

- ¹¹ Mellanby, E., *Lancet*, I, 407, 1919.
- ¹² Myers, C. N., and Voegtlin, C., *Jour. Biol. Chem.*, 42, 199, 1920.
- ¹³ Funk, C., *Jour. Physiol.*, 45, 489, 1913; 46, 173, 1913.
- ¹⁴ Williams, J. J., *Jour. Biol. Chem.*, 29, 495, 1917.
- ¹⁵ Steenbock, H., and Bcutwell, P. W., *Ibid.*, 41, 81, 1920.
- ¹⁶ McCarrison, R., *Ind. Jour. of Med. Research*, 6, 275, 1919; *Brit. Med. Jour.*, Serial 3086, 249, 1920.
- ¹⁷ Funk, C., *Jour. Physiol.*, 53, 247, 1919.
- ¹⁸ Emmett, A. D., and Luross, G., *Proc. Amer. Soc. Biol. Chem.*, 1918, and *Jour. Biol. Chem.* 43, 265, 1920. Also Emmett, A. D., and Stockholm, M., *Jour. Biol. Chem.*, 43, 287, 1920.
- ¹⁹ Eddy, W. H., and Roper, J. R., *Am. Jour. Dis. of Child.*, 14, 189, 1917.
- ²⁰ Daniels, A. L., and Byfield, A. H., *Ibid.*, 18, 546, 1919.
- ²¹ Uhlmann, F., *Zeit. f. Biologie.*, 68, 419, 1917-18.
- ²² Voegtlin, C., and Myers, C. N., *Am. Jour. Physiol.*, 49, 124, 1919.
- ²³ Dutcher, R. A., *Jour. Biol. Chem.*, 36, 63, 1918; *Proc. Nat. Acad. of Sc.*, 6, 10, 1920.
- ²⁴ Emmett, A. D., and Allen, F., *Jour. Biol. Chem.*, 38, 325, 1919.
- ²⁵ Harden, A., and Zilva, S. S., *Biochem. Jour.*, 12, 259, 1918.
- ²⁶ Hess, A. F., *Am. Jour. Dis. Child.*, 12, 98, 1917.
- ²⁷ Williams, R. J., *Jour. Biol. Chem.*, 38, 465, 1919.
- ²⁸ Bachman, F. M., *Ibid.*, 39, 235, 1919.
- ²⁹ Stark, M., *Med. Record*, 92, 70, 1917.

CLINICAL AND PATHOLOGICAL LABORATORIES.*

THEIR MAINTENANCE, SERVICE CHARGES AND SCOPE OF WORK.

BY HENRY J. GOECKEL.¹

As clinical laboratory examinations, that is, the chemical, microscopical and biological examinations, are becoming of more value in the diagnosis and control of disease, the employment of such methods is increasing. With this increase many more laboratories are being established in hospitals, and as state, municipal and private institutions.

From an apology for a laboratory, such departments are becoming of paramount importance in hospital equipment. Many of the more recent institutions have set aside an entire building or unit of structure for this purpose. From an equipment for making a routine urine examination, and examining a few specimens and tissues microscopically, they are now equipped for far more extensive work. The time has come when no hospital can lay claim to recognition unless it has a well-equipped laboratory.

This being the case, it will be timely to discuss the various factors involved in, and their bearing on, the cost of such service. This is especially opportune, because many electing this branch as a vocation are not trained in industrial or business methods. Many who are concerned with the establishment of such laboratories, especially in connection with hospitals, pharmacies, and with medical groups, are not conversant with the subject.

The factors to be considered will vary with the given laboratory. The following will probably include all to be considered:

The first comprehensive item to be considered is the proportionate charge for what may be called the overhead or fixed expense. This is the cost of main-

* Read before Section on Practical Pharmacy and Dispensing, A. Ph. A., City of Washington meeting, 1920.

¹ Pathologist and biological chemist of Muhlenberg Hospital, Plainfield, N. J.

taining the laboratory, including rental or depreciation of building, taxes, assessments and repairs, heat, light, water, telephone and telegraph service, porter or janitor service, etc., as in any other business.

Then comes the average depreciation and replacement cost of equipment. This is more significant at the present time than it was in the past, because of the marked advance in the cost of such material.

