A very simple reminder, which has been found thoroughly practicable, is to tie the bottles of the tablets, or other packages, to the container of the drug itself, so that the hand will not fail to find the article to be used.

If it is not advisable to mix lots, as previously suggested, tie all of the packages of the same strength to the container and always use the smaller lot first.

Not every prescription will permit of such use, and, though many do, none but appropriate uses are in mind; for deceit cannot qualify as conservation.

As an illustration of a proper use: An open package of a considerable quantity of one-eighth grain codeine sulphate triturates are to be reduced to near requirements. The bottle is accordingly tied to the codeine sulphate bottle, and, when the prescription comes in, calling for four grains of codeine sulphate in three ounces of Brown Mixture thirty-two of these tablets containing four grains of codeine sulphate (and some sugar or sugar of milk) are used. Following the utilization of the one-eighth grain tablets, others, such as one-sixth, one-quarter and one-half are used in the same manner, perhaps in succession, or, with the visible reminder to prompt the memory, these strengths may be thought of and used in preference, according to circumstances.

Thus, lot after lot of these needless items are reduced or entirely consumed and proper record made of the number and strength of the tablets so used along with any other data needed to properly check up the inventory.

This example of course extends to other tablets as well as to those of codeine sulphate.

Pills may likewise be used if reducible to powder. Gelatin coated pills are better suited for use in capsules since the material of the capsule itself, the final integument, is also gelatin.

The utilization of some of the other forms of the narcotics, which may be used in similar ways, is a matter for thought in each individual instance.

If kept in mind by one means or another, there will be found an occasional opportunity to utilize these substances, but the plan must pass the censorship of conscientious consideration.

IS RESEARCH WORK ALONG THE LINES SUGGESTED BY THE LAST REVISION OF THE PHARMACOPOEIA POSSIBLE OR PRACTICAL IN SCHOOLS OF PHARMACY?*

BY CHARLES S. CHASE, M.D.

The foregoing interrogatory is pertinent and timely, it seems to the writer of this paper. Pertinent for either of two reasons, and practical because the experience of the biological laboratories connected with the large drug manufacturing houses of our own and foreign countries has fully proven it to be so.

As to the first query, its pertinency. The fact that for more than a score of years wholesale manufacturers of drugs have found pharmacodynamics necessary in assaying all glucoside-containing drugs, and many others, discloses a field

* Read before Joint Session Section on Legislation, A. Ph. A., American Conference of Pharmaceutical Faculties and National Association of Boards of Pharmacy, Chicago meeting, 1918.

manifestly waiting for research pharmacists to visit and explore. A second reason touching its pertinency may be stated as the anxiety all practitioners of medicine, especially internists, always manifest with reference to the probable effects of the drugs they use therapeutically. The evidence even of percentage strength shown by chemically assayed drugs carries with it many times nothing further. It offers no suggestion to a practitioner that the presence of atropine in belladonna, for instance, in varying quantities may or may not produce certain physiological changes in the organism. This point is all-important to the practitioner, and should be, therefore, to the manufacturing or dispensing pharmacists who desire to efficiently serve him. What it might mean to those most vitally interested, the patients, becomes a matter of conjecture, not of certainty.

The graduate pharmacist, therefore, of the present day who desires to serve in the higher ranks of his profession should feel a strong impulsion toward post-graduate work. His work in such direction, further, should be elected with special reference to a well-defined course in pharmacodynamics. Such a course a graduate student in the College of Pharmacy of the University of Iowa elected at the beginning of the session of 1917–18. She chose as her minor what I will name as pharmaceutical pharmacology, selecting as her particular theme the corroboration of the U. S. P., as to the directed bio-assay of Cannabis. The methods followed were those laid down in the text, with two changes. One was with reference to a control, or comparison dose, of a known standard preparation of the drug; the other was in the use of but one animal, a dog. The animal was selected, however, with much care, having in mind constantly the desirable qualities of good nature, a quiet disposition, good health, and absence of timidity.

