

**Outlines of medical diagnosis : prepared for the use of students at the Harvard Medical School.**

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OUTLINES OF

MEDICAL DIAGNOSIS

1911



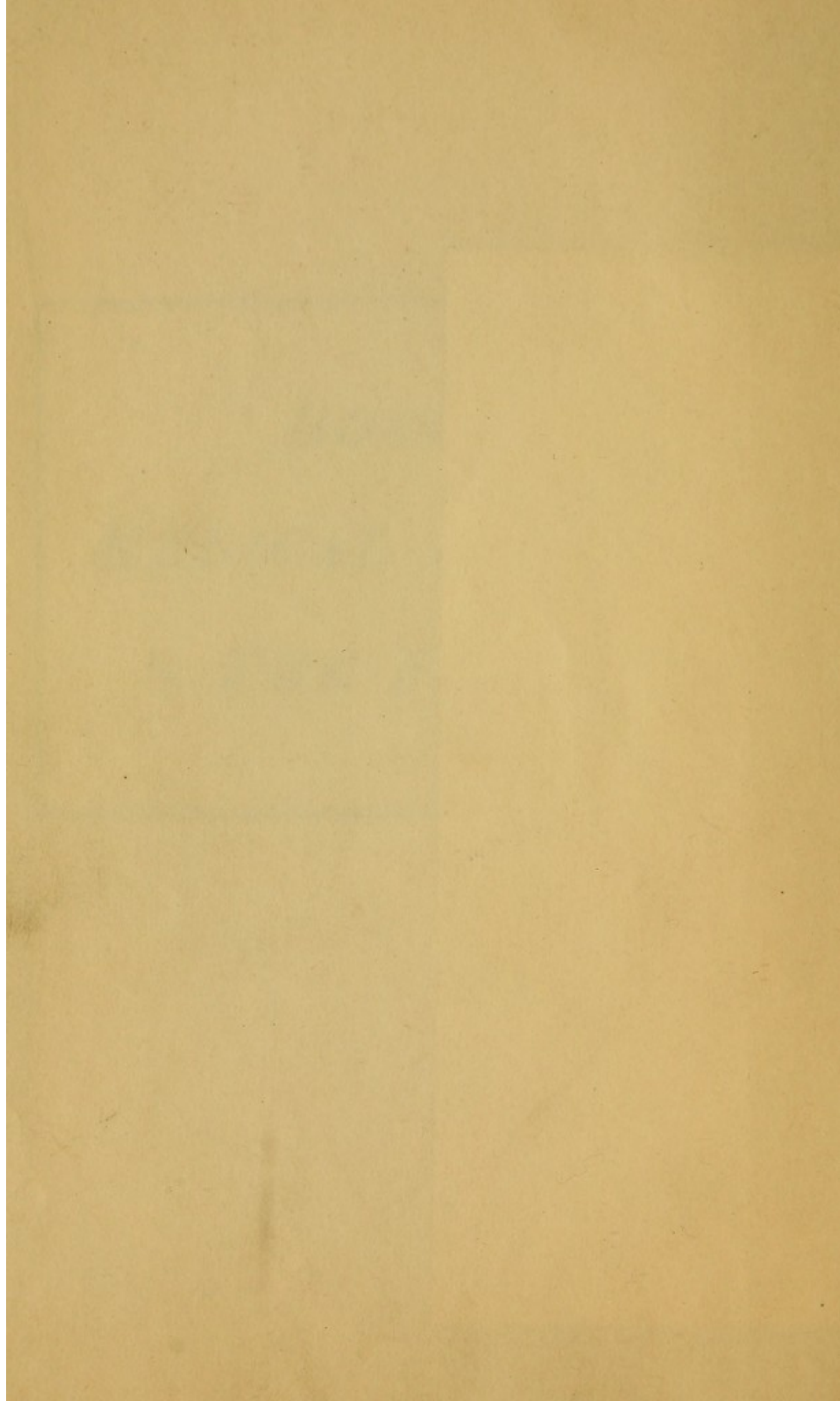
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# OUTLINE

## MEDICAL DICTIONARY

THE  
MEDICAL  
DICTIONARY





OUTLINES  
OF  
MEDICAL DIAGNOSIS.