The cost of reagents is next to be considered. This will not prove as great in the hands of an intelligent, skilled analyst as in the services of a poorly qualified one. As a rule, in a properly conducted laboratory, the cost of reagents will not be large when compared with the volume of work accomplished. The cost is likely to be greater for the maintenance of a hospital or municipal laboratory than for a private or commercial one. In the former type much work must be done without netting direct monetary returns. Due to interne inexperience and student service, this cost is also increased. Research work should be provided for in hospital and municipal laboratories. In the former institutions an effort should be made to secure endowments for research and for the laboratory, otherwise it is unlikely that due consideration will be given for this in the hospital budget.

The average time required to make a certain kind of an examination constitutes an important item for consideration. Herein the judgment of many who conduct laboratories is at fault. To correctly estimate this factor there should be included the average time required to receive the specimen and the data relative to it; the time consumed in making the analysis; the time required for recording and, if possible, to interpret the results, also the time to prepare for and to deliver the report; likewise the time to index and file it for future reference.

Whenever possible charge accounts should be avoided, as they increase the cost. Where indulged in, the time involved, the loss, etc., become factors in cost.

A fifth consideration is a personal factor. As in all skilled or professional service, the quality or value of the results depends upon the education, training, experience and reliability of the analyst. Hospitals and municipalities will in the future be obliged to provide larger appropriations for such services than in the past, and this will also affect private practice.

A sixth item of expense is chargeable to advertising and unpaid service. As in medical practice, some service will be rendered without remuneration; sometimes unwillingly, through bad charge accounts; otherwise, to patients of the cliental physicians, when the former are not in a position to pay for the service. In some states and cities these expenses may, in a measure, be unnecessary. The rendition of such service may be the result of more extensive examinations than the attending physician considers necessary, or the patient is able to pay for; these examinations may be needed for arriving at a conclusive diagnosis.

To illustrate: The physician may ask for a Widal test. Should there be typhoid or paratyphoid infection, and the test resulting negatively or very doubtful, the results might prove otherwise than an aid. Many paratyphoid infections seem to simulate malaria. Laboratories occasionally have repeated requests to search for malarial plasmodia, whereas a series of agglutination tests will quite frequently disclose an infection by the bacillus paratyphoid, type B.

In the writer's opinion, whenever possible a general charge should be made for a diagnostic laboratory examination, and a complete series of tests made to

not only seek evidence of certain conditions but to establish or rule out others. The tests included in such a series will change from time to time, as knowledge increases, or the facilities of the given laboratory improve.

At the present time the following would be a general outline of the procedure for the various classes of disease, employing such tests as appear to be of proven value:

Anemia—a complete blood count, urine and feces examination; occasionally, gastric examination, Wassermann reaction, and gonorrhoeal fixation test.

Diabetic cases—urine examination, blood sugar, alveoli carbon dioxide tension and alkali reserve determination, and a blood count.

Cardiac cases—a blood count, blood culture, urine, alveoli carbon dioxide tension and alkali reserve of blood plasma, Wassermann reaction, and gonorrhoeal fixation.

Gastric examinations—a complete clinical examination of the gastric contents by the Rehfus fractional method, feces and urine examination, and a Wassermann reaction.

Kidney involvements—urine, creatinine in blood and in urine, renal efficiency tests, *i. e.*, phenolsulphophthalein or Mosenthal fractional urine method.

Hodgkin's Disease, Lukemia, etc.—a blood and urine examination, Wassermann reaction and, at times, a tissue examination.

Mastoid—blood count and culture, urine and pus examinations, and pus cultures.

Pneumonia—blood count, urine examination, and sputum for tubercle bacilli, etc., and for pneumococcus type, etc.

Typhoid or Malaria—a blood count and malaria search, Widal reaction for typhoid, paratyphoid A and B, and for colon bacilli, general urine examination, and for bacteria by agglutination tests, or blood culture.

Meningeal cases—blood count, spinal fluid examination in general and by culture, and Wassermann reaction.

The enumeration and consideration of these several factors may prove enlightening to many physicians as well as to those conducting or contemplating the establishment of such laboratories.

An understanding of these factors will save many from being parties to agreements which are a discredit to their intelligence and, more or less, a fraud and menace to patients. This refers to entertaining a contract to have clinical laboratory work done for \$100 or \$150 a year by a laboratory agreeing to call for the specimens daily, to analyze and furnish a report on the same.

