their weights and then solutions were injected into the lymph sacs. It was found that these frogs absorbed even less readily than the controls kept in wet cages.

In another series of experiments it was found that .9 *per cent.* salt solution was more readily absorbed than distilled water, and 25 *per cent.* alcohol more readily than the salt solution. 50, 75 and 95 *per cent.* alcohol is fairly well absorbed, but not so readily as the 25 *per cent.*

Frogs which are plainly diseased (red-leg disease) may absorb quite readily, while others which, to all appearances are quite healthy, may not absorb at all. In two instances of this kind, I obtained roughly 25 *per cent.* more fluid from the ventrol lymph sac than I had injected. I believe, however, that the matter of absorption is largely due to the health of the frogs and the condition under which they are kept, and if proper attention is paid to the handling, cleansing and storing of the frogs, but little difficulty will be experienced with poor absorption. If, when assaying, all frogs are discarded which contain an excess of fluid in the lymph sac one hour after being injected, quite uniform and reliable results are obtained by the one-hour frog-heart method.

Department Experimental Medicine, Eli Lilly & Company.

STILLINGIA SYLVATICA.

E. R. MILLER, R. I. BROOKS AND C. P. RUTLEDGE.

The root of *Stillingia sylvatica* has been a popular remedy in the Southern States for more than a century. It was first introduced to the medical profession by Thomas Young Simons, in an article published in 1828, in the American Medical Recorder.

In 1846, Dr. H. B. Frost[1] published a paper on Stillingia in which he considered it "not very far inferior to mercury in its action upon the capillary and secreting vessels in changing their morbid states or conditions."

In 1850, the root of *Stillingia sylvatica* was introduced into the United States Pharmacopœia and has occupied the position of an official remedy ever since.

Concerning the value of the drug there is very great divergence of opinion, but it is still largely used in domestic practice, chiefly as an alterative, and by the medical profession, especially in the form of certain proprietary remedies of which it forms an ingredient. Notwithstanding its long use, however, there is very little known concerning the chemistry of the plant, the pronounced acridity of the drug being attributed to a volatile oil, a fixed oil and a resin called sylvacrol.

The Volatile Oil:—The term "oil of stillingia" has been applied to two products of very different character, meaning on the one hand a preparation obtained from the root by steam-distillation and on the other an alcoholic or ethereal extract of the same. To add to this confusion there are contradictory reports concerning the presence of volatile oil in the root. Thus, W. Saunders[2] extracted five pounds

1. Am. Jour. Pharm., 20, 306.
2. Proc. A. Ph. A., 1868, 460; Am. Jour. Pharm., 41 (1869) 149.

of the dried root with alcohol and obtained five and a quarter ounces of an extremely thick oil. J. H. Harmanson[3] distilled the root with water and obtained an opalescent distillate, but no volatile oil. On the other hand, W. Bichy[4] distilled 100 gm. of the powdered drug and was able to separate from the distillate 3.25 gm. of a yellowish oil lighter than water. This latter result is widely quoted in text-books and works of reference.

With the object of obtaining a quantity of the volatile oil for a chemical investigation, we collected about 150 pounds of the fresh root and after a few weeks subjected it, in a coarsely comminuted condition, to steam distillation. The distillate was acid to litmus and possessed a rather disagreeable odor, but, much to our surprise, only a few drops of a slightly yellowish oil, lighter than water and of disagreeable odor, could be separated from the distillate. A large part of the distillate was neutralized with sodium bicarbonate and shaken out with ether. After removal of the ether only a small residue was obtained. The distillate which had been neutralized and extracted with ether was evaporated on the water bath to a small volume, slightly acidified with sulphuric acid and distilled with steam, but the amount of acid obtained was too small to be examined further. Just what influence the time of collection, method of drying and age of the drug may have on the yield of volatile oil we are unable to say, but we are inclined to doubt the possibility of obtaining ¾% of volatile oil from unadulterated stillingia root under any circumstances.

The Alkaloid:—Bichy's analysis of the root seemed to show, in addition to the ordinary constituents of plants, the presence of an alkaloid (stillingine). E. G. Eberhard[1] made a chemical examination of stillingia root in 1891, and concluded that no alkaloid is present. In his examination the drug was extracted in three different ways, one of which was a repetition of Bichy's process, but in the final test for alkaloids he applied, in two cases, only Mayer's reagent and in the other Mayer's reagent and picric acid. Since Mayer's reagent does not form a precipitate with all known alkaloids, and picric acid may fail to give a precipitate with alkaloids in weak solution, Eberhardt's experiments may be considered as not conclusive.

In order to obtain further knowledge on this question we carried out the following experiments:—

1. 220 gm. of the fresh root, finely comminuted, were extracted by maceration with hot water acidulated with acetic acid. The liquids obtained by straining and expressing were united, filtered and evaporated by gentle heat to a semi-solid mass. This was extracted with alcohol, filtered, the alcohol evaporated off and the residue concentrated to a small volume. This was mixed with 200 cc. of distilled water, filtered, made alkaline with ammonia, extracted with ether and the ethereal solution shaken with a small amount of distilled water acidulated with H_2SO_4. This solution gave characteristic precipitates with the following alkaloidal reagents:—

Wagner's reagent, Dragendorff's reagent, Scheibler's reagent and tannic acid.