PREPARED FOR THE USE OF STUDENTS,  
*unit* AT THE  
HARVARD MEDICAL SCHOOL, BOSTON.

1911.

SIXTH EDITION.

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1911.

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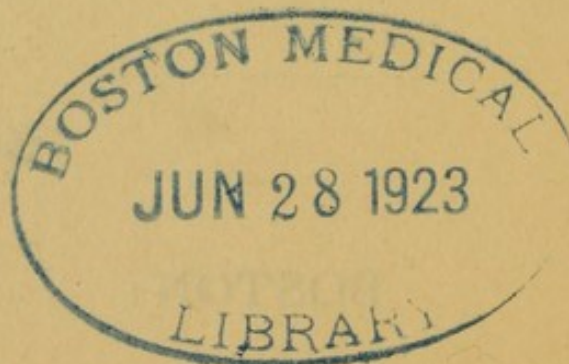
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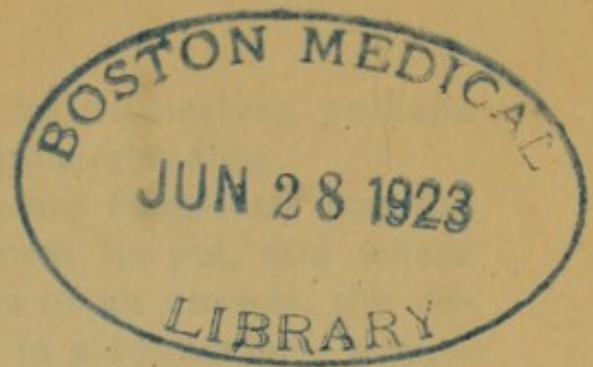


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## THE HISTORY.

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**N**OTE 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



JUL 28 1923

## THE HISTORY

NOTE: The title of the present work (issued in 1911) was, "The History of the Nervous System" (London: H. K. Lewis, 1911). The title of the present work (issued in 1923) was, "The History of the Nervous System" (London: H. K. Lewis, 1923).

The history of the nervous system is a subject of great interest and importance. It is a subject which has attracted the attention of many of the greatest minds of the world. The history of the nervous system is a subject which has attracted the attention of many of the greatest minds of the world.

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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, lung 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 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-



not likely to be accurately stated by the patient, and  
from that, consideration of the patient's history.  
General questions as to history and physical  
findings. The patient's history should be taken  
and it is doubt of the reliability of an answer, the  
doubt information may be obtained in a satisfactory  
way, patients will admit that parents have had "nervous  
breaks" 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 with  
a person or in the neighborhood with a tuberculous individual.  
Important diseases often are forgotten by patients in  
giving the general history, therefore it is well to ask  
specifically regarding the commonest tuberculous lesions,  
lung (see questionnaire), kidney, bones, joints, etc.  
Inquiries should be made concerning the use of  
drugs, tobacco, tea, coffee, etc. In general the times and  
the methods of eating and sleeping. Inquiries about over-  
work and mental strain should be made and mental  
history and as a rule the same applies to general dis-  
ease. Occasionally patients' conditions with regard to  
general diseases are often poor. A patient will admit  
to a "strain" or "strain" in the past or perhaps a "strain"  
will then, however.

Present Illness. The first question should always relate  
to the first symptoms and the time of its occurrence. The  
sequence of subsequent symptoms should be carefully in-  
vestigated. The patient's answers often suggest other  
diseases 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  
many individual symptoms (e.g., abdominal pain, etc.)  
should be assigned according to their significance and  
order of onset, frequency, duration, character and severity.  
The next fact of a patient's history is the extent of his  
illness. It is important to note the general condition  
of the patient at the time and place. Always remember the  
importance of the patient and the condition of the

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.       |
| 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 when symptoms are more distinct than in  
 condition of fatigue.  
 It is necessary to include in the history a few general  
 questions concerning the general progress of the disease  
 especially about its onset and date for the history of the  
 patient, right away, how at present progress of the  
 disease and also questions about the function of the  
 various systems not included in the patient's present  
 statement.

