Outlines of medical diagnosis : prepared for the use of students at the Harvard Medical School, Boston, 1913.

Outlines of Medical Diagnosis

1913

OUTLINES

OF

MEDICAL DIAGNOSIS.

PREPARED FOR THE USE OF STUDENTS,

AT THE

HARVARD MEDICAL SCHOOL, BOSTON.

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INDEX.

THE HISTORY.

NOTE the name of the patient, state (married or single), age, residence (town, street and number) and birthplace (malaria, hydatid, etc.), occupation (eye strain, writer's cramp, painter's colic, etc.) and the date on which he is seen.

The family history and personal history should be taken, and the progress of the present illness obtained in detail. If the patient is very ill, depend largely on the friends for data and obtain other necessary information during later visits. Avoid embarrassing questions in the presence of a third person.

As a rule, let the patient tell his story, simply guiding his narrative into profitable channels. Avoid leading questions. Do not be misled by his medical expressions. Lay diagnoses of meningitis, influenza, gastric catarrh, rheumatism and dysentery are untrustworthy and must not be allowed to interfere with a correct diagnosis on the part of the examiner. Note the difference between chilliness and a true chill. Sometimes the history obtained is incorrect because of the dulness of the patient, either natural or due to the disease. Here repeated questioning may finally secure a satisfactory story.

Histories obtained from hospital patients are proverbially untrustworthy. Such persons are for the most part ignorant and unobservant. No matter what methods are employed to obtain the history, it is well to be sceptical about its accuracy, especially when the physical examination furnishes contradictory evidence. In children this is particularly important. Most children are unable to furnish information about themselves, and their histories must be obtained from the people in charge. Their symptoms are

not likely to be accurately stated by themselves, perhaps from fear, embarrassment or misunderstanding.

General questions as to heredity are frequently unsatisfactory. Definite interrogations must be put, and where one is in doubt of the truthfulness of an answer, the desired information may be obtained in a roundabout way,—*e.g.*, patients will admit that parents have had "nerve trouble" or "brain trouble," although they might deny the presence of insanity. Family tendency to tuberculosis should be asked for, but it is of greater importance to know whether the patient has been in close relation, either at home or in the workshop, with a tuberculous individual.

Important diseases often are forgotten by patients in giving the personal history, therefore, it is well to ask specifically regarding the exanthemata, rheumatic fever, pneumonia, St. Vitus' dance, jaundice, etc. Inquiries always should be made concerning the use of alcohol, tobacco, tea, coffee, diet in general, the times and the methods of eating, drinking and sleeping. Inquiries about pregnancy and menstruation should be simple and straightforward and as a rule the same applies to venereal disease. Occasionally indirect questions with regard to venereal diseases are often best. A patient will admit having had a "strain" or frequent or scalding urine, who will deny gonorrhea.

Present Illness. The first question should always relate to the first symptom and the time of its occurrence. The sequence of subsequent symptoms should be carefully investigated. The patient's answers often suggest other subjects important in the differential diagnosis, and the doctor or student then can show the extent and accuracy of his medical knowledge by asking enough but not too much. Individual symptoms (*e. g.*, abdominal pain, etc.) should be analyzed according to their situation, time and mode of onset, frequency, duration, character and severity. The mere fact that a patient vomits or expectorates is of little value. It is important to note the quantity, color, presence of blood and mucus. Always consider the temperament of the patient and his customary use of lan-

guage when statements are made dealing with pain, discomfort or fatigue

It is desirable to include in the history a few general questions concerning the appetite, frequency of intestinal evacuations, ability to sleep and work (as an index of the sufferings), night sweats, loss of weight, progress of the disease, and also questions about the functions of the various systems not included in the patient's preliminary statement.

(*e.g.*) **Digestive.**		Appetite, nausea, vomiting, discomfort, eructations, defecation.
Respiratory.		Cough, expectoration, pain in chest, dyspnoea.
Circulatory.		Shortness of breath, palpitation, oedema.
Nervous.		Headache, convulsion, paralysis.
Urinary.	(*a*)	Renal: headache, amount of urine, oedema.
	(*b*)	Vesical: dysuria, retention, frequency of micturition, amount of urine.
Menstrual.		Profuse, scanty, absent, painful, irregular.

In noting the subsequent course of the disease, to determine improvement or the reverse, questions should be directed in accordance with the above inquiry. Do not be satisfied with general statements. Require specific answers.

*General Examination of the Body.

General Observations. Nutrition of skin and muscles, size, weight, attitude.

Skin, Mucous Membranes and Subcutaneous Tissue. Pale, flushed (hectic), cyanotic, pigmented, jaundiced. Cold, hot, dry, moist, satiny, rough, desquamating; scars, eruptions (Koplik's sign, etc.), haemorrhages, oedema, myxoedema, emphysema, calluses, rheumatic nodules, tumors, hair, parasites, fat, deformities (as in facial paralysis, etc.).

Lymph Nodes. Suboccipital, mastoid, parotid, submaxillary, superficial and deep cervical, supraclavicular, axillary, epitrochlear, inguinal; (bronchial, mediastinal, mesenteric).

Lymph nodes may be small, large, hard, soft, fluctuating, adherent or non-adherent, discrete or conglomerate.

Muscles. Atrophy, hypertrophy, resistance (firm, flabby), paralysis, spasm, tremor, fibrillation, contracture.

Bones and Joints. Redness, heat, tenderness, swelling, crepitus, mobility, epiphyses, deformities (spinal curves, bow-legs, chronic arthritis, Heberden's nodes, exostoses) and tumors.

Arteries and Veins. Size, varicosity, pulsation (especially in neck), character of vessel wall.

Radial Pulse. Rate (tachycardia, bradycardia), regularity, rhythm, tension (compressibility and blood pressure estimation), volume, character of wave (dicrotic, water hammer or Corrigan's, etc.). Capillary pulse. Comparison of the heart's contractions with the radial pulse. Comparison of the radials.

Blood Pressure. Systolic pressure estimated by some form of the Riva Rocci apparatus. Diastolic pressure approximately estimated by determining the point at which the sound disappears while listening with a stethoscope placed over the brachial artery a short distance below the cuff of the Riva Rocci apparatus as the pressure falls.

*Physical examination is not dependent upon a knowledge of the patient's previous history and present sensations. It is a good exercise, therefore, for students to examine the patient before the history is taken. A complete, systematic and unbiased examination will thus be obtained.

Respiration Frequency; rhythm (Cheyne-Stokes type, etc.); character (painful, shallow, costal, diaphragmatic). Relation of inspiration to expiration. Dyspnoea (expiratory, inspiratory).

Temperature. Mouth, axilla or rectum.

HEAD.

Size, shape (rachitic, hydrocephalic, microcephalic, asymmetric), fontanelles, tender spots.

Facies. Placid, stupid, anxious, pinched, puffy, adenoid, alcoholic, hemiatrophic, myxoedematous, acromegalic, mask-like (paralysis agitans).