In the writer's opinion, it will be found that physicians who so contract do not average less than five specimens a day, and in the larger cities it is nearer to ten a day. This means that they pay from twenty-seven to forty-one cents a day for the daily collection, examination, etc., of five or more specimens. The writer, some years ago, when approached with such an offer, incurred the physician's enmity by telling him that "if he thought he could get ten or more urine, sputum and blood examinations a day for twenty-seven and a half cents he did not possess sufficient intelligence to bother with."

The Health Department of the City of New York conducted an investigation of such contract laboratories, with the result that they have fallen into disrepute in that city, only to be reestablished elsewhere.

ABSTRACT OF DISCUSSION.

Henry J. Goeckel: At the 1919 convention of the American Pharmaceutical Association I presented a paper on "Pharmaceutical Education and Opportunities," to focus attention upon the subject of clinical pathology and its relation to pharmacy. I endeavored to bring out the fact that it is a branch of medical art and science which requires a greater chemical

and pharmaceutical knowledge than is required for the practice of general medicine and surgery, and that it should, therefore, be classed in the group of pharmacal medicine with pharmacology and pharmacy proper. For this reason it should have greater consideration by colleges of pharmacy giving advanced courses.

The clinical laboratory work can be divided into two classes or grades—that of the clinical laboratory technician, and clinical pathology proper. The latter is divided into three main subdivisions, *i. e.*, pathology, serology and bacteriology, and biological chemistry.

The technician's work is that capable of being readily done by one of limited knowledge and training in the subject. It requires sufficient knowledge to make a technically reliable routine urine examination, general blood counts, staining specimens for bacterial identification, milk examinations, and routine Wassermann serologic work, etc. To this extent every college of pharmacy should qualify its advanced students. In my opinion, every first-class prescription pharmacy should, if favorably located, be equipped for such work.

To the question of your Chairman, "Should this clinical course be given in the regular course at colleges of pharmacy?" I emphatically answer, "It should not." The regular course in pharmacy is to qualify the student to become a reliable and intelligent compounder of medicaments, and a more or less efficient business man. Every subject not germane to this end is detrimental to the interests of pharmacy, as it will detract from the main purpose. It should be given in the advanced courses, when the student has acquired the foundation for his pharmaceutical knowledge and is better qualified to take up the work.

With the rapid extension in the field of clinical pathology, the demand for laboratory examinations is increasing, and many more laboratories are being established, not only in connection with hospitals, but as state and municipal institutions. This is a field which American pharmacy should bestir itself to enter.

A student to become qualified as a clinical pathologist requires a more extensive training than is at present given by colleges of pharmacy, and will require more than a three-year course. It is a branch which can well be made a major subject in universities having both a medical and pharmacal faculty, where a longer course is given to qualify for the doctor in pharmacy degree.

Most physicians, because of their personal limited experience and the crowding of other more immediate needs of medical practice, cannot utilize and fully interpret the results of clinical laboratory examinations. It, therefore, becomes the function of the pathologist to interpret the results and know the clinical value of each test employed. To do this the clinical pathologist, besides being well versed in the chemical, pharmacal and general biological phases of analysis, must have a good knowledge of normal and pathological histology, embryology and anatomy. He must be qualified to do autopsies, and should know many things the physician must know, excepting physical diagnosis and prescribing. To qualify students in higher or advanced pharmacy for this work requires the coöperation of medical and pharmacy schools.

The demand for properly qualified clinical pathologists will, in all probability, considerably exceed the supply in a few years' time. They will, for the most part, be required for hospital laboratories, etc.

Curt P. Wimmer: Pharmacists, at this time, are not trained for the work, and the openings for pharmacists in this line of professional service are not numerous.

Bernard Fantus: In this line of work the pharmacist can and should reclaim some of his lost prestige. There is a wonderful field here for real professional work, and the pharmacist can rightfully claim it, if he will prepare himself for it.

Ivor Griffith: I agree with Dr. Fantus; diagnostic laboratories will become more popular, and physicians are learning to appreciate their value; hospitals and health department laboratories do not garner in all the work.

ALEXANDRIA SENNA CULTIVATED IN INDIA.

BY C. J. ZUFALL.

Recently, importations of an unusual, in fact, apparently unknown form of Alexandria senna leaves were received in New York. At first glance, these leaves seemed to be an admixture of Alexandria senna and India or Tinnevely senna.