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and
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The Hypothalamus in Poliomyelitis

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I. THE HYPOTHALAMUS: CLINICAL STUDIES IN BULBAR POLIOMYELITIS.

A Preliminary Report

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Interest in the hypothalamus in bulbar poliomyelitis has been stimulated in recent years by the observation of a wide variety of clinical signs including hypertension, hypothermia, hyperthermia, gastric hemorrhage and gastric dilatation during the acute stages of the illness. In addition, individuals who recovered have exhibited altered reactions to stressful environmental situations both physical and emotional. None of these observations could be satisfactorily explained on the basis of anterior horn cell, pontine or medullary involvement. The nature and diversity of the clinical findings suggested involvement of a central autonomic control center. The hypothalamus, described as the "head ganglia of the autonomic nervous system" has long been known to exert marked influence over such diverse autonomic functions as water metabolism, glucose and fat metabolism, regulation of body temperature, vasomotor activity, gastro-intestinal activity and the emotions.

For these reasons a careful pathological survey of the hypothalamus in bulbar poliomyelitis was undertaken and tests devised to provide a clinical survey of this area of the brain.

1. Anatomy:

The hypothalamic area surrounds the antero-lateral aspect and the floor of the third ventricle. In this location it is well protected, lying as it does in the midline above the pituitary body and the optic chiasm. Its vascular supply is extremely abundant and arises from the arterial circle of Willis.

Microscopically the Hypothalamus has been divided into 4 areas:

A. The anterior Hypothalamic area: This area lies immediately above the chiasm and consists of the following nuclear groups:
   (1) Supraoptic nucleus
   (2) Paraventricular nucleus
   (3) Preoptic nucleus

B. The medial Hypothalamic area: This area lies behind the optic chiasma and consists of 2 nuclear condensations which lie in the lateral walls of the third ventricle beneath the ventricular surface.
   (1) Ventro-medial hypothalamic nucleus
   (2) Dorso-medial hypothalamic nucleus

C. The posterior Hypothalamic area (pars mammilaris): This is a fairly well defined area caudal to the pars tuberalis and includes the mamillary bodies. It is composed of two nuclear masses:
   (1) The posterior hypothalamic nucleus
   (2) Mamillary nucleus and associated pre, supra, lateral and mamillary condensations. This marks the caudal limits of the hypothalamus. This nucleus constitutes the chief connecting link between the temporal lobe and the thalamus--via fornix and tract of Vic d' Azur.

D. The lateral Hypothalamic area: This zone is difficult to define. It is characterized by scattered small and large cells related to the postero-laterally located nucleus intercalatus. The nucleus tuberalis lies in this area and fibers have been traced into the infundibulum.

The extensive distribution of the characteristic large cells which have aggregated to form nuclear masses such as the paraventricular, supraoptic, tubercle, and the posterior hypothalamic is a unique

feature of the hypothalamus and may account in part for its physiological functioning as a unit.

Afferent and efferent tracts of the hypothalamus connect the hemispheres, in particular the frontal, temperal and parietal lobes with lower centers. In the hypothalamus itself the tracts are very close to nuclear masses; in particular the tracts from the anterior hypothalamic nuclei pass through the posterior hypothalamus on their way to midbrain, pontine, medullary and spinal cord centers.

2. Physiology:

There has been a tendency in the literature to implicate separate hypothalamic centers each subserving some physiological function. The anatomical structure and the small size suggests tha improbability of multiple discrete centers. Carefully controlled experiments show that stimulation of very minute areas results in the activation of more than one bodily system.

The Hypothalamus, however, seems to

CHART SHOWING MAJOR FUNCTIONS OF HYPOTHALAMUS
AND EFFECTS OF IMPAIRED FUNCTION

Specific Function	Anterior Hypothalamus (Parasympathetic)		Posterior Hypothalamus (Sympathetic)	
	Normal Function	Destruction	Normal Function	Destruction
1. Cardiovascular				
Blood pressure	Decreased	Hypertension	Increased	Hypotension
Pulse	Decreased		Increased	
Blood vessels	Dilated		Constricted	Syncope
2. Gastro-intestinal				
Peristalsis	Increased	Distention	Inhibition	
Acidity	Increased	Hemorrhage?	Inhibition	Ulceration?
Secretion	Increased		Inhibition	Hemorrhage?
3. Heat Control				
Sweating	Present	Hyperthermia	Absent	Hypothermia
Blood vessels	Dilated		Constricted	
Metabolism	Decreased		Increased	
Heart rate	Decreased		Increased	
4. Miscellaneous				
Water metabolism	Inhibits?	Diabetes Insipidis		
Sugar metabolism	Inhibits	Hyperglycemia	Accelerates	Hypoglycemia
Sleep				Somnolence
5. Emotional Response		Sham rage?	Controlled	Emotional blunting

contain a dual mechanism for autonomic control. The anterior and part of the middle group of nuclei are concerned with parasympathetic activities, while the posterior and a part of the middle coordinate sympathetic responses. The two are not sharply demarcated. Stimulation of the anterior Hypothalamus

causes bladder contraction, cardiac inhibition, increased gastro-intestinal peristalsis, increased gastric acidity. Stimulation on the other hand of the postero-lateral nuclei evokes dilatation of the pupils, rise in blood pressure, cardiac acceleration and inhibition of gastro-intestinal activity.