Eyes. Pupils (size, equality, shape, reflexes, Argyll-Robertson), ophthalmoplegia (strabismus, ptosis), nystagmus, conjunctivitis, exophthalmos; vision (condition of retina, hemianopsia, amaurosis). Oedema of lids (pertussis, Bright's disease). Ophthalmoscopic examination.

Nose. Hypertrophies, external deformities, tumors, discharge, membrane (culture), ozæna, epistaxis, deviations and perforation of the septum, spurs, enlarged turbinates, new growths.

Lips. Color, hare-lip, ulcerations, herpes, fissures.

Breath. Foul, alcoholic, urinous; acetone, gas poisoning.

Tongue. Protrusion; pale, red, cyanotic, dry, moist, coated, fissured, scarred, smooth, rough, indented by teeth, ulcerated, geographical tongue, salivation, stomatitis, *leucoplakia buccalis,* mucous patches.

Gums. Color, spongy, hæmorrhagic (scurvy), lead line (lens), pyorrhea, tumors, sordes.

Teeth. Carious, deformed (Hutchinson), number.

First dentition: 6-8 months, two lower incisors; 8-10 months, four upper incisors; 12-14 months, two lower incisors and four molars; 18-20 months, four canines; 28-32 months, four molars. Total, twenty.

Second dentition: 6 years, four molars; 7 years, four incisors; 8 years, four incisors; 9 years, four bicuspids; 10 years, four bicuspids; 11 years, four canines; 12 years, four molars; 17-25 years, four wisdom teeth. Total, thirty-two.

Buccal Mucous Membrane. Pigmentation. Ulceration. Mucous patches.

Pharynx. Tonsils, palate, adenoids, membrane (culture), eruptions, thrush, elongated or oedematous uvula, tonsillar and retropharyngeal abscess, pharyngeal and palatal reflexes and paralyses (tabes, diphtheria, bulbar paralysis).

Larynx. Voice changes from the normal, indicating the need of laryngoscopic examination. (Paralysis of vocal cords may exist without hoarseness.)

Ear. Hearing, discharge, examination of canal (foreign bodies, wax, tympanum), mastoid tenderness, tophi, stigmata.

Neck. Torticollis, spinal curvature, venous fulness, pulsations, tracheal tug, parotid, thyroid, lymph nodes, cysts, high spinal abscess.

CHEST.

Inspection. Size, shape (barrel chest, paralytic chest, rachitic chest), symmetry and comparative mobility, respiratory movements, diaphragm phenomenon, intercostal spaces (prominence, retraction, Broadbent's sign), cardiac impulse, pulsations. Breasts: pigmentation, evidences of lactation, tumors.

Palpation. Tactile fremitus, cardiac impulse, pulsations, thrills, friction, tender points.

Percussion. Sense of resistance and elasticity. Percussion note. Variations from the normal pulmonary or cardiac boundaries.

Auscultation. Voice sounds, respiratory sounds, cardiac sounds, adventitious sounds.

HEART.

Inspection. Position of apex beat, pulsations.

Palpation. Apex impulse, thrill, friction (pulsation).

Percussion. Size and position of the heart.

Auscultation. Heart sounds: diminution, accentuation, rhythm, doubling. Murmurs: seat, time, character, transmission, relation to heart sounds. Examine in both erect and recumbent positions.

LUNGS.

Inspection. Rate and character of respiration.

Palpation. Tactile fremitus, friction, râles.

Percussion. Pulmonary resonance, normal or modified. Mobility of pulmonary borders.

Auscultation. Respiratory murmur, voice sounds (spoken or whispered), adventitious sounds, râles, friction and succussion sounds.

Cough. Dry, loose, hacking, constant, paroxysmal and painful.

ABDOMEN.

Inspection. Size, shape, thickness and tension of the abdominal wall, irregularities of outline due to tumors, etc., umbilicus, striæ, superficial veins, herniæ, peristalsis, respiratory movements, pulsations.

Palpation. Position, outline and mobility of liver, gall-bladder, stomach, appendix, spleen, kidneys, bladder; tumors (see below); relation to inflated colon, stomach and to other organs. Tenderness: seat, superficial or deep; resistance, friction, fluctuation wave (true and false), splashing, pulsation (aorta). Spasm of abdominal muscles.

Percussion. Outline of liver, gall bladder, spleen, stomach, bladder, uterus and tumors. Modifications due to distended intestines and free gas in the peritoneal cavity. Differentiation between ascites and cysts; condition of flanks, movable dulness, curve of dulness.

Auscultation. Arteries, foetal heart, placental bruit, splashing, gurgling.

Rectum. Piles, fissure, ulcer, abscess, fistula, pilonidal sinus, impacted fæces, stricture, prolapse, intussusception; uterus, prostate, tumors, relation to neighboring organs.

Genitals. Testes, epididymis, spermatic cord, varicocele, hydrocele, tumors; penis, glans, phimosis, ulcerations, urethra, character of the stream; discharge (urethritis, balanitis), prostate (vesiculae seminales); vagina, introitus (urethral caruncle), hymen, perineum, malformations; uterus; cervix, body; tubes, ovaries, tumors; discharge from urethra, vagina, uterus.

Extremities. Deformities, congenital and acquired. Conditions due to mal-nutrition and disease (clubbed fingers), oedema, flat-foot, tenderness (neuritis, trichinosis).

Spine. Curvatures, mobility, tender points, spina bifida.

Tumors. Location, shape, size, color, consistency, surface, tenderness, mobility (by respiration, by hand), dulness, pulsation, relation to organs.

NERVOUS SYSTEM.

1. **General Appearance.** Stigmata; asymmetry of head and face; ears; palate. General faulty development; nutrition.

2. **Mental Condition.** Intelligent, emotional (hysterical), special defects, psychoses, hallucinations, hypochondriasis, delirium, apathy, stupor.

3. **Motion.**

    1. Paresis or paralysis (flaccid or spastic), as related to lesions of: *a*, brain; *b*, cord; *c*, cranial or other peripheral nerves; *d*, functional disorder (hysteria). Cortex, monoplegia. Capsule, hemiplegia. Cord paraplegia. Peripheral nerves, individual distributions.
    2. Gaits: spastic, ataxic, etc.
    3. Pupils: size, equality, outline, reaction to light and with accommodation; Argyll-Robertson pupil (syphilis, tabes, dementia-paralytica). Eye movements: strabismus, exophthalmos.
    4. Reflexes: pupillary, palatal, knee jerk, ankle-clonus, plantar (Babinski); Kernig's sign; wrist, elbow, Achilles tendon, abdominal, cremaster.
    5. Ataxia (Romberg), localized and general convulsions, tremor, choreic and athetoid movements, fibrillation.
    6. Electrical reactions: reaction of degeneration (R. D.) and partial R. D.

4. **Sensation.**

    1. Tactile, pain, temperature, position, delay, paresthesiae, dissociation.

2. Distribution of disturbance: focal, segmental, peripheral, functional.
3. Special senses: sight, hearing.
4. Incontinence; retention; sexual power.
5. **Genito-Urinary Organs.**
6. **Speech.** Aphasia, scanning (multiple sclerosis), monotone (paralysis agitans), nasal (bulbar paralysis).
7. **Trophic.** Nutrition of skin and joints, atrophy of muscles, perforating ulcer, vaso-motor.