(a) Digestive. Appetite, nausea, vomiting, diarrhea,  
 loss of appetite, constipation.  
 Respiratory. Cough, expectoration, pain in chest,  
 dyspnea.  
 Circulatory. Shortness of breath, palpitation,  
 edema.  
 Nervous. Headache, convulsions, paralysis.  
 Urinary. (1) Renal: headache, amount of urine,  
 edema.  
 (2) Vesical: dysuria, retention, etc.  
 Genital. (1) Male: impotence, abnormal  
 discharge.  
 (2) Female: abnormal discharge, etc.

In making the subsequent course of the disease to deter-  
 mine improvement of the various questions should be di-  
 rected in accordance with the above inquiry. Do not be  
 satisfied with general statements. Inquire especially as

## \*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 (alcoholic), 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.

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

**Temperature.** Mouth, axilla or rectum.

\*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.



# GENERAL EXAMINATION OF THE BODY.

General Observations. Position of the body and limbs.

Skin, Mucous Membranes and Subcutaneous Tissues. Hair, Nails (fingernails, toenails), Eyebrows, Eyelashes, Ears, Nose, Mouth (lips, tongue, throat), Throat, Larynx, Trachea, Bronchi, Lungs, Heart, Liver, Gall-bladder, Stomach, Intestines, Kidneys, Bladder, Uterus, Vagina, Penis, Testes, Prostate, Spermatic Cord, Epididymis, Seminal Vesicle, Utricle, Bulbourethral Gland, Penile Urethra, Anal Canal, Rectum, Sigmoid Colon, Cecum, Caecum, Appendix Vermiformis, Spleen, Pancreas, Adipose Tissue, Glands (thyroid, parathyroid, thymus, pituitary, pineal, adrenal, thyroid, parathyroid, thymus, pituitary, pineal, adrenal).

General Observations. Position of the body and limbs.

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## 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).

**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 bicuspid; 10 years, four bicuspid; 11 years, four canines; 12 years, four molars; 17-25 years, four wisdom teeth. Total, thirty-two.

**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.

**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.



10  
The chest is examined by inspection, palpation, percussion, and auscultation. The lungs are examined by inspection, palpation, percussion, and auscultation. The heart is examined by inspection, palpation, percussion, and auscultation. The abdomen is examined by inspection, palpation, percussion, and auscultation.

## HEART

**Inspection.** The shape of the chest, the position of the heart, the position of the lungs, the position of the diaphragm, the position of the stomach, the position of the liver, the position of the spleen, the position of the kidneys, the position of the bladder, the position of the uterus, the position of the ovaries, the position of the prostate, the position of the testis, the position of the penis, the position of the scrotum, the position of the anus, the position of the rectum, the position of the sigmoid, the position of the colon, the position of the small intestine, the position of the large intestine, the position of the stomach, the position of the liver, the position of the spleen, the position of the kidneys, the position of the bladder, the position of the uterus, the position of the ovaries, the position of the prostate, the position of the testis, the position of the penis, the position of the scrotum, the position of the anus, the position of the rectum, the position of the sigmoid, the position of the colon, the position of the small intestine, the position of the large intestine.

## LUNGS

**Inspection.** The shape of the chest, the position of the heart, the position of the lungs, the position of the diaphragm, the position of the stomach, the position of the liver, the position of the spleen, the position of the kidneys, the position of the bladder, the position of the uterus, the position of the ovaries, the position of the prostate, the position of the testis, the position of the penis, the position of the scrotum, the position of the anus, the position of the rectum, the position of the sigmoid, the position of the colon, the position of the small intestine, the position of the large intestine.

