

The divergence of results shown in Table I for any one alkaloid indicates the desirability of specifying some one indicator if concordant values are to be obtained. The variations shown are to be explained presumably by one or both of the following factors: the different transformation ranges of the indicators, and the actual hue selected by the analyst to mark the attainment of the end-point of the titration. In the latter connection, modified methyl red has a distinct advantage in having near the center of its transformation range a more or less neutral hue which may be taken as the end-point.

In view of the satisfaction which modified methyl red has given in this Laboratory for any titrations in which methyl red is applicable, and in view of the advantage which it seems to possess for the titration of the alkaloids studied, the writers recommend that it be specified as the preferable indicator for use in the determination of atropine, brucine and strychnine. The potentiometric method, using a quinhydrone electrode, should be considered as an alternative procedure.

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MICROBIOLOGY VERSUS BACTERIOLOGY.*

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The term "microbiology" was adopted because it represents most adequately the study of those biologicals concerned with micro-organisms. We might have called the subject biological materia medica, but that would not differentiate it from the study of the glandular products used in medicine.

While an outline of the course would seem to indicate that the topics under consideration are similar to those of Applied Bacteriology, the subject matter, mode of presentation, as well as the methods to be used should be the factors which bear out the objectives of the curriculum.

Microbiology has found its way into the pharmacy curriculum because a knowledge of the subject has become as essential to the pharmacist as an applied course in bacteriology is for the medical student. And right here I would like to state my disapproval of the introduction of a medical course in bacteriology for those intending to minister to the public needs in the sole capacity of retail pharmacist. To my knowledge, the practicing pharmacist is not called upon to make diagnostic tests. He has neither the equipment nor background for this type of technical work. The Board of Health of New York City clearly recognizes this fact in that it not only demands a B.S., but in addition, requires that the applicant, for a permit to undertake this work, show his ability through a searching and specific examination subsequent to an inspection of his laboratory.

On the other hand, preventive medicine, rather than therapeutic medicine is making itself felt, and even growing in use and appreciation as the public becomes more aware of its rightful share of good health and wholesome living conditions. The physician, with rare exceptions, no longer meets with opposition at the suggestion of prophylactic treatment for the exposed members of the family;

* Scientific Section, A. PH. A., Miami meeting, 1931.

viz., vaccination of the school child, anti-rabies virus for the dog-attacked youngster or typhoid inoculations at the rumor of a near-by polluted stream. The dispenser of remedies must of necessity be fully armed with all the available information concerning the comparatively new and ever-increasing biological aids in the treatment of contagious diseases.

I have planned our course with three objectives in view.

1. To give the student a basic knowledge of the bacteriological biological articles which he may be called upon to dispense in the retail trade.

2. Sanitation, personal and community hygiene. It is our aim to develop by means of this objective, the realization of the urgent need for thorough cleanliness of the individual as well as in the matter concerning the profession.

3. A knowledge of the more recent aids in preventive medicine; such as the use of anti-venin, allergy and non-specific protein therapy, etc.

THE FIRST OBJECTIVE.

TEACHING METHODS USED.

The lecture-demonstration method has met with the greatest success for our work. As aids to the lectures, we make use of charts, graphs, illustrations, practical demonstrations wherever possible, micro-photographs and occasional supplementary lectures by representatives of the leading biological manufacturing houses.

Orientation is made possible by preview discussion periods, previous to the lectures. At our first gathering of the class, many prejudices and erroneous ideas are cleared up at once. New concepts are launched for some, through the easy informal discussions at our early meetings. Incidentally, a census is taken in order to ascertain the amount and kind of store experience the members of the class have had up to this time. Of course, those who have worked in stores with Board of Health stations readily demonstrate to the class the practical aspect of the course. This leads us easily to the question: "What preparations are most frequently called for?" The answers invariably decide the topical order of the items under consideration throughout the first unit (objectives).

All commercial biologicals, including antitoxins, vaccines, serums, extracts, toxins, etc., are given the following consideration:

1. The annual death rate (for the past 50 years) caused by the disease for which the preparation is used.
2. Causes of infection.
3. History of the organism.
4. Morphology and cultural properties of the organism.
5. Means of identification of the organism as well as the disorder.
6. Modes of transmission.
7. Preventive control.
8. Therapeutic (biological) treatment.
9. Methods of manufacture of the commercial products.
10. Standardization and dosage.

THE SECOND OBJECTIVE.

The second (objective) unit deals with and considers the various methods of sterilization and disinfection. Sewage disposal, food and water inspection and

the causes of epidemics and pandemics make up a large part of the subject matter of this phase of the work.

Lecture discussion periods are held on the protozoal and fungal parasites, as well as the modern methods for community control of the diseases of which they are the cause. Lecture and laboratory methods are used in the study of the changes brought about in the blood by many of these parasites. The student is given the opportunity of making his own blood smears to be compared with lantern projection of micro-photographs of pathogenic blood.