Sweating results from stimulation of the anterior hypothalamus. Thermo regulatory centers exist in the hypothalamus. Heat dissipation is a function of the anterior hypothalamus while heat conservation is invested in the posterior part. Lesions of the anterior Hypothalamus are followed by hyperthermia and an inability to regulate against increased body heat. Mechanisms involved in loss of body heat are intimately combined with the vascular system and include peripheral vasodilatation, drop in blood pressure, decreased heart rate, panting, sweating and decreased metabolism. As opposed to this, heat conservation is accompanied by such phenomena as shivering, vasoconstriction, accelerated heart rate, increased metabolism. Lesions in the heat conservation center will result in inability to regulate against decreased body temperature, and result in hypothermia.

Water metabolism is controlled in part by the antidiuretic principle secreted by the neurohypophysis in turn under control of the supraoptic nuclei. Destruction of this system results in diabetes insipidus.

Hyperglycemia and glycosuria, usually transitory, follows stimulation of the tuberal and posterior part of the lateral hypothalamic area. This is due largely to sympathetic discharges affecting adrenal medulla with release of adrenalin. Lesions of the anterior hypothalamus result in hypoglycemia and abnormal sensitivity to insulin.

Adiposity, not infrequently noted with extrasellar and hypothalamic tumors, is due to involvement of the ventro-medial nucleus.

Little is known of the mechanism of fat metabolism.

Disturbances in sleep have been noted in periventricular lesions. Lesions of the posterior hypothalamus have resulted in hypersomnolence and narcolepsy in some cases.

Diencephalic seizures accompanied by various autonomic phenomena have been related to the anterior hypothalamus as well as to the posterior.

The following diagram shows the autonomic phenomena associated with the hypothalamus. From this it is apparent that the hypothalamus exerts widespread autonomic control.

3. Pathology:

Microscopic studies of the complete hypothalamus have been completed in 115 cases of bulbar poliomyelitis. In 85 percent of the cases this region of the brain showed inflammatory reactions consisting of both perivascular and diffuse changes. In none of the cases were these changes severe enough to result in an inflammatory necrosis. The changes were most severe medially, adjacent to the ventricular surfaces.

Actual neuronal damage was observed in 70 cases or 61 percent of the patients. In these cases there was at least 5 percent or more cell damage within one or more nuclear groups. The neuronal involvement was spread diffusely throughout all the nuclear groups being most intense in the supraoptic nuclei and mildest in the tuberal and mammillary nuclei.

4. Clinical:

Unfortunately the present day neurological examination does not include any test that is adequate to evaluate the autonomic nervous system which is of paramount importance to the human being. It is a matter of record that there are no good tests, laboratory or clinical, that provide an evaluation of the auto-

nomic control center where diverse autonomic phenomena are invested in a small group of cells. It is illogical to expect one procedure to give information about the function of a group of cells having control over several autonomic phenomena. This fact in addition to the pathological changes in the hypothalamus and the observed clinical phenomena prompted us to set up a battery of several tests none of which individually would conclusively indicate hypothalamic involvement. The occurrence of several abnormal responses to those tests in a battery would be much more significant and indicative of hypothalamic dysfunction. Because of the immensely complex arrangement of the autonomic pathways we are fully cognizant that other parts of the autonomic system may be involved in poliomyelitis and may play a part in the production of some of the responses to these tests.

Twelve cases of bulbar poliomyelitis all of whom were in respirators and had tracheotomes were subjected to this test battery. Fourteen control subjects with widely varying neurological conditions were similarly investigated.

The tests are as follows:

(1) Postural Adaptation Response: In passing from the recumbent to the upright position an adjustment in circulationdynamics is necessary. The normal response of such postural change is a slight drop in systolic blood pressure of 5-10 mm. of Hg with a return to the previous value in 30 to 60 seconds; a rise in diastolic pressure; decreased pulse pressure and increased pulse rate. This is a simple test to perform. Postural vascular adjustment involves a coordination between sympathetic and parasympathetic responses and, therefore, suggests hypothalamic involvement when abnormal.

Six cases or 50 percent of the test group had defects in this test.