The second step in the experimental work was obtaining a preparation of the drug to be standardized of as great purity as could be obtained. This was done by seeking it from a manufacturer of acknowledged skill and care. A fluid-extract of the drug whose strength was to be ascertained was next prepared. A dose of this was selected arbitrarily, being 0.03 mil per Kg. wt. of the animal used. The same dose of the assumed standard, it should be observed, was used in the control experiment. The drug was well diluted with water and given the animal by means of a stomach tube. The end reaction in both the control and the tested drug was manifest incoördination, shown by lack of ability to longer support its head apparently, a drooping of same being present, and a spreading widely of the hind legs. Also a "lack of interest" in what was happening about him was plainly observeable, from a lively, very much interested animal he became an apathetic, uninterested and very indifferent one.

The symptomatology of the animal as to nervous conditions, the rate and character of the heart and respiration, the stomach (nausea, etc.), bowels, urinary organs, etc., etc., was closely observed and carefully recorded. The same routine was followed after three days, using the same animal and the same dosage of the same preparation. This was repeated for six consecutive periods each three days apart, after which a summation of the results was made and tabulated. The specimen under examination was shown by this physiological titration to be much inferior to the control, and a dose of about 0.045 mil was found to be needed to produce the symptoms shown after using the control. It should leave the laboratory, therefore, or the hands of a dispenser so marked.

A criticism might here be offered by an investigator with reference to having used but one animal in the experimentation, namely, that one in so doing would not have an opportunity to institute comparisons between several animals. To such objection it could be replied that a single animal used at stated intervals would be much less likely to cloud the results than would several with marked variations as to habits, power of resistence, or degrees of susceptibility, temperament, etc. This point, indeed, is well made in an elaborate criticism of the process by P. S. Pittenger, Ph.C., presented before the Scientific Section of the American Pharmaceutical Association, at its session at Indianapolis in 1917. (Biological Assay Method of the U. S. P., IX Revision. See JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, Vol. VI., No. 10. October, 1917.)

It may be observed, further, that it was required that the research should trace the complete history of Cannabis from the date of its appearance as a drug, and especially as an official drug, with its varying actions as noted by different observers; also that any hints as to its physiological action in the earlier days should be carefully noted and compiled. It is of interest to recall a statement found in the "Pharmacopoeia Londonensis, or the New London Dispensatory, 1682." It observes, speaking of its action, "That it cures the Cough and Jaundice, but fills the Head with Vapours." T. Lauder Brunton, three hundred years later, makes practically the same observation in reporting its action. The drug has therefore an ancient but not so honorable a history. It was found on the whole that the specimen under investigation maintained its reputation for effecting the results declared for so many centuries it would produce. It is known, of course, to this body; it is little used however by the medical profession. Such use in practice, as it has, is restricted almost exclusively to the profession of veterinary medicine.

It may not be improper, before closing, to remark that the prosecution of the research herein outlined was of such interest to the student who conducted it that she has requested the privilege of supplementing it during the approaching session of 1918–19. She asks for the opportunity to carry forward the recommendations of the Pharmacopoeia with reference to the other drugs named as worthy of verification by this process. Especially might it be worth while to attempt to standardize ergot, though neither mentioned nor recommended by the Pharmacopoeia. The usual process of discoloration of the comb and wattles of the cockeral as recommended by Worth Hale and others, seems to be accepted as a fairly good and accurate one, but it could disclose a possible Dale's paradox which might be disastrous, in an unfortunate combination of ergot and epinephrin for instance.

On the whole, therefore, it seems to the writer that it is well worth while for students of pharmacy to seek opportunities wherever and whenever they offer themselves to engage in original research work, if possible. Also it would amply repay them to be able to corroborate the percentage strength given on labels of original containers under certain conditions. Finally, the fields of opportunity along the lines suggested in this paper are full of such possibilities as would amply repay for one such services rendered.