## ABDOMEN

**Inspection.** The shape of the abdomen, the position of the heart, the position of the lungs, the position of the diaphragm, the position of the stomach, the position of the liver, the position of the spleen, the position of the kidneys, the position of the bladder, the position of the uterus, the position of the ovaries, the position of the prostate, the position of the testis, the position of the penis, the position of the scrotum, the position of the anus, the position of the rectum, the position of the sigmoid, the position of the colon, the position of the small intestine, the position of the large intestine.



**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).

**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 (vesiculæ 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, meningitis, 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.
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 colon.





## 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 Rectum.**

**Examination of Genitals and Bladder.**

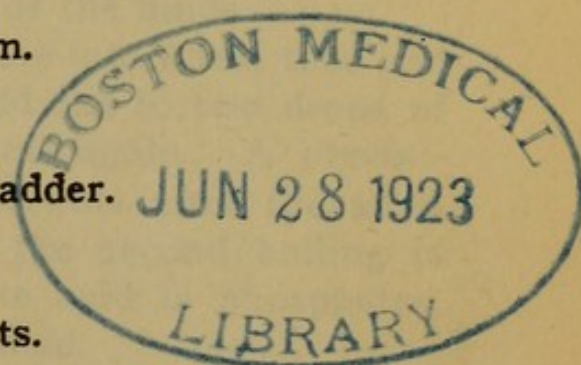
**Examination of Urine.**

**Examination of Sputum.**

**Examination of Gastric Contents.**

**Examination of Faeces.**

**Examination of Blood.**



# GENERAL ORDER OF EXAMINATION

State and Development of Bones.  
 State of Nutrition. Muscles, tendons, ligaments, weight.  
 Characteristics of the Skin.  
 Position of the Body.  
 Mental Condition.  
 Temperature.  
 Head. Skull, facial expression, eyes, ears, nose, lips, teeth.  
 Neck. Larynx, thyroid gland, carotid arteries, jugular veins.  
 Thorax. Inspection: symmetry of respiration, tactile fremitus, percussion of the lungs, auscultation of the lungs.  
 Heart: location of cardiac apex, by inspection and palpation; rhythm and palpation; murmurs elsewhere on the surface of the thorax, and in epigastrium; palpation of precordial, percussion of the cardiac area; 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.

Genitalia.

Spine.

Examination of Nervous System.

Examination of Larynx.

Examination of Nostrils.

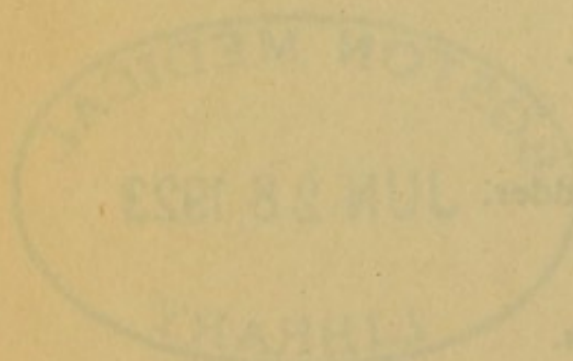
Examination of Genitals and Bladder.

Examination of Uterus.

Examination of Prostate.

Examination of Uterus.

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



the test, while nearly abundant does. There were a few  
five white and test is placed, and no precipitate occurs  
with this test, the possible presence is usually noticed by  
this.

An experiment was made by the quantity of albumin can be  
obtained by performing the heat test without the addition  
of salt solution, and then allowing the albuminous precipi-  
tate to settle. Albumin, amounting to two or three per  
cent of the fluid, was converted into a compact coagu-  
lum. The part of the coagulated albumin occupies  
half the volume of water, the rest being present in the  
the solution, and is not present in the test tube. The  
coagulum is not even the bottom of the test tube is  
covered. The coagulum is not even the bottom of the test  
tube, but no precipitate. The heat test with phos-  
phoric acid, the fluid is placed in a test tube, and  
quantitative estimation. It is not a very accurate method,  
but serves for making comparative amounts.

