the eighteen samples and while the color reaction was usually true to the statement, there was much difficulty in distinguishing between the deep red of Curacao and the reddish brown of Socotrine Aloes, and the green color of Cape Aloes was often very poorly developed. Therefore, we tried out the same reaction by mixing the *aqueous solution* mentioned above with nitric acid in the proportion of 5 to 2, and the results were splendid. In each case the eleven samples of West Indies Aloes gave very distinctly a bright red color. The two samples of Socotrine Aloes remain of a bright yellow color which becomes a bright red upon heating. The four samples of Cape Aloes assumed at first a reddish color which soon changed to a more or less brilliant green.

Ninth, Other Tests.—Aloes contains emodin and to conform to the U. S. P. requirements it must show the reddish color formed when emodin is brought into contact with ammonia water. The dilution prescribed is 1-1,000. All samples examined responded to this test.

SUMMARY.

To return to the original question—Is it really worth while for the Pharmacopoeia to continue the differentiation between the three kinds of aloes? From a therapeutic standpoint it would seem not. No physician ever specifies in his prescription a particular kind of aloes or of aloin. So far as I know, no manufacturer recommends the superiority of any particular kind of aloes or aloin, and, undoubtedly, buys for his preparations the West Indies Aloes, which is commercially the

lowest priced. We do not distinguish in dose between the three. Yet, it is true that there is a specified demand from some sources for these various commercial kinds of aloes, and perhaps the Pharmacopoeia as a book of standards should continue the differentiation. While it is doubtful whether we can bring out positive points of distinction in external color or color of the powder, size or shape, odor or taste, microscopic appearances, or solubility in water or alcohol, we do have a very definite distinction in the color of the aqueous solution and in the color produced with nitric acid. Despite all of the work that has been done for many years on aloes, it seems that no really satisfactory assay has as yet been devised for determining the percentage of aloin present. Furthermore, according to the literature, there is a wide variation in the percentage of aloin present in the various kinds of aloes, ranging possibly from 4 to 30%. Also, it is true that the full therapeutic value of aloes is not due entirely to the aloin. It would appear as though an excellent opportunity lies in the study of the therapeutic activity of aloes compared with its aloin content.

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THE PHARMACEUTICAL MANUFACTURER AND PHARMACOPOEIAL REVISION.*

BY F. F. BERG.

The popular conception of the Pharmacopoeia is that of a book to be found on the shelf of every well-regulated pharmacy, which the pharmacist uses as a guide for the practice of his profession. This conception is entirely proper for such is the purpose which its founders and revisers have intended it to fulfill, but in recent years it has found a place with other professions that are likewise governed by its standards.

Referring to the historical introduction of the present Pharmacopoeia it is possible to trace each revision, and how, through the coöperation of medical and pharmaceutical interests, the volume has changed with each succeeding decade to meet more exacting demands.

It is not within the scope or intent of this paper to comment at length upon the tremendous and marvelous advance made by medical science within the past few years, but may it suffice to say that any authoritative work serving to provide, regulate or standardize medicinal matter is subject to revision in accordance with that which medical science finds to possess therapeutic value, or may be needed as a manufacturing adjunct to the same.

From its earliest form, when it constituted the means of establishing uniformity for the commonly used medicaments of the day for the doctor and pharmacist, its scope has been enlarged to include preparations, compounds and component parts thereof, which are so diversified in form, and subject to such specifications for purity, quality and strength, that it has become necessary to include with the doctor and pharmacist in the revision proceedings the combined knowledge and skill of chemists, biologists, pharmacologists, and teachers, which professions

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