ROENTGEN RAY EXAMINATION.

The Roentgen rays give valuable information in regard to the presence of foreign bodies, especially when metallic, the condition of fractures and dislocations, the presence of tumors, of aneurisms, especially of the aorta, and of many diseases of the bones and joints. Confirmatory evidence may be obtained in cases of calculi, conditions of the lungs and of the pleural cavity and regarding the position and size of heart, oesophagus, stomach and intestine. With the use of bismuth meals motor function of the gastro-intestinal tract may be studied.

GENERAL ORDER OF EXAMINATION.

Size and Development of Bones.
State of Nutrition. Muscles, subcutaneous fat, weight.
Characteristics of the Skin.
Position of the Body.
Mental Condition.
Temperature.

Head. Skull, facies, eyes, ears, nose, lips, teeth, tongue, gums, pharynx.

Neck. Thyroid, lymph nodes, carotid arteries, jugular veins.

Thorax. Inspection: frequency of respiration, tactile fremitus, percussion of the lungs, auscultation of the lungs.

Heart: location of cardiac apex, by inspection and palpation; visible and palpable pulsations elsewhere on the surface of the thorax, and in epigastrium; palpation of praecordia, percussion of the cardiac outline; auscultation of the heart, examination of the arteries and veins, radial pulse.

Abdomen. Inspection, palpation and percussion of stomach, liver and spleen; palpation of the kidneys.

Extremities.

Spine.

Examination of Nervous System.

Examination of Larynx.

Examination of Eye (Ophthalmoscopy).

Examination of Rectum.

Examination of Genitals and Bladder.

Examination of Urine.

Examination of Sputum.

Examination of Gastric Contents.

Examination of Faeces.

Examination of Blood.

URINE.

Quantity in twenty-four hours. In suspected nephritis separate night and day portions. Color. Odor. Reaction. Specific gravity. Sediment. Turbidity. Shreds.

Turbidity. Cloudiness may be due to pathological sediment or bacteria or to precipitation of normal phosphates or urates; if due to urates it will disappear upon heating; if due to phosphates, with a few drops of acetic acid.

Preservation of Urine. Specimens, except those to be examined for sugar by the fermentation test, may be preserved by the addition of forty per cent formalin in the proportion of two drops to the liter.

Albumin. The proteid compound usually present in pathological urine is a mixture of serum albumin and serum globulin. Other proteids as nucleo-albumin, albumose or allied substances as mucin may be present.

1. Nitric acid test. This reacts to all urinary proteid except peptone. To 5 c. c. of filtered urine add one-third the quantity of nitric acid by pouring it down the side of the glass so that it underlies the urine. A white precipitate forms at the junction of the two fluids in the urine. A precipitate higher in the urine may be due to urates. Bile or urinary coloring matters may give a color to the urine or precipitate at the junction of the fluids.

2. Heat test. Pour 10 c. c. of urine into a test tube and boil the upper half of the fluid. Add one to two drops of ordinary (36%) acetic acid and boil again. A precipitate appearing on boiling which persists after the addition of the acid, or appearing on the second boiling is albumin; one disappearing with the acid is phosphates. The test may fail with an excess of acid.

3. A more delicate test for serum albumin is the following: Add to a test tube half filled with filtered urine one-fifth its volume of a saturated aqueous solution of sodium chloride; heat to boiling point; add two to five drops of fifty per cent acetic acid and heat again. This test may serve to distinguish nucleo-albumin, as most forms of nucleo-proteid found in urine do not react to

the test, while serum albumin does. Thus where a positive nitric acid test is present, and no precipitate occurs with this test, the proteid present is usually nucleo-proteid.

An approximate idea of the quantity of albumin can be obtained by performing the heat test without the addition of salt solution, and then allowing the albuminous precipitate to settle. Albumin, amounting to two to three per cent of the fluid, becomes converted into a compact coagulum. One per cent of the coagulated albumin occupies half the column of urine; five-tenths per cent one-third of the volume; one-tenth per cent one-tenth volume, and with five-hundredths per cent the bottom of the test tube is covered. One hundredth per cent or less causes a turbidity, but no precipitate. The Esbach test with picric acid, using the Esbach graduated tubes, may be used for quantitative estimations. It is not a very accurate method, but serves for judging comparative amounts.

Bence-Jones Body. (Albumose.) Perform the heat test for albumin as above described. The appearance of a heavy precipitate which partially clears on boiling suggests albumose. If albumose is present a cloud will appear in the filtrate on cooling. The precipitate formed with nitric acid, if due to albumose, disappears with heat, that of serum albumin does not.

Sugar.—Qualitative. 1. Fehling's Test. Boil 10 c. c. of mixed Fehling's solution in a test tube. Add slowly 5 c. c. of urine. Separate in two portions in two test tubes. Set one aside and boil the other. The presence of sugar is shown by the appearance of a red and yellowish precipitate. A precipitate occurring in the mixture set aside without further heating is sugar. A trace may take 15 minutes to several hours in appearing. If precipitate fails to occur in specimen boiled, sugar is absent. A precipitate coming with boiling may or may not be sugar. In cases of doubt do phenylhydrazin test or ferment urine for 24 hours and do Fehling's test after fermentation. If no reduction then, the first precipitate was due to sugar.

2. Nylander's Test. Add 1 c. c. Nylander's reagent to 10 c. c. urine in a test tube. Boil 2 or 3 minutes. If sugar

is present the fluid assumes first a yellow, then yellowish brown, and finally almost black color, and after some time a black sediment forms.

Sugar—Quantitative. 1. Fehling's Test. Dilute 10 c. c. of Fehling's solution (5 c. c. copper sulphate and 5 c. c. alkaline tartrates, H. M. School solutions),[1] with 40 c. c. of water and boil in a flask to test the solution. Add slowly, by means of a burette, the urine diluted with water 1.10. After each addition boil briskly. When the point is reached at which the blue color wholly disappears, the copper is reduced. 10 c. c. of Fehling's solution are reduced by 0.05 grams glucose, which is, therefore, the amount of glucose in the urine used. The per cent of glucose equals 5, divided by the number of c. c. of undiluted urine. To get accurate results with this method, the dilution of the urine or the amount of water added to the Fehling's solution in the flask should be such that about 100 c. c. of fluid are present at the completion of the test.

2. Fermentation Test. To 100 c. c. of urine of known specific gravity add one-third of a yeast cake. Set in a warm place for twenty-four hours. If at the end of this time there is no reaction with Fehling's solution, take the specific gravity; otherwise continue the fermentation till test is negative. Multiply the difference in specific gravity before and after fermentation by 0.23 to get the per cent of glucose present.

Acetone. To one-sixth of a test-tube of urine add a crystal of sodium nitro-prusside. Make strongly alkaline with NaOH. Shake. The addition of a few drops of glacial acetic acid gives a purple color to the foam, if acetone is present. In conditions of severe starvation

Diacetic Acid. Add a strong aqueous solution of ferric chloride to one-third of a test tube of urine. A Burgundy red color shows the presence of diacetic acid. If the reaction takes place after the urine has been previously boiled, it is not due to diacetic acid. In diabetes and other cases of starvation

B-Oxybutyric Acid. If the ferric chloride reaction is strongly positive B-oxybutric acid is probably present.

1. See page 36

Indican test. hydrochlor. acid conc.
pot. chlorate sol.
urine.
Shake in chloroform.

Bile. 1. Shake and look at the foam.

2. Iodine test. (Tr. iodine, 1; alcohol, 15.) Pour 1 c. c. on the top of the urine in a test-tube. A green ring at the junction of the two fluids shows bile.

Diazo Reaction. To 5 c. c. sulphanilic acid solution add two drops of a 0.5 per cent solution of sodium nitrite. Add an equal quantity (5 c. c.) of urine. Shake and add quickly 2 or 3 c. c. of ammonium hydrate. A carmine color, especially in the foam, shows a diazo reaction. If the reaction is positive and the mixture is allowed to stand for twenty-four hours, a precipitate forms, the upper margin of which exhibits a green, greenish black or violet zone.

Indican. To 15 c. c. of urine add 3 c. c. of a twenty per cent solution of lead acetate. Filter. To the filtrate add equal volume of concentrated HCl containing 0.4 gram ferric chloride in 100 c. c. Shake for two minutes. Add 3 c. c. chloroform and again shake. If Indican is present in considerable quantity the chloroform will assume a deep blue color. (Obermeyer's test.)

Blood in pigment form in solution as in haemoglobinuria is demonstrated by the Guaiac test. (See p. 29.)

Sediment. Microscopic examination. Casts. Pus. Blood. Epithelial cells. Crystals. Fat. Bacteria.

Tubercle Bacilli in Urine. 1. Centrifugalize, decant, dilute with water, recentrifulgalize and make a cover glass preparation from the sediment. This should be spread thinly and dried, holding in the fingers over the flame of a Bunsen burner. Fix by passing three times through the flame while held with forceps.

2. Cover the preparation thoroughly with carbolic-fuchsin solution and steam over the flame during thirty seconds to one minute. Do not allow the staining solution to dry on the surface of the cover glass, but add more stain if necessary.

3. Wash in water.

4. Decolorize for twenty seconds in 20 per cent sulphuric acid.

5. Wash in water.

6. Wash for thirty seconds, or until no more color will come out, in 95 per cent alcohol.

7. Wash in water.

8. Cover the preparation with Löffler's methylene-blue solution for thirty seconds.

9. Wash in water and mount.

Tubercle bacilli are bright red; nuclei and other bacteria are blue. (The washing with alcohol is designed to decolorize any smegma bacilli which may be present. These bacilli hold their color in the presence of acids, but not in the presence of alcohol. Absolute differentiation from smegma bacilli requires inoculation.)

STAIN FOR GONOCOCCI.

1. Smear a cover glass as thinly as possible with secretion or urinary sediment.

2. Cover for one minute with Stirling's gentian violet, or with aniline-methyl-violet.

3. Wash in water.

4. Cover with IKI solution for thirty seconds.

5. Wash in 95 per cent alcohol until the blue color ceases to come out.

6. Wash in water.

7. Counterstain with dilute carbolic fuchsin 1 to 8 without heat, or with saturated aqueous solution of Bismarck brown.

8. Wash in water and mount.

Diplococci within leucocytes, which have been decolorized by Gram and have taken the counterstain of red or brown are to be considered as gonococci.

BLOOD.

Examination of Fresh Blood. Size, shape and color of red blood corpuscles (erythrocytes). Leucocytes, Fibrin, Parasites (Malaria, Filariasis, etc.).

Haemoglobin. Use Tallqvist's scale. (This determines at once the presence or absence of anaemia.) For accurate estimations use a Fleischl-Miescher or Sahli apparatus.

$$\text{Color index} = \frac{\textit{Per cent Haemoglobin}}{\textit{Per cent Red Corpuscles}} = \frac{100}{5{,}000{,}000} = 100\%$$

Examination of Stained Specimen. Preparation of specimen. 1. Cleanse the cover glass thoroughly with soap and water. Wipe dry.

2. Wash the edge of the ear with water, and thoroughly dry.

3. Quickly pierce the lower edge of the lobe of the ear with a clean surgical needle.

4. Wipe away the first few drops of blood.

5. Touch the centre of the cover glass, held by its edges, against the top of the drop of blood, avoiding the skin.

6. Drop this cover glass upon another clean cover glass. The blood should spread evenly between the two without any pressure.

7. Draw the cover slips apart, keeping their faces parallel. The blood films made thus should dry almost immediately, and are then ready to be stained.

Method of Staining. 1. Cover the specimen with five or six drops of Wright's modification of Leishman's stain for one minute.

2. Add two or three times the quantity of water, and let this diluted stain remain for two minutes, for malarial organisms, four minutes.

3. Wash in water until the preparation has a pinkish color. Extra washing with water tends to decolorize the basic staining elements and to bring out the red acid stain. It is useful in bringing out the red granules in malarial organisms.

4. Dry and mount.

By this method the presence of malarial organisms, leucocytosis, leukaemia, type of anaemia, abundance of blood plates, and the granular stippling of the red corpuscles may be determined.

Red Corpuscles. Variation in size (makrocytes and mikrocytes) and shape (poikilocytosis). Loss of color (achromia). Stippling. Polychromatophilia. Tendency toward a general increase or decrease in size.

Number of { Normoblasts / Megaloblasts } seen in one or more stained specimens while counting 250 white corpuscles.

White Corpuscles. Estimation of the number of white corpuscles by the number in microscopic fields as compared with the normal, whether number is increased or normal.

Differential count. Leucocytosis:—if present, variety.

Number of Neutrophiles (polynuclear).

Basophiles (lymphocytes, large mononuclear, transitional cells).

Eosinophiles. Increased in trichinosis, uncinariasis, some skin diseases and other conditions.

Mast cells.

Myelocytes (neutrophilic, eosinophilic).

Blood Plates. These appear with Wright's modification of Leishman's stain as round or oval bodies stained purplish, showing a mesh-work. They are one-third of the size of the red blood corpuscles, and often are found in clumps. A plate lying upon a red blood corpuscle may be mistaken for a malarial parasite.

Parasites. Malarial plasmodia are stained blue, with small red nuclear dots, and are found in the red corpuscles; collections of pigment are seen in the white corpuscles. Filaria appear stained light blue. Spirilla of Relapsing Fever stain blue.

Blood Count. Red Corpuscles. Draw the blood into the blood counter up to the mark 0.5 and dilute with Gower's solution up to the mark 101. Mix thoroughly. Count

the red corpuscles in twenty-five small squares at each of the four corners of the ruled field and multiply the total by 8,000. Repeat the count and take the average. This gives the number of corpuscles in a cubic millimetre.