Heine-Jensen's Test. (Albumin). Perform the heat test  
for albumin as above described. The appearance of a  
heavy precipitate which settles on heating the  
fluid albumin. If albumin is present a cloud will  
appear in the fluid on cooling. The precipitate formed  
with phosphoric acid is due to albumin, disappears with heat.  
Test of serum albumin does not.

Sugar's Test. A. Reibner's Test. Boil to 5 c.c.  
in a test tube. Add slowly 5 c.c.  
of water. Separate in two portions in two test tubes. Put  
one aside and boil the other. The presence of sugar is  
shown by the appearance of a red and yellowish precipi-  
tate. A precipitate occurring in the mixture set aside  
without further heating is sugar. A trace may take 15  
minutes to several hours in separating. If precipitate falls  
in color to sediment boiled sugar is absent. A precipitate  
forming with boiling may or may not be sugar. The case  
of doubt do phenylhydrazine test or ferment test for as  
four and do Reibner's test after fermentation. If no  
precipitate after the first separation was due to sugar.  
B. Sugar's Test. Add a c.c. of Reibner's reagent to  
5 c.c. urine in a test tube. Boil 5 or 10 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),<sup>1</sup> 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.

**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.

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

1. See page 34







**Urea.** Amount in twenty-four hours. The per cent can be determined by Squibb's method, which is not trustworthy, however, in diabetes.

**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. 26).

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

**Tubercle Bacilli in Urine.** 1. Centrifugalize, decant, dilute with water, recentrifugalize 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.

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 at gonococci.

1. Decolorize for twenty seconds in 20 per cent sulphuric acid.  
 2. Wash in water.  
 3. Wash for thirty seconds or until no more color will come out in 95 per cent alcohol.  
 4. Wash in water.  
 5. Cover the preparation with 1.0% methylamine blue solution for thirty seconds.  
 6. Wash in water and mount.  
 Label the bacilli are bright red; nuclei and other bacteria are blue. (The washing with alcohol is designed to help out any excess 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 negative bacilli requires inoculation.)

### STAIN FOR CORYNEBACTERIA

1. Smear a cover glass as thin as possible with serum or ordinary fastener.  
 2. Cover for one minute with Ehrlich's gentian violet.  
 3. Wash in water.  
 4. Cover with 1% solution for thirty seconds.  
 5. Wash in 95 per cent alcohol until the blue color comes to come out.  
 6. Wash in water.  
 7. Counterstain with dilute carbol fuchsin 1 to 5 with hot water for thirty seconds.  
 8. Wash in water and mount.  
 Bacteria which are leucocytes, which have been decolorized by fuchsin and have taken the counterstain of red or brown are to be considered as non-stained.



## 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 more accurate estimations use a Fleischl-Miescher or Sahli apparatus.

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

**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 thus should dry almost immediately, and are then ready to be stained.

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**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.

## BLOOD

Examination of Fresh Blood. The shape and color of red blood corpuscles (erythrocytes), leucocytes, lymphocytes (leucocytes), etc. This determines the presence or absence of anemia. The more anemias are a blood disease or health condition.

Color Index. For red blood corpuscles. For white blood corpuscles.

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

2. Wash the edge of the cover with water and thoroughly dry.

3. Quickly spread 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 center of the cover glass, held by its edges against the top of the drop of blood, avoiding the skin.

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

7. Draw the cover slip apart, keeping their faces parallel. The blood films thus should dry almost instantaneously, 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 the diluted stain remain for two minutes for molecular penetration.

3. Wash in water until the preparation has a pinkish color. Excess washing with water tends to wash out the color. Wash with water until the red corpuscles are pale, almost colorless, and to bring out the red nucleus. It is useful in helping out the red granules in material 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	}	seen in one or more stained specimens while counting 250 white corpuscles.
		Megaloblasts		

**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

4. Dry and moist

By this method the presence of residual organisms, leucocytes, bacteria, type of nucleus, abundance of blood plasma and the general staining of the red corpuscles may be determined.