In order to more fully acquaint the members of the class with the most recent literature concerning microbiology, each student is advised to select for special investigation, a topic of greatest interest to him. Some few prefer an assignment from the instructor. These "research" problems are written with the understanding that they be inspirational. All old stuff will not go, except as a preliminary review of the subject dealt with. The reports are delivered orally before the class, it being understood that at the conclusion of each report, discussions and questions may follow. Naturally, the student is only asked to defend his own statements or give the authority for the same. Among the topics chosen last year were: psittacosis, antibacterial serums, allergy, tuberculins, complement fixation, poliomyelitis, toxoids, diagnostic tests, yellow fever, bacteriophage and cancer. Each report is neatly written, in good form, and includes a substantial bibliography. The study is filed away for future reference.

THE THIRD OBJECTIVE.

The latter part of the course is devoted to lectures and discussions of the more recent aids employed in preventive medicine.

We have been fortunate in being able to secure assistance (from a well-known biological house) for the demonstration of venom extraction from rattlers and the action of anti-venin on venom-inoculated birds. An authority on hay-fever and asthma has been kind enough to offer his services in the way of lectures on allergic asthma, hay-fever and ivy poisoning.

Upon completion of the course, such salient material as the phenomena of immunity, opsonins and non-specific protein therapy are adequately covered.

The final examination, one of four compulsory tests, is here appended, in order to more fully convey the scope and contents of the course.

Second Year
College Class

Materia Medica 59-60
Microbiology

May 11, 1931.

Instruction: Copy only the *one word* or *phrase* which represents the correct answer.

1. Increase in temperature is, in the case of typhoid, (a) dangerous; (b) fatal; (c) a syndrome; (d) contagious; (e) improvement.
2. The potability of water is determined by (a) source; (b) temperature; (c) clarity; (d) bacterial count; (e) odor.
3. Organisms that cause disease because of their presence in drinking water are called (a) typhoid bacilli; (b) water-borne organisms; (c) aqueous cultures; (d) filterable viruses; (e) sewage bacteria.
4. Hookworms gain entrance into the human body by means of (a) assimilation of decayed meat; (b) consumption of canned vegetables; (c) contact with hookworm carrier; (d) poor ventilation; (e) soil infection.
5. African sleeping sickness is conveyed by (a) species of *stegomyia*; (b) tsetse-fly; (c) anopheles; (d) culex; (e) rats.

6. *Spirochæte pallidum* is (a) trypanosome; (b) filterable virus; (c) saprophytic spirillum; (d) roundworm; (e) diplococcus.
7. The tubercle bacillus was discovered by (a) Neisser; (b) Pasteur; (c) Koch; (d) Calmetti; (e) Pappenheim.
8. Pollacine is a (a) pollen toxin; (b) hay-fever antidote; (c) pollen fever; (d) unit dose; (e) cutaneous test.
9. In acute infections, three stages of fever can be distinguished. The first is the (a) fastigial; (b) pyrogenetic; (c) defervescent.
10. Intermittent fevers are characteristic of (a) tuberculosis; (b) typhoid; (c) diphtheria; (d) malaria; (e) leprosy.
11. Tuberculosis of the spine is known as (a) consumption of the spine; (b) lupus; (c) Pott's disease; (d) scrofula; (e) spinal meningitis.
12. The greatest danger of tuberculosis infection to man is due to (a) consumption of raw milk; (b) unwholesome diet; (c) poor sanitation; (d) coughing and spitting; (e) eating of infected meat.

Instruction: Complete the following statements by as few words as possible.

13. Resistance against tuberculosis can be increased by
14. The Dick test is used to determine
15. The Schick test is used to determine
16. Anti-snakebite serum is used to
17. Organisms which give rise to pus formation are known as
18. Vaccine virus is obtained from previously inoculated
19. Anti-rabic vaccine virus is obtained from
20. Rabies virus is made avirulent by
21. Active immunization for animals against anthrax is brought about by the injecting of
22. The curative dose of tetanus antitoxin is units
23. How many units are contained in the protective dose of tetanus antitoxin?
24. Diphtheria antitoxin is marketed in dosage from to
25. State the unit of tetanus antitoxin.
26. State the official Latin title of diphtheria antitoxin.
27. What is the unit of diphtheria antitoxin?
28. All extracts or suspensions of the tubercle bacilli are known as
29. The four known strains of *Bacillus tuberculosis* are
30. Which of the following substances are used as prophylactics? (a) tetanus antitoxin; (b) Koch's old tuberculin; (c) vaccine variole; (d) diphtheria antitoxin; (e) pertussis vaccine.
31. State the causative agents of each of the following: (a) whooping cough; (b) typhoid fever; (c) scarlet fever; (d) botulism; (e) pneumonia.
32. Diagrammatically show the morphological character of each of the following: (a) bacilli; (b) diplococci; (c) spirilla; (d) streptococci; (e) flagellated bacillus.
33. State the botanical name of the causative agent of typhoid fever.
34. State how the above may gain entrance into the body.
35. What is the incubation period for typhoid fever?
36. Is the biological preparation for typhoid fever used prophylactically, therapeutically or both?
37. Are typhoid epidemics ever caused by carriers?
38. How many doses of typhoid vaccine are given for prophylactic treatment?
39. How is typhoid vaccine administered as to time intervals between doses?
40. What organism does Typhoid Mixed Vaccine contain?
41. What is the purpose of the Widal test?
42. When is the Widal test carried out?
43. What is a filterable virus?
44. What is the antigen causing hay-fever?
45. State briefly the composition of the following types of vaccines: (a) autogenous; (b) polyvalent; (c) mixed; (d) univalent; (e) sensitized.
46. What are the four modes of administering tuberculin?