White Corpuscles. Draw the blood into the blood counter up to the mark 0.5 and dilute with 0.5 per cent acetic acid up to the mark 11. Mix thoroughly. Count the corpuscles on the ruled field. Clean the slide and count again. Multiply the sum of these two counts by 100. The product is the number of white corpuscles in a cubic millimetre.

Examine another drop in case of considerable variation in the count of red or of white corpuscles.

Widal's Serum Reaction. Use a bouillon culture of Bacillus Typhosus twelve to twenty-four hours old. Examinations by high power dry lens or oil immersion lens should show the bacilli in active motion and unclumped.

Collect three or four drops of the blood to be examined in a small test-tube.

Mix nine drops of the typhoid culture and one drop of blood serum upon one end of a slide. Place four drops of water on the other end of the slide and add one drop of the 1:10 dilution and mix. Cover both the 1:10 and the 1:50 dilutions with cover slips. Drops of equal size may be obtained by using a platinum loop. Make controls by following above procedure except omit the blood serum.

The serum reaction is regarded as positive when there is complete clumping of the bacilli and absolute cessation of motility. The time limit for the test is one hour, although the agglutination frequently occurs within a few minutes. A reaction at 1.50 within one hour can be accepted as evidence of typhoid infection or antityphoid vaccination.

(If dried blood is employed for the test, it must first be mixed with drops of water, which can then be used in place of one drop of serum.)

Blood Cultures. The diagnosis of typhoid fever is earliest made by the detection of typhoid bacilli in the blood. To five c. c. of sterilized ox bile add two and one-half c. c. blood, removed under aseptic precautions, from a vein or

the ear. Incubate ten hours and then inoculate boullion or some other appropriate medium. After twelve hours' incubation typhoid bacilli should be easily demonstrated in the culture medium and their identity may be confirmed by the Widal reaction. During the first week the bacilli can be recovered from the blood in ninety to one hundred per cent of the cases, but in the second week in only fifty to sixty per cent.

Serum Reaction for Syphillis. The complement fixation test of Wassermann is of the greatest value in determining a previous syphilitic infection. This test can be made satisfactorily only by one trained in its use.

SPUTUM.

Origin. May be from mouth, nose, pharynx, larynx, lung (or stomach), one or more or all. Note source, whether hawked or coughed.

Quantity. The quantity expectorated in twenty-four hours may vary within wide limits,—small, as in beginning tuberculosis of the lungs, or large, as in chronic bronchitis or bronchiectasis.

Odor. Ordinarily there is no odor to sputum. Under certain circumstances, however, as in abscess or gangrene of the lungs, the odor may be foetid and disagreeable.

Sputum for examination should be coughed up, not hawked. It is sometimes difficult to obtain, especially in the case of young children. It will then be found of service to insert a swab into the pharynx. As a result of the irritation the sputum will be raised and can be removed upon the swab before it is swallowed.

MACROSCOPIC EXAMINATION.

Amount.

Inspection. Sputum may be,—

(*a*) Mucous: viscid.

(*b*) Purulent: seen in pure form only in bronchiestasis and in perforation into the lungs or bronchi of foci of pus, such as abscess of the lung or empyema.

(*c*) Muco-purulent: most common form and not characteristic of any particular condition.

(*d*) Serous: thin, often slightly red in color (blood) and frothy (pathognomonic of acute pulmonary oedema).

(*e*) Nummular: common in tuberculosis of the lungs.

(*f*) Hæmorrhagic: seen especially in phthisis, pneumonia, epistaxis, abscess of the lung, hæmorrhagic infarction, new growths and passive congestion.

(*g*) Tenacious as in pneumonia,—adheres to inverted cup.

Color may be,—

(*a*) Rusty or orange-juice: common in pneumonia. Prune-juice: occasional in pneumonia, cancer of the lung.

(*b*) Grass-green: rare, in pneumonia combined with jaundice.

(*c*) Black or gray: from substances inhaled, as carbon, or colored by food, as chocolate, berries, wine or by tobacco.

(*d*) Reddish yellow: from rupture of abscess of the liver into the lung.

MICROSCOPIC EXAMINATION.

Important Constituents.

(*a*) Bacteria:

1. Tubercle bacillus. Influenza bacillus. Bacillus mucosus capsulatus. Acid-proof bacillus (in gangrene). Pneumococcus. Streptococcus.

2. Actinomyces granules.

(*b*) Elastic fibres: in all destructive processes of the lungs; phthisis, gangrene, abscess.

Unimportant Constituents.

(*a*) A few leucocytes.

(*b*) A few red blood corpuscles.

(*c*) Alveolar epithelial cells, often containing fat and carbon.

(*d*) Squamous and cylindrical cells.

(*e*) Various bacteria.

(*f*) Particles of food.

Tubercle Bacillus. By means of a small pair of forceps or a stiff platinum wire select from the sputum purulent or cheesy particles and smear the same on the cover glass.

1. The cover glass preparation should be spread thinly, dried, holding in the forceps, over the flame of a Bunsen burner and fixed by passing three times through the flame while held with cover glass forceps.

2. Cover the preparation thoroughly with carbolic-fuchsin solution and steam over the flame during thirty seconds to one minute. Do not allow the staining solution to dry on the surface of the cover glass, but add more stain if necessary.

3. Wash in water.

4. Decolorize for twenty seconds in twenty per cent sulphuric acid, or thirty-three per cent nitric acid.

5. Wash in water.

6. Wash for thirty seconds or until no more color will

come out, in 95 per cent. alcohol. If specimen is still distinctly red, it may be returned for a few seconds to the acid and then to the alcohol as before.

7. Wash in water.

8. Cover the preparation with Löffler's methylene-blue solution for thirty seconds.

9. Wash in water and mount.

Tubercle bacilli are bright red, nuclei and other bacteria are blue.

Pneumococcus and Bacillus Mucosus Capsulatus. These may often be recognized by their morphology and by the possession of a capsule. Special staining methods for capsules do not give constant results and are probably no more trustworthy than the simple staining with Löffler's methylene-blue solution. If the preparation be mounted in water instead of in balsam the capsules are often visible as hyaline zones about the bacteria.

Pneumococcus. The pneumococcus may, however, be recognized with a fair degree of certainty, even if its capsule is not demonstrable. Probably the most satisfactory method is that of Gram. The pneumococcus will then be stained blue black with its more or less characteristic morphology well shown.

Gram's Method of Staining. 1. Smear the cover glass as thinly as possible.

2. Cover with Stirling's gentian violet or aniline-methyl-violet and heat to steaming point.

3. Wash in water.

4. Cover with IKI solution for thirty seconds.

5. Wash in 95 per cent alcohol until the blue color ceases to come out.

6. Counterstain with Bismarck brown for thirty seconds.

7. Wash in water and mount.

Influenza Bacillus. Influenza bacilli are the smallest bacteria found in the sputum. They are very small short rods. Their middle portions sometimes do not stain and thus appearances are presented suggestive of small diplococcus forms. They do not stain by Gram's method. For diagnosis they should be present in large numbers, both inside and outside of leucocytes.

