

THE MANUFACTURE OF FLUID EXTRACTS.

BY C. F. RAMSAY.

Those unfamiliar with the manufacture of Fluid Extracts little realize how necessary it is to have a particular knowledge of each drug, especially in making large quantities of these extracts. It is possible to make a pint, or two, of a Fluid Extract without trouble, but in the manufacture of five hundred or a thousand pints, in many cases difficulties will be encountered. Some drugs require to be finely powdered, while others are extracted better in a coarse condition. Drugs must be run in copper, iron, or tin percolators according to their nature. Even after a proper menstruum is found for a given drug, working on a small scale, when large quantities are handled, that menstruum does not always prove satisfactory. In making Fluid Extracts, the object is to have each c.c. represent one gram of drug and in order to do this it is often necessary to continue percolation. Some drugs may be extracted in a week, while others require three or four weeks.

Knowing the best menstruum for a given drug on a small scale, it is then necessary to adapt it to manufacturing conditions on a large scale. The drug may be of a mucilaginous nature and will swell so that percolation is impossible.

In such a case it is necessary to mix the drug with shavings or with sawdust. For instance in the manufacture of Fluid Extract of Squill (hydro-alcoholic), we are dealing with a drug that contains about 22% of sugar and a mucilaginous principle, resembling dextrin, known as *sinistrin*. If Squill is ground and macerated with dilute alcohol, it will swell so that percolation is impossible. Even after mixing the cut bulb with shavings, percolation is very slow. After the percolate has been obtained, in some cases two distinct layers will be found, the sugar layer being at the bottom. It is impossible to remove this sugar layer without losing some activity. The best results are obtained by using an 80% alcoholic menstruum and operating on the cut bulb. The writer speaks of the alcoholic extraction of Squill, because a better product is obtained with that menstruum than by the U. S. P. method, as was pointed out by Hamilton in the American Journal of Pharmacy.

Another drug difficult to extract, because of its mucilaginous character is *Cereus Grandiflorus*. This drug is obtained in the green condition and has to be treated with alcohol immediately. Although 95% alcohol is used as a menstruum, there is a large amount of moisture in the drug which dilutes the alcohol sufficiently to produce a sticky mass. This is a case where it is better to wash the drug with a little alcohol, concentrate this portion in the still, and then percolate the washed drug with more alcohol. In the case of Bladder-wrack, we have another drug difficult to extract because it is so mucilaginous. It is also very difficult to thoroughly extract *Calumba*, even after mixing with shavings. This drug contains about 35% starch and 5% of gum which accounts for the trouble. *Lappa* and *Squaw Vine* are also in this class. The writer would suggest that a strong alcoholic menstruum be used on drugs of this nature.

Some drugs are of a very light nature and, if not properly packed, they will

not give full strength "fluids" as the menstruum will pass through too quickly. In dealing with drugs of this kind, it is best to have them packed in as many percolators as possible, so that a given amount of menstruum will be in contact with the drug a longer time. Otherwise it would be necessary, in most cases, to use so much menstruum to flood the drug, that more than a pint to the pound would be drawn off. Arnica Flowers often rises to the top of the percolator, leaving considerable menstruum at the bottom, which of course is not in contact with the drug. Other drugs in this class, which often give trouble, are Colocynth, Quassia, Red Clover Blossoms, Sourwood Leaves and Marrubium.

Very often drugs are difficult to extract because of their hard structure, as for instance, Physostigma, Podophyllum, and Stone Root. In handling these drugs it is advisable to have them in a fine powder. Physostigma contains about 48% of starch, 23% of proteids, gum and fat which add to the difficulty of extraction. Using a coarse powder of Physostigma, the writer was able to obtain only from 40% to 60% of the alkaloid.

The addition of glycerin to a menstruum often retards percolation. This is especially noted when the drug contains considerable extractive matter, as the glycerin serves to make it more viscous and sticky, thus making percolation slow and difficult. The writer has experienced trouble in this respect with Uva Ursi, Geranium, Hydrastis, Rose, Hamamelis and Cinchona. Percolation proceeds much easier without glycerin, but of course such fluid-extracts would not be in accordance with the U. S. P.