(2) Temperature Adaptation Response: The main control over body temperature has long been known to be invested in the hypothalamus. A heat loss center has been postulated and experimentally supported in the anterior hypothalamus. Unduly delayed response to external heat would indicate hypothalamic dysfunction. In the execution of the test two bed cradles with 8-150 watt lamps are placed over the patient. A fine powdered mixture of starch and iodine is brushed lightly over the patient and the time of onset of sweating noted as manifested by the appearance of dark blue color. Normally one should show sweating in 15-20 minutes.

Fifty percent of the cases of bulbar polio had abnormal tests. In several cases no sweating occurred after a period of 3 to 4 hours.

The value of such a test is illustrated in the following case: A young girl of nine was brought to the University Hospital for a check-up. She had had bulbar polio and had made a respectable recovery. The parents wished to determine whether it was advisable to take the daughter to Arizona. The patient failed to sweat after 4 hours of continuous application to the heat cradle. The parents were advised accordingly. To be subjected to hot environment might have been disastrous in this case.

(3) Glucose Tolerance: It is the belief of many observers that oral glucose tolerance curves should be interpreted with extreme caution. The curve may be influenced by many factors such as gastrointestinal motility muscular activity, renal, pancreatic, liver, and adrenal function. The hypothalamus exerts some control over glucose metabolism probably through the hormonal influence of the pituitary on the adrenal gland. In the absence of any disturbances of the pituitary gland, the adrenals, the liver, the pancreas, the kidneys or the gastro-intestinal tract the glucose curve may be suggestive of hypothalamic involvement Three and six hour curves are obtained after ingestion of 100 gms. of glucose.

Forty-five percent of the patients with

bulbar poliomyelitis exhibited flat tolerance curves.

(4) Elevated Hemoglobin: High hemoglobin values have been reported in experimental stimulation of the hypothalamus.

Three cases or 25 percent showed hemoglobin values of 18.5 to 19.5 gms./100 cc.

(5) Miscellaneous Tests: The BMR, 17 keto steroids were grouped together. Neither in itself is indicative of hypothalamic damage. They reflect the general hormonal state. With absence of thyroid, and adrenal disease, they may be of some significance.

Four cases had abnormal values in one or other tests.

(6) Eosinophil Response to Epinephrine: Despite the fact that nerve fibers have not been traced from the hypothalamus to the anterior pituitary, the latter is thought to be under control of the hypothalamus through hormonal influence. Following a fasting eosinophil count 0.3 cc. of 1:1000 epinephrine was injected S. C. Four hours later the eosinophil count was repeated. The normal response is a fall of 50 percent or greater at the end of the time period.

Three patients in the polio test group showed abnormal eosinophil response to epinephrine.

(7) Water Metabolism: Diabetes insipidus is the best known defect in water metabolism arising from hypothalamic dysfunction. No satisfactory test is available as a check on water metabolism. The Robinson-Keppler-Power test was used. In this test as modified by Thorn fluids are withheld after 6:00 p.m. on the day preceding the test. This specimen is discarded. All urine voided between 10:00 p.m. and 7:00 a.m. is measured. Twenty cubic centimeters of water per kilagram of body weight are then ingested rapidly. Urine specimens are collected and measured at 8:00 a.m., 9:00 a.m., 10:00 a.m. and 11:00 a.m. If the volume of any of the hourly specimens exceeds the total overnight volume the test is normal or negative. In two cases of bulbar polio this test was abnormal.

(8) Eosinophil Response to ACTH: Eosinophil counts are made 4 hours after administration of 25 mgm. of ACTH. A basal lead is first recorded. Three abnormal results were observed in the test group.

(9) Emotional Adjustment: Many patients surviving bulbar poliomyelitis show an altered reaction to emotional problems. This is a frequent observation of near relatives who would constitute a fair guide. Almost 80 porcent of the cases studied have shown emotional instability or at least an altered reaction, to stress situations. We do not feel this is a reaction to a chronic illness but rather the result of damage to the hypothalamus which is well known to be intimately tied up with emotions and emotional expression. To test this presents a formidable problem which is being attacked at present.

The electroencephalogram was an added test which in this study showed no indication of hypothalamic abnormality. 14 per second and 6 per second positive spikes are characteristic discharges from the hypothalamus. Sleep activation is usually necessary to demonstrate the discharges. Sleep studies were not performed in any of the cases.

Discussion: In a critique of this study it is apparent that more cases are needed in both the test and control groups. It is furthermore obvious that new tests need to be devised and the present tests refined. The concept involved in hypothalamic testing is embraced in the word stress. A partially damaged hypothalamus may be quite capable of sustaining an individual in a protective environment such as the hospital. Stress of any type, however, may not be tolerated at all. The tests were devised to introduce the element of stress e.g.: heat, posture changes, fluids, etc.