Method of Examination for Influenza Bacilli. Make cover glass preparations from a purulent particle of the sputum, spreading it thinly. Stain with Löffler's solution of methylene-blue, heating to the steaming point. Then wash in water and mount. When bacteria resembling influenza bacilli are present, stain a similar cover glass preparation by Gram's method and counterstain with Bismarck brown.

The influenza bacilli will appear faintly brown stained instead of stained blue black as in the case of the pneumococcus.

Elastic Fibres. 1. Heat equal parts of 10 per cent NaOH and sputum in the water bath till clear.

2. Centrifugalize or collect in a conical glass.

3. Examine sediment microscopically. (Caution must be used against mistaking various forms of artefacts for elastic tissue.)

4. Wash sediment free from the alkali by centrifuging several times with water. Then stain with Weigert's elastic tissue stain.

Examination of Serous Fluids.

Cerebro-spinal Fluid. Note rate of flow from needle used in lumbar puncture. Note the clearness or turbidity. Examine sediment for leucocytes. Stain sediment and determine differential count of leucocytes. Stain sediment for bacteria, such as meningococcus, bacillus tuberculosis, etc. Special tests for syphillis.

Exudates and Transfusions in Pleural or Peritoneal cavities. Color. Pale, straw, orange, red, opalescent, bile stained (iodine test).

Specific gravity. Effusions 1008-1018. Exudations 1016-1026.

Albumin. Effusions 0.2 per cent to 2.0 per cent. Exudations, 2.0 per cent to 6.0 per cent.

Nucleo-proteid and Mucin. Serous fluids give a marked precipitate with acetic acid. Note the amount of fibrin (clot).

Sediment. The sediment of exudates shows leucocytes, —that of transfusions shows a few epithelial cells, granules of fat, cholesterin.

Cyto-diagnosis. 1. Place fluid in thoroughly clean centrifuge tubes and centrifugalize at least five minutes.

2. Pour off supernatant fluid by inverting the tube.

3. Suspend the sediment in the remaining drops of fluid by stirring with platinum loop.

4. Spread a drop of the mixture on a perfectly clean cover-slip with the platinum loop.

5. Allow the preparation to dry spontaneously. (Do not heat.)

6. Stain with a fluid made as follows:

Wright's modification of Leishman's stain, 3 parts.

Pure methyl alcohol, 1 part.

Allow this to remain on the preparation from twenty to forty-five seconds, then dilute it with eight or ten drops of water and allow it to stand one or two minutes.

7. Wash carefully with water.

8. Dry over a flame, holding the cover-slip in the fingers.

9. Mount in cedar oil or xylol balsam and examine with an oil-immersion lens.

Bacteria as well as cells are stained by this method.

Gastric Contents.

A—Contents of Fasting Stomach.

Contents of fasting stomach are generally to be obtained in the morning by expression with the tube—water should not be used to wash out contents. In normal conditions a few c. c. (10-20 c. c.) of clear fluid are obtained. This may or may not contain HCl. The sediment under normal conditions is very slight in amount, showing a very rare food granule of starch or fat, sometimes a few cells or leucocytes, yeast and bacteria.

Examination. 1. **Amount and character of contents.** Amounts over 50 c. c. indicate hypersecretion, stasis, or gastritis. The presence of a sediment of food elements means stasis. Fresh blood may give a red color, changed blood may give a brown color, and bile gives a green color. Odor. The odors of butyric and acetic acids are characteristic of fermentation.

2. **Sediment.** The presence of more food particles than found in the normal means stasis. Great numbers of epithelial cells suggest gastritis. Numerous low organisms as bacteria, yeast, sarcinae may be present in stasis. Sarcinae always means stasis. When the contents separates into three layers, the lower consists of partially digested food, the middle of a rather thin liquid, while the upper is made up of froth due to gas liberated by the active fermentation, and contains mucus and light fragments of food. The marked formation of these three layers is suggestive of dilation of the stomach.

3. **Mucus.** In "catarrh" of the stomach, especially in chronic gastritis, the contents often is mixed so intimately with an abundant quantity of mucus that it pours like thick syrup or glue. Strings of mucus from the mouth are often present in any condition, floating on the surface.

4. **Blood.** Fresh blood in amount colors the contents. Any marked amount suggests ulcer or cancer. Blood streaks are sometimes present as a result of the action of the stomach tube on the membrane. Blood in the stomach may come from the lungs or throat.

5. **Test for Blood** where no fresh blood or blood streaks are present—"Occult bleeding." Guaiac test. To 10 c. c. of gastric contents in a test tube add one-third quantity of commercial strong acetic acid or 2 c. c. of glacial acetic acid and 15 c. c. of ether. Insert cork and invert several times. After the ether has separated, decant. Add this ethereal solution to a mixture of 10 drops of freshly prepared tincture of guaiac and 30 drops (2 c. c.) hydrogen peroxide. A blue color under these conditions indicates the presence of blood.

The following are the most important sources of error in the interpretation of this test: (1) blood from the mouth, throat or lungs; (2) blood caused by the irritation of the tube; (3) fish, meat or its extracts; (4) bile.

6. **Lactic Acid.** Gastric contents should be examined at once, as lactic acid readily develops if the contents are left for some time in a warm place. Lactic acid is seldom found in the presence of free HCl. Dilute a solution of ferric chloride to a very faint yellow color with water. Fill the concavities of two test-tubes with this solution, using one for comparison. An intensification of the yellow color on addition of gastric contents indicates lactic acid with considerable certainty. A negative test rules out lactic acid.

When the lactic acid test is positive it may be confirmed as follows: Add two drops of HCl to 10 c. c. of gastric contents and shake with 10 c. c. of ether; decant the ether and add it to one-third of a test tube of very dilute aqueous solution of ferric chloride. A greenish yellow color at the junction of the liquids shows the presence of lactic acid.

B—Contents of Stomach After a Meal.

Test Breakfast (Ewald) consists of one large slice of bread and a glass and a half of water. Express at end of one hour by means of the tube.

In expressing the contents, avoid dilution with water or saliva.

Examination 1. **Amount and character.** The quantity in the normal as a rule is from 50 to 125 c. c. Larger amounts suggest hypersecretion or hypomotility. In

hypersecretion the proportion of fluid to sediment is excessive. The food elements should be in fine particles. In achylia the bread appears as in a mixture of bread and water unchanged by any digestion.

2. **Reaction.** The reaction in the normal is acid to litmus. Acid reaction may be due to free HCl, combined HCl (proteids), acid salts or organic acids.

3. **Presence of Free HCl.** Free HCl should be present.

Tests. Günzburg's. Gently heat a drop of contents on porcelain plate and while heating (not boiling) add a drop of Günzburg's reagent. A deposit of red crystals shows the presence of free HCl. This test gives no color with organic acids.