3. Am. Jour. Pharm,, 54 (1882) 387.
4. *Idem* 57 (1885) 529-531.
(1) Lilly's Bull. No. 17, November, 1891.

2. 150 gm. of fresh root were extracted with hot water acidulated with acetic acid. The total liquid obtained by straining and expressing was concentrated to about 40 cc., made slightly alkaline with KOH and distilled, the distillate being received in a small amount of water acidulated with H_2SO_4. The distillate was evaporated on a water bath to about 5 cc. and then tested with the following results:—

Wagner's reagent gave a reddish yellow ppt.; Dragendorff's reagent gave a yellowish brown ppt.; Scheibler's reagent gave a very abundant white ppt.; Picric acid gave a lustrous yellow crystalline ppt.; Tannic acid gave a yellowish white ppt.; Platinum chloride gave a yellow ppt.

3. 250 gm. of the fresh root were cut into very fine pieces and extracted by maceration with purified 95% alcohol. The alcoholic solution was slightly acidulated with HCl and the alcohol distilled off on a water bath and the residue concentrated by moderate heat to a small volume. This was mixed with 25 cc. of distilled water, filtered, the filtrate made slightly alkaline with KOH and shaken out with ether, the ethereal solution evaporated to small volume and then shaken with 5 cc. of distilled water acidulated with H_2SO_4. This solution gave characteristic precipitates with Wagner's, Dragendorff's, and Scheibler's reagents.

Following the extraction with ether, chloroform was used and an aqueous acid solution prepared in the same way. The above-named reagents gave precipitates with this solution, also, but in smaller amounts.

4. About nine kilos of the fresh root were subjected to pressure, yielding a juice which was free from acridity, but had a slightly sweet taste and a disagreeable nauseating odor. This juice was allowed to evaporate to dryness spontaneously. The residue was extracted with 95% alcohol, filtered, the alcohol evaporated off and the residue reduced to a small volume on a water bath. On the addition of water an oily layer separated. This had a disagreeable odor and was soluble in alcohol, ether and chloroform. The mixture was shaken up with ether, then made alkaline with KOH and again extracted with ether. The two ethereal solutions were concentrated and separately shaken with a small amount of water acidulated with H_2SO_4. With the usual alkaloidal reagents these solutions gave only very slight reactions.

5. About eleven kilos of the fresh root were extracted by the method given in experiment No. 2. From the ethereal solution obtained from this extract, after the addition of two or three drops of HCl, the greater part of the ether was removed by distillation and the remainder allowed to evaporate spontaneously. A brown residue was obtained. This was treated with acidulated water, filtered and tested with alkaloidal reagents. Each of the following gave a decided precipitate:—

Compound solution of iodine, Pot. bismuth iodide, Pot. mercuric iodide, Pot. cadmium iodide, Phospho-tungstic acid, Picric acid, Tannic acid, Phosphomolybdic acid, Mercuric chloride, Platinic chloride.

The remainder of the liquid which gave the above-named tests was made alkaline with NaOH and shaken out with ether. When a drop of concentrated HCl was added to this ethereal solution a yellow precipitate was formed. This was filtered out and found to be soluble in water. The ether solution was allowed to

evaporate spontaneously, the residue mixed with a few cc. of water, filtered, acidulated with HCl and this solution tested with the same reagents. Very heavy precipitates were obtained in all cases.

The total quantity of acidulated aqueous solution was then treated with potassium bismuth iodide. A very heavy deep red precipitate was obtained. This was filtered out, washed with distilled water, mixed with distilled water, acidulated with HCl and H_2S passed through the mixture, the bismuth sulphide filtered off, the filtrate made alkaline with KOH and shaken out with ether and the ether allowed to evaporate spontaneously, leaving a yellow amorphous residue.

Some of this residue, dissolved in water and acidulated gave precipitates with all the reagents named above.

The amount of this residue was not sufficient for further examination.

Alabama Polytechnic Institute, Auburn, Alabama.

CANNABIS SATIVA:

IS THE MEDICINAL VALUE FOUND ONLY IN THE INDIAN GROWN DRUG?

H. C. HAMILTON, M. S.

Not many students of the subject will to-day answer this question in the affirmative. There is too much evidence to the contrary. Some, however, have not yet been brought to the point of accepting as "Standard," an extract of Cannabis Sativa irrespective of the locality from which the crude drug was obtained if the fact is noted that it is not of Indian origin. For this undoubtedly, tradition is largely responsible. Originally only three or four provinces[1] on the west coast of India were included in the territory from which official, medicinally active hemp could be obtained. Later,[2] however, no limit was placed on the drug specifications except that it be from India; and as no distinguishing feature is present to assure its origin as being Indian, no doubt much material appears on the market from other sources and is accepted as "Indian."

This statement might be accepted as the cause for the uncertain action of the drug noted by many observers. What seems much more likely to be the reason for the inconstant and inconsistent results reported by some observers, is that the variable effects, both clinical and pharmacological, which are obtainable even with active material had not, at that time, been sufficiently recognized. Houghton[3].

While the dog is generally accepted as the most satisfactory test animal,[1, 4 & 5] not every one is applicable for the purpose. Many of them must be rejected as not being sufficiently susceptible and even the susceptible ones are not uniformly so.

This being true, unless exceptional care is exercised in observing the pharmacological action of the drug extract, misleading reports are certain to follow.

It is not the intention of the writer at this time, to adduce data to prove the activity of American grown Cannabis Sativa, because it is possible to prove almost anything one wants to prove about the activity or inactivity of extracts of