47. State five methods which might be employed in the sterilization of live cultures.
48. Would all the above methods be equally effective in the preparation of attenuated cultures?
49. State *only* the *essential* differences in the manufacture of antibacterial sera and antitoxins.
50. State how attenuation differs from sterilization.

BACTERIOLOGY.

The course in Applied Bacteriology is given to the candidates for the B.S. in Pharmacy only. Its purpose lies in the training of students for this portion of clinical analysis. Non-pathogenic organisms of economic importance as well as the disease-producing bacteria and protozoa are included in the curriculum.

Periodicals and texts are readily available for student use. Each member of the class is expected to read of the history and discoveries of the various organisms and discuss their readings intelligently in class.

The first part of the course is devoted to the morphological and cultural properties of the various micro-organisms. The latter portion is purely applied in nature and includes the bacteriology of water, sewage, air, soil, milk, excreta, sputum, spinal fluid and blood.

All members of the class participate in the carrying out of the Widal test as well as other agglutination reactions, the preparation of autogenous vaccines and the determination of disinfectant coefficient of liquids, ointments, tooth-pastes and inhalants.

The following methods of presentation are observed:

A. Discussion-demonstration hours covering the morphological and cultural properties of the pathogenic and non-pathogenic micro-organisms.

Formal lectures are largely replaced by lecture-discussion periods. At the first lesson, the class is introduced to the general plan of the course. An outline consisting of the units covered, together with the references on each unit, is handed to the students. At the second meeting, a discussion is started by the professor in charge, concerning the problems given in the first unit; the time allowed for these group conferences is not less than 30 minutes—of the 3-hour session—and not more than 60 minutes. The two or more remaining hours of the weekly meetings are devoted to the habits and characteristics of the organisms, or phenomena of the specific unit.

B. Each member of the class is told to select from a list of topics, some one problem upon which he is to prepare an original report, covering the history, factual material to date and personal remarks concerning the reading matter embodied in his report. The report is delivered orally before the class on definite dates assigned for that work. At such time, the class is privileged to question the student reporting, on the plan of seminar procedure.

C. The final practical examination is started four weeks before the last meeting of the class. Each student selects a topic which is of major interest to him; such as, the analysis of water, milk, sputum, disinfectant coefficient of commercial antiseptics, the change from normal to pathological blood, etc. A preliminary report consisting of a detailed outline of the method of procedure, materials to be used, preparations to be made and bibliography consulted, is handed to the head of the department for acceptance and permission to continue with the examination. Last year several parents coöperated with the department

to the extent of supplying their sons with material of questionable pathogenicity from their every-day medical practice.

Among the topics investigated by the 1930-1931 class were, agglutination tests on *B. abortus*, identification and bacterial count of washings from raw hides, blood count and morphology of the corpuscles of patients suffering from intestinal parasites, comparison of Board of Health sputum samples, bacterial count of well and spring water, etc.

From the foregoing brief outline of these courses, it can be readily seen that the work for the retail pharmacist consists largely of behavior and knowledge objectives. Experiments are in the nature of vicarious experiences in that they are mainly demonstrated, but nevertheless real.

On the other hand, the B.S. candidate, trained to become the diagnostic analyst with a cultural background, is able and ready to participate in the necessary skills and techniques of this specialized field.

COLUMBIA UNIVERSITY, COLLEGE OF PHARMACY.

WASHINGTON STATE ASSOCIATION DISCUSSES PRESCRIPTION PRACTICE.

L. D. Bracken, of Seattle, and Ronald P. Robertson, of Spokane, directed a prescription symposium; the subjects included:

Detailing Physicians.

1. Own Preparations.
2. U. S. P. and N. F. Preparations.
3. Pharmaceutical Specialties.
4. Proper Price for Prescriptions, Office Supplies, Pharmaceutical Service.

Delivery Methods and Costs.

How to Keep Adequate Store Records.

Credit to Physicians and Patients.

Stock Control.

Merchandising Stock for Prescription Stores:

1. Ethical Patents and Their Scope.
2. Toilet Lines.
3. Rubber Goods and Sundry Lines.
4. Window and Interior Displays:
 - A. Professional.
 - B. Merchandising.



U. S. P. and N. F. Display of Minn. Pharm. Assoc. at Minn. State Med. Assoc., 1932.