Töpfer Test. To 5 c. c. of contents add 3 to 6 drops of a 1 per cent alcoholic solution of Töpfer's reagent. A carmine red color shows a free mineral acid, i. e., free HCl. Pink or orange color may be due to traces of free HCl or to organic acid combinations.

O O Tropaeolin. Gently heat a drop of contents on plate and add a drop of a saturated alcoholic solution of O O Tropaeolin. A blue or violet color shows free HCl.

Congo red paper turns blue in the presence of 0.01 per cent free HCl. As, however, it gives a purple color with organic acid and salts it is not a reliable agent for testing for traces of HCl.

Quantitative estimation of free HCl, and the total acidity.

Free HCl. To 10 c. c. unfiltered gastric contents add three to four drops of a solution of Töpfer's reagent. Titrate with a decinormal $\left(\frac{N}{10}\right)$ NaOH solution until the disappearance of the carmine red color. This point represents the neutralization of the free HCl in the contents used. To estimate the quantity of free HCl multiply the number of c. c. of $\left(\frac{N}{10}\right)$ NaOH used in this titration by 10. This gives the amount of free HCl in 100 c. c. gastric contents in terms of $\left(\frac{N}{10}\right)$ NaOH. This is the simplest method of recording the acidity. The result may be expressed in per cent of HCl if the above quantity is multiplied by 0.00365 (the quantity of HCl which

is neutralized by 1 c. c. $\left(\frac{N}{10}\right)$ NaOH). The normal quantitative values of free HCl vary between 0.07 and 0.18 per cent, or 20 to 60 c. c. $\left(\frac{N}{10}\right)$ NaOH per 100 c. c. gastric contents.

(If extreme accuracy is desired, the titration may be repeated with another portion of gastric contents, adding NaOH until the carmine red color of Töpfer's reaction becomes pink to orange and then establishing end point by testing drops on a plate with O O Tropaeolin until the reaction fails.)

Total acidity. To the same contents in which the free HCl has already been neutralized add two or three drops of a one per cent solution of phenolphthalein. Continue the titration with the $\left(\frac{N}{10}\right)$ NaOH solution until a permanent red color is obtained. This represents the neutralization of all the acid constituents of the contents (the free mineral and organic acids and the combined acid). To estimate the total acidity multiply the number of c. c. of $\left(\frac{N}{10}\right)$ NaOH used from the beginning of titration up to this point by 10. This gives the total acidity of 100 c. c. gastric contents in terms of $\left(\frac{N}{10}\right)$ NaOH. The result may be expressed in per cent HCl by multiplying the above quantity by 0.00365. The normal quantitative values of total acidity vary between 0.15 and 0.30 per cent, or 40 to 80 c. c. $\left(\frac{N}{10}\right)$ NaOH per 100 c. c. gastric contents.

Combined HCl may be present where free HCl fails. This can be tested for by Ewald Sjoqvist test.

Vomitus. Vomitus may be subjected to the same tests as gastric contents obtained by the above methods. Blood or positive blood tests in vomitus have the same significance as in expressed contents if meat is absent. Sarcinae in vomitus are positive evidence of stasis. Presence of food here has no significance as to stasis. Tests for free HCl are significant if positive, but the absence of free HCl is not necessarily significant as in test meal contents.

Intestinal Contents.

Obtain faeces without artificial aid, as cathartics or enema.

Quantity and Frequency. Dejections vary according to habit and the character of the food; weight is normally 120-250 g. In starvation they are reduced to a minimum. Stools may be numerous but without fæcal matter. In diarrhœa from the lower colon (dysentery) the stools are small and frequent; in that from the small intestine or upper colon—large, but relatively infrequent.

Consistency and Form. The longer the stools remain in the rectum, the harder and dryer they become. Frothy stools are indicative of excessive intestinal fermentation.

Reaction. Normally neutral, faintly acid or alkaline. The superficial reaction is often different from that of the central portion. Cholera and typhoid stools are alkaline. Carbohydrate and milk diets give an acid reaction.

Color. The normal brown color is due to hydrobilirubin (urobilin). Infants' stools are normally bright or golden yellow. On standing they may soon change their color. Color varies with,—

1. Food—light with milk or bread; dark, with blackberries, red wine and exclusive meat diet, etc.; green with green vegetables.
2. Drugs—green, calomel; black, bismuth; black, iron—though perhaps only on standing.
3. Blood. If originating in stomach 500 c. c. give tarry stools.
4. Bile—clay-colored from diminished secretion or obstruction to the flow of bile and also from unabsorbed fat. The green color of stools depending on bile is pathological and is due to bilirubin.

Odor. Of importance in infants. Normally slightly sour. Foul in proteid putrefaction. Sour in acid fermentation. Odorless in cholera infantum.

Bile. The presence of bile in the stools may be determined by the following test: Mix thoroughly a portion of fæces, equivalent to a walnut in size, with 100 c. c. of a concentrated aqueous solution of corrosive sublimate. Set aside for twenty-four hours in a wide-mouthed covered glass dish. All particles containing hydrobilirubin

are colored red, while simultaneously all particles with bilirubin assume a green shade.

Mucus. Mucus in the stools is as a rule indicative of inflammation of the large intestine. It may occur as jelly-like particles intimately mixed with the faeces, seen in acute colitis and dysentery, or as membranous flakes and shreds, seen in chronic colitis and especially in the type known as "colica mucosa." It is recognized microscopically as follows: Under the microscope the mucus particles show no structure, and can thus be distinguished from gelatinous food particles which may resemble mucus macroscopically. The particles or shreds often contain numerous epithelial cells ("mucous colitis") or masses of leucocytes (acute colitis and dysentery).

Blood. Fresh blood may occur in the faeces from haemorrhoids, in dysentery or acute colitis, or from ulcer of the intestine. It may be recognized by the color which it gives to the stool or in many cases only by the finding of the corpuscles in microscopic examination. If the blood comes from high up in the alimentary tract it is often changed, giving a dark color to the faeces,—often giving the so-called "tarry stool." In such cases its presence is recognized by the guaiac test. (See p. 29.) Blood may often be present to this test where no suggestion of its presence is given by the color of the faeces. This is called "occult bleeding."

In cases of occult bleeding where a positive blood test is obtained it is best to exclude meat from the diet, especially where diarrhoea is present, and repeat the test.

Pus. Considerable amounts come from abscesses which rupture into the large intestine. Pus from above the caecum is usually digested. Numerous leucocytes in the faeces indicate inflammation of the intestine. In dysentery the small numerous stools often consist entirely of mucus, pus and blood.

Tubercle Bacilli. The diagnosis of intestinal tuberculosis is only justifiable when the tubercle bacilli are present in flocculi of mucus which have been isolated from the stool and washed in water.

Intestinal Parasites. The commoner parasites are: Amoebae; round worms (ascaris); hook worms (unci-

naria); pin worms (oxyuris); whip worms (trichocephalus); tape worms; beef (taenia mediocanellata or saginata; this worm has a pigmented head); pork (taenia solium, very rare; this worm has hooklets about the head); fish (dibothriocephalus latus; this worm has pigmented rosettes); strongyloides intestinalis.