**Red Corpuscles.** Variation in size (macrocyte and microcyte) and shape (spherocytes, stomatocytes, etc.) showing (1) spherocytosis, (2) stomatocytosis, (3) tendency toward a general increase or decrease in size.

Seen in one or more stained specimens while counting 500 white corpuscles.	<b>Normoblasts</b>
	<b>Microblasts</b>

**White Corpuscles.** Estimation of the number of white corpuscles by the number of red corpuscles (ratio) as compared with the normal, whether method is employed or normal.

**Differential count.** Leucocytes of present variety (number of polymorphs (granulocytes)).

**Neutrophils.** Increased in bacterial infection, leucocytosis, viral diseases, later mononuclear (acid granular cells).

**Eosinophils.** Increased in the blood.

**Lymphocytes.** Seen after disease and after conditions.

**Platelets.** (Thrombocytes, thrombocytes).

**Platelet Count.** These appear with Wright's modification of Leishman's stain as found on steel bodies stained but platelets showing a mesh-work. They are one-third of the size of the red blood corpuscles and often are found in clumps. A platelet upon a red blood corpuscle may be mistaken for a residual parasite.

**Platelets.** Platelets themselves are stained blue with iron-haematein stain and are found in the red corpuscles. Collections of platelets are seen in the white corpuscles. Platelets appear stained light blue. (Smith's of R-1 stain never stain blue).

**Blood Count.** Red Corpuscles. Direct blood count the blood counted up to the mark of and white with Count in a solution up to the mark for. (This is the principle of 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 conclusive evidence of typhoid infection.

(If dried blood is employed for the test, it must first be

The red corpuscles in twenty-five small squares at each of the four corners of the ruled field and multiply the total by 8000. Repeat the count and take the average. This gives the number of corpuscles in a cubic millimeter.

White Corpuscles. Draw the blood into the blood count up to the mark 43 and dilute with 0.5 per cent acetic acid up to the mark 44. Mix thoroughly. Count the corpuscles in the ruled field. Count the white and count again. Multiply the sum of these two counts by 100. This product is the number of white corpuscles in a cubic millimeter.

Examine another drop of countable suspension in the count of red or of white corpuscles.

White's Serum Reaction. Use a portion of serum of human lymphatic tissue or wegg-bone serum. Mix immediately by hand power or by mechanical means. Should show the bacilli in active motion and unattached. Collect three or four drops of the blood to be examined in a small test-tube.

Make 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 with the 1:10 and the 1:50 dilutions with cover slips. Place at equal size may be obtained by using a standard foot. Make count in the following table. Record the blood reaction.

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 conclusive evidence of typhoid infection. (The dried blood is employed for the test.)



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.

...with some of water, which can then be used in  
place of one drop of serum.  
**Blind Culture.** The diagnosis of typhoid fever is easily  
made by the detection of typhoid bacilli in the blood.  
To find a culture of this and one-half a  
small amount under aseptic precautions from a vein or  
the rectum, insert the needle and then inoculate portion  
of serum which 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. Though 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.



## 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.

**Inspection.** Sputum may be,—

(a) Mucous: viscid.

(b) Purulent: seen in pure form only in bronchiectasis 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 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.

Method of Examination for Infected Health. State  
cover great quantities from a particular article of the  
specimen, spreading it thinly (then with Lister's solution  
of antiseptic, leaving to the evening point. Then  
wash in water and alcohol. When further transferring  
infected parts are present, wash a sterile cover glass  
preparation by Gown's method and concentrate with the  
microscope.

The infected health will appear clearly, brown stained  
marked at various places when seen the face of the glass.

- Examine films. 1. Heat about 100 of 10 per cent  
NaOH and spread in the water bath till clear.  
2. Centrifuge or allow to settle in a covered glass.  
3. Examine sediment microscopically.