Some drugs contain considerable extractive matter and, if not properly percolated, are bound to give trouble. With these it is best to divide the drug into as many percolators as possible and reserve a portion of the first percolate from each percolator. Otherwise the menstruum keeps getting heavier and so saturated that it is almost impossible to get it through the last portion of drug. In this class are such drugs as Poplar Buds, Black Willow Bark, Elder Flowers, Helonias, Digitalis, and Mistletoe.

In extracting drugs containing considerable oil, such as Sabal and Sandalwood, it will be observed that the first portion of percolate is milky, due to the separation of oil. In this case the 95% alcohol used as menstruum, is diluted by the moisture of the drug, so that it will not dissolve the oil. This portion should be concentrated in the still and percolation continued with 95% alcohol.

The writer has experienced considerable trouble with the Fluid Extracts of Convallaria and Digitalis. Using the menstrua indicated in the U. S. P., it was impossible to get the full activity from the drug. With Convallaria at times only 50% of the activity was obtained. Many experiments were carried out, on a manufacturing scale, to ascertain the best way of extracting these drugs. It was found that 80% alcohol was the best menstruum for both.

With alkaloidal drugs, it is always necessary to continue percolation, in order to obtain all of the alkaloid. Even then there are some drugs that give trouble. For example, with Cinchona Calisaya, many experiments were made to find out why it was impossible to get the full activity. The writer found that by not adding the glycerin to the menstruum and reserving the first portion of percolate from each percolator very good results were obtained. There is considerable

extractive matter in Cinchona and when glycerin is used in the menstruum percolation is difficult. Sanguinaria (hydro-alcoholic) causes much trouble. The writer tried menstruums of different strengths and also additions of a little hydrochloric, acetic, and nitric acids. If the drug is fine, it packs so that percolation is impossible. The best results were obtained by using 71% alcohol, with about 2% of hydrochloric acid, and having the drug coarsely powdered. Gelsemium is hard to extract, which may be due to the starch and gum which it contains. Nux Vomica also gives trouble. This drug contains about 11% proteid, 6% of sugar, and gum, which may account for the difficulty. Pilocarpus is also troublesome.

Without long-continued percolation, it is sometimes difficult to thoroughly exhaust Sundew, Echinacea, Fringe Tree, Gravel Plant, Adonis, Arbor Vitæ, and Caulophyllum.

As the primary object of Fluid Extracts is concentration, a suitable menstruum should in each case be selected with the object of dissolving and retaining permanently the active constituents of the drug, and in order to do this, each drug must be separately and individually studied. Many experiments are necessary, to determine which is the most suitable menstruum and the best conditions on a manufacturing basis.

NOTES ON A GLYCERINE SUBSTITUTE.

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Two years ago, when Glycerine doubled in price, there appeared on the market two very similar substances, under coined names, at about half the price of this article, and for which the following claims were made: "Mixes readily with water, keeps indefinitely, never becomes rancid or ferments, contains no acids, in many respects and for many purposes is far superior to glycerine; made from cane sugar; especially adapted for use where soft, moist results are desired and for which purpose it is being employed successfully in place of C. P. Glycerine, also as a sweetener for food products, and, finally, for all purposes for which C. P. Glycerine is used." The above statements are misleading in almost every respect, especially in reference to its use in U. S. P. preparations, where on trial I did not find a single successful case, except in one instance, viz.: it could be used to keep solid extracts from becoming hard.

A physical examination showed a slightly yellowish color, no odor, an adhesiveness or viscosity resembling commercial glucose, taste much sweeter than glycerine, not cloying or repulsive, sp. gr. 1.402 at 25° C., soluble in water and alcohol, but not in a mixture of three parts of alcohol and one part ether.

Chemically the substance responds to every test for "Glucose" sugars, abundantly and quickly. It seems therefore, that the substance is a reduced cane sugar as claimed, of complex nature and considerable purity, but it is certainly not a synthetic, or near-synthetic Glycerine, and at best might be a substitute for commercial glucose, however, the price, four times that of the last named substance, would prohibit such use.