When these parasites occupy the intestinal tract, it is usual to find in the stool the eggs of the round worm, hook worm, pin worm or whip worm; segments of the tape worm; or embryos of the strongyloides.

Food Elements. Masses of food, as portions of vegetables, masses of meat, cellulose grains, as corn, potato, grain, etc., can often be seen macroscopically. Microscopically, muscle fibre, cellulose grains of vegetables, starch granules, fat in the form of neutral fat drops, splinters of fat substance, masses of calcium and magnesium soap can be distinguished. Food elements of all kinds are present in increased quantity in most conditions of diarrhoea from any cause (except acute dysentery). Curds are frequently seen in infants' stools. They are of two kinds. The small, soft curds indicate a disturbance in the utilization of fat. The firm curds consist mostly of proteid substance (casein).

Information in regard to the functional capacity of the alimentary tract for the digestion and absorption of food elements as fats, starch, meat, may be obtained by the study of the food elements in the faeces. For the purpose of this study it is best to use a special or "test" diet. By comparing the findings in food elements in the faeces on this diet with those found in normal cases under a similar diet, abnormalities in the utilization of the various forms of food can be recognized.

A simple test diet is the following:

7 A. M. One pint of milk, one slice and a half of dry toast.

10 A. M. One pint gruel. Gruel sufficient for the day is prepared from two gills of oatmeal, one pint of milk, two and one-half tablespoonfuls of butter, two eggs, one pint of water. Strain after cooking.

12.30 P. M. One-fourth pound of chopped steak broiled rare with two-thirds of a tablespoonful of butter. Serve on toast. Mashed potato, made with potato, milk, and a tablespoonful of butter.

4 P. M. Same as 7 A. M.

7 P. M. Same as 10 A. M.

Method of Examination. The whole mass of faeces is thoroughly stirred. A small portion is rubbed up with a pestle in an evaporating dish or mortar, adding sufficient water to obtain a thick liquid. Pour out a thin layer upon a black plate. Examine macroscopically and microscopically.

With the above diet in normal conditions no large macroscopic food masses should appear. Under the microscope a few muscle fibres well rounded with faint striae are present. No free starch is present. A few cellulose grains containing starch may be present. Fat appears in the form of masses of calcium or magnesium soap.

In abnormal conditions muscle fibres may be more numerous and less digested, as in disease of the pancreas. Free starch may be present, especially in infants where starch digestion is abnormal. Cellulose elements may be in excess. Forms of fat not normally seen, as neutral fat drops, crystals and splinters of fat in excessive quantity may be present.

The detection of starch may be aided by adding a drop of IKI mixture to a specimen. The detection of neutral fat may be aided by adding a drop of an alcoholic solution of Soudan III to the specimen.

VENEREAL LESIONS; MUCOUS PATCHES, Etc.

Lesions of these types should be scraped superficially and the exuded serum examined for the spirocheta (pallida) of syphilis. The most satisfactory method of examination is by means of the dark field illumination apparatus used on a fresh drop of serem under a cover glass. Smears may be made, dried and stained with Wright's modification of Leishman's stain. With this the spirochetae stain red.

Apparatus and Chemical Reagents.

Stethoscope.
Microscope with oil immersion.
Centrifugal Machine.
Blood Counter.
Sahli or other Haemoglobinometer.
Tallqvist's Haemoglobin Scale.
Cover glasses and slides.
Burette.
Forceps.
Graduate.
Specific Gravity Bulb.
Squibb's Urea Apparatus.
Test-tubes.
Red and Blue Litmus.
Congo paper.

Nitric Acid—conc.
Sulphuric Acid—conc.
Hydrochloric Acid—conc.
Glacial Acetic Acid.
Commercial Strong Acetic Acid 33-36%.
Dilute Acetic Acid 0.5%.
Sodium Nitrite 0.5%.
Ammonium Hydrate.
Sodium Hydrate, Decinormal Solution.
Sodium Hydrate.
Sodium Nitro-prusside.
Ferric Chloride (strong aqueous solution).
Iodine Solution (Tr. Iodine, 1; Alcohol, 15).
Silver Nitrate Solution 1:8.
Sodium chloride, saturated aqueous solution.
Corrosive Sublimate, saturated aqueous solution.
Lead Acetate, 20%.

Fehling's Solution. Dissolve 34.64g. pure $CuSO_4$ in water and make up to 500 c. c. Dissolve 173 g. Rochelle Salts and 60 g. Sodium Hydrate each in 200 c. c. water and mix, and then make up also to 500 c. c. 5 c. c. of each sol. are used for the test.

Nylander's Reagent. Dissolve 4 g. Rochelle Salts in 100 g. 10% Sodium Hydrate and heat at a slow temperature on the water bath with 2 g. Bismuth Subnitrate until as much Bismuth as possible is dissolved.

Sulphanilic Acid. Solution for Diazo reaction. Make a saturated solution of sulphanilic acid in a solution of hydrochloric acid 50:1000.

Bromine Solution for Urea: Bromine, 30 g.; Sodium Bromide, 30 g.; Water, 240 c. c.

Sodium Hydrate Solution for Urea: NaOH, 100 g.; Water, 250 c. c.

Concentrated Hydrochloric Acid containing 0.4 g. ferric chloride in 100 c. c.

IKI Solution: Iodine, 1 g.; Potassium Iodide, 2 g; Water, 300 c. c.

Bismarck brown (saturated aqueous solution).

Alcohol 95%.

Gower's Solution: Sodium Sulphate, 7 g; Acetic Acid, 20 g.; Acquae, 120 c. c.

Wright's modification of Leishman's Stain. To 100 c. c. of 0.5% aqueous solution of Sodium Bicarbonate add 1% of Methylene-blue. Steam in an Arnold sterilizer for one hour. When cold, stir into the unfiltered mixture 500 c. c. of a 1% aqueous solution of Eosin. Filter and dry the precipitate without washing. Make a saturated solution of this precipitate in absolute methylic alcohol. Filter and add 25% of absolute methylic alcohol.

Löffler's Methylene-blue.

Carbolic-fuchsin: Carbolic acid crystals, 5; Fuchsin, Saturated Alcoholic Solution, 10; Water, 100.

Methylene-blue (saturated aqueous solution).

Stirling's solution of gentian-violet. Gentian-violet, 5 g.; Alcohol, 10 c. c.; Aniline, 2 c. c.; Water, 88 c. c. This solution keeps well.

Aniline-methyl-violet may be made up in the same way as Stirling's gentian violet by substituting methyl-violet for the gentian violet.

Günzburg's Reagent. Phloroglucin, 2 g.; Vanillin, 1 g.: Alcohol, 30 g.

Töpfer's Reagent. Dimethyl-amido-azo-benzol 0.5 per cent alcoholic solution.

Phenolphthalein. 1.0 per cent alcoholic solution.

Hydrogen Peroxide.

Tincture Iodine.

Gum Guaiac.

Chloroform.

Ether.

Apparatus and Chemical Reagents may be obtained of F. H. Thomas Co.