## EXAMINATION OF SEROUS FLUIDS.

**Cerebro-spinal Fluid.** Note the clearness or turbidity. Examine sediment for leucocytes. Stain sediment and determine differential count of leucocytes.

**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.

## EXAMINATION OF SEROUS FLUIDS.

General Remarks. Note the character of turbidity. Examine sediment for leucocytes. Stain sediment and examine centrifugal coat of leucocytes.

Albumen and Transudates. In general, the fluid is clear, pale gray, orange red, opalescent, or milky (chylous).

Specific Gravity. Effusion medium. Examinations 1015.

After 10 minutes of rest to 20 per cent. fluid. After 24 hours to 50 per cent.

Albumen and Globulin. Serum fluids give a marked reaction with acids. Note the amount of fluid.

Reaction. The sediment of exudates shows leucocytes. Test of transudates shows a few epithelial cells. Greenish color of exudates.

Microscopic. This fluid is thoroughly clean. No bacteria and centrifugation at least 500 times.

2. Pour off supernatant fluid by inverting the tube. Examine the sediment in the remaining drops of fluid by mixing with platinum loop.

3. Divide a drop of the mixture on a glass slide. Cover with a glass slip.

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

5. Stain with a fluid made as follows: 1. 10% solution of Lushman's stain.

2. 1% solution of alcohol.

3. Allow this to remain on the preparation from 10 to 15 minutes, then wash it with water or two drops of water and allow it to stand for 10 minutes.

4. Wash carefully with water.

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

6. Mount in cedar oil or xylol balsam and examine with 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 shake. 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



Test for blood where no fresh blood is blood outside the present "Oscillating" (Oscillating) test. To 10 c.c. of gastric contents in a test tube add one-third quantity of concentrated sulfuric acid and 1 c.c. of 1% ferric chloride and 1 c.c. of water. Heat to boil and shake. After the water has evaporated, add the mixture to a solution of 10 drops of freshly prepared solution of cuprous and 10 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 stomach (2) blood from the small intestine (3) the urine of the patient (4) blood from the rectum (5) the

6. Lactic Acid. Lactic acid is found in the stomach at once as gastric contents develop if the contents are left for some time in a warm place. Lactic acid is formed in the presence of heat. It is a solution of lactic acid in a very faint yellow color with water. With the addition of two test-tubes with this solution, using one for comparison. An intensification of the yellow color on addition of caustic 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 10 c.c. 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 for blood (Hemoglobin) consists of one large tube of blood and a glass and a ball of water. Repeat at end of one hour by means of the tube.

In processing the contents, avoid dilution with water or saline.

Reaction: Amount and character. The quantity in the stomach as a rule is 10 to 15 c.c. Larger amounts suggest hypersecretion or hypermotility. 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



hypermetabolism the proportion of fluid to solid is increased in the  
residue. The fluid elements should be in the particles  
in which the fluid appears as in a solution of fluid and  
water unchanged by any chemical.

Reaction. The reaction in the mixture is acid to  
alkaline. Acid reaction may be due to free HCl, combined  
HCl (protein), and also to organic acids.

Reaction of Free HCl. Free HCl should be present  
in the substance. Usually when a sample of substance is  
ground in water and while heating (see below) a  
drop of phenolphthalein is added. A drop of 1% solution  
shows the presence of free HCl. This reaction is positive  
with organic acids.

Indicator Test. To a 2 cc. of the substance add a few drops  
of a 1% solution of solution of Thymol. The color  
changes red when a few drops of 1% solution of HCl  
HCl. This is done to show the presence of free  
HCl or to show the presence of organic acids.

O. O. Test. A small amount of substance is  
placed in a test tube and a drop of a saturated solution of  
O. O. is added. A blue or white color change is seen.  
Congo red paper turns blue in the presence of acid and  
red in the presence of alkali. It is a good test for  
acid and alkali. It is not a reliable reaction for  
acid and alkali.

Phosphorus Test. A small amount of substance is  
added.

Free HCl. In the presence of a substance, water is added  
and the mixture is heated. A solution of 1% of  
Thymol is added. The color changes from red to blue.  
The disappearance of the color is due to the fact  
that the reaction of the HCl is the same as the  
reaction of the substance. To estimate the amount of free HCl  
in the substance, the number of cc. of 1% HCl used in the  
reaction is noted. This gives the amount of free HCl in the  
substance. A known amount of substance is added to a  
known amount of water (10 cc.) and the mixture is  
heated. The amount of water of evaporation is noted. The  
mixture is then cooled and the amount of HCl in the  
mixture is determined by the amount of HCl which



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

**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.

is denoted by  $\gamma = \frac{1}{2} \left( \frac{1}{2} \right)$  (KAO). The normal  
differential value of the  $\gamma$  is very low and  
and per cent of 20 to 30 (KAO). (KAO) per cent of 20 to 30.

It is very easy to find the normal range for  
referred to as another point of view, showing  
that the normal range of  $\gamma$  is very low and  
per cent of 20 to 30 (KAO). (KAO) per cent of 20 to 30.

Total value of the same contents is shown in  
the table. The normal range of  $\gamma$  is very low and  
per cent of 20 to 30 (KAO). (KAO) per cent of 20 to 30.

It is very easy to find the normal range for  
referred to as another point of view, showing  
that the normal range of  $\gamma$  is very low and  
per cent of 20 to 30 (KAO). (KAO) per cent of 20 to 30.

It is very easy to find the normal range for  
referred to as another point of view, showing  
that the normal range of  $\gamma$  is very low and  
per cent of 20 to 30 (KAO). (KAO) per cent of 20 to 30.



## 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 faecal matter. In diarrhoea 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 faeces, 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. 26). 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:







*Amoeba coli*; round worms (*ascaris*); hook worms (*uncinaria*); 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 tablespoon-







fuls 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.





## APPARATUS AND CHEMICAL REAGENTS.

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

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

Fehling's Solution. Dissolve 34.64g. pure  $\text{CuSO}_4$  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.
- 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.

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

Sodium Hydroxide Solution for Urine: NaOH, 100 g.  
Water, 250 c.c.  
Concentrated Hydrochloric Acid containing 0.2 grams  
chloride in 100 c.c.  
KI Solution: 100 g. KI dissolved in 100 c.c. Water.

Standard Brown (Standard aqueous solution).  
Alcohol, 100 c.c.  
Sodium Hydroxide Solution: Sodium Hydroxide, 2 g.; Acetic Acid,  
10 c.c.; Water, 100 c.c.

Water's modification of Lieberman's test: To 100 c.c.  
of 0.5% aqueous solution of Sodium Bicarbonate add  
10 c.c. of 10% solution of Sodium Chloride. Stir in an Arnold sterilizer  
for one hour. When cold, stir into the undisturbed  
mixture 100 c.c. of 1% aqueous solution of Potassium  
Iodate and stir the precipitate without washing. Make  
a saturated solution of this precipitate in absolute  
alcohol. Filter and add 10% of absolute  
methyl alcohol.

Lieberman's Methylalcohol.  
Carbonic tetrachloride: Carbonic acid crystals, 25; Lieberman's  
Standard Alcoholic Solution, 100; Water, 100.  
Methylalcohol (Standard aqueous solution).

Reagent's solution of gentian-violet: Gentian-violet, 2 g.;  
Alcohol, 10 c.c.; Acetic Acid, 2 c.c.; Water, 88 c.c. This  
solution keeps well.  
Reagent's Standard Hydrochloric Acid: 10 g.;  
Alcohol, 20 g.

Reagent's Standard Dimethyl-amido-azo-benzol 0.5 per  
cent alcoholic solution.  
Reagent's Standard 10 per cent alcoholic solution.  
Hydrogen Peroxide.  
Iodine Solution.

Conc. Ammonia.  
Calcium Formate.  
Sulphur.

Apparatus and chemical reagents may be obtained of  
F. W. Johnson & Co.