While we do not believe the tests presented here are conclusive they are suggestive of hypothalamic involvement. The primary aim of this test battery aside from possible determination of hypothalamic damage is the utilization of the information gained in advising the patient which stressful situations are best avoided. The knowledge gained and its application completes the therapeutic program of the individual who survives acute bulbar poliomyelitis.

Since we have become aware that this area of the brain is involved in bulbar poliomyelitis and are cognizant of its control over many vital functions, all patients with bulbar poliomyelitis should have the benefits of the tests, crude as they may be, because a life may depend upon the results. Until a test battery of this nature, or a better one, has been performed, no patient with bulbar poliomyelitis has been adequately treated. It is much more important than the mere determination of the extent of muscle paralysis. The future of the patient surviving coronary thrombosis is dependent upon the advice given by his physician. Likewise, the future of the patient with bulbar polio is dependent upon the physician's advice. Such counsel can be significantly enhanced by the results from a battery of tests of this nature which are easy to perform, inexpensive, and the gain immeasurable.

II. MEDICAL SCHOOL NEWS

Coming Events

Nov. 26 - Dec. 1 Continuation Course in Child Psychiatry for Pediatricians and General Physicians
November 27 Special Lecture; "Facts and Theories of Comparative Psychiatry," Dr. Eduardo Krapf; Owre Amphitheater; 8:15 p.m.
November 28 Special Lecture; "Mental Health Problems of Aging," Dr. Eduardo Krapf; Museum of Natural History Auditorium; 8:15 p.m.
January 3 - 5 Continuation Course in Gynecology for General Physicians
January 7 - 9 Continuation Course in Pediatrics for General Physicians

* * *

Faculty News

The thirty-seventh annual meeting of the American College of Surgeons was attended by a large delegation from our Department of Surgery. Dr. Owen H. Wangensteen, Head of the Department, and other members journeyed to San Francisco to attend this important surgical meeting. The following members of the department presented papers: Dr. C. W. Lillehei, "The Role of Stress in the Etiology of Peptic Ulcer;" Dr. Yoshio Sako, "Experimental Studies on Gastro-Intestinal Anastomoses;" Dr. Bernard Zimmerman, "Studies on the Control of Salt-Regulating Adrenal Hormones;" Dr. F. S. Cross, "The Loss of Buffering Capacity of Alkaline Solutions After Passage Through Long and Short Duodenal-Jejunal Loops;" Dr. Fletcher Miller, "The Evaluation of Carbon Dioxide Toxicity in Man and Experimental Animals;" Dr. Edward Mason, "Competative Inhibition of Gastric Iodide Secretion by Thiocyanate;" Dr. George Moore, "Portal Venography;" Dr. Shelley Chou, "The Use of Radioactive Iodinated Human Serum Albumin for the Isotope Encephalometric Localization of Brain Tumors;" Dr. Douglas Cole, "Isotope Encephalometry by Use of Scintillation Counters and a Multiple Channel Detector Unit;" A. L. Ferrin, "The Evaluation of Experimental Methods of Producing Functional Mitral Stenosis."

Rheumatic Fever Symposium

A Symposium on Rheumatic Fever will be presented at the University of Minnesota on November 29 to December 1. The Symposium is given with the sponsorship and financial support of the Minnesota Heart Association and will bring to this campus many distinguished scientists who have contributed to our knowledge of this disease. The meetings, which will be held in the Auditorium of the Museum of Natural History, are open to the public. Minnesota physicians are especially invited to join with the students and faculty of the Medical School in this event. Dr. Morse J. Shapiro, former member of the faculty who is now practising in Los Angeles, will return to present a paper on the "General Management of Rheumatic Fever." Dr. Lewis Thomas, American Legion Research Professor at the University, is in charge of the program and will be joined by other members of our faculty and the Mayo Foundation as participants who will present papers.

* * *

Continuation Course in Child Psychiatry

Child Psychiatry will be the subject of a continuation course to be presented for general physicians and pediatricians at the Center for Continuation Study on November 26 to December 1. The course is presented under the direction of Dr. Reynold A. Jensen, Head of the Child Psychiatry Service at the University of Minnesota. Dr. Reginald S. Lourie, Director of the Department of Psychiatry, Children's Hospital, Washington, D.C., and Dr. J. Franklin Robinson, Director of the Children's Service Center of Wyoming Valley, Wilkes-Barre, Pennsylvania, are the visiting faculty members for the course. They, together with Dr. Jensen, will present formal lectures and will act as group discussion leaders for the informal sessions which will make up the major part of the teaching program for the course.

III. UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
WEEKLY CALENDAR OF EVENTS

Physicians Welcome

November 19 - 24, 1951

Monday, November 19

Medical School and University Hospitals

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; M-109, U. H.

10:00 - 12:00 Neurology Rounds; A. B. Baker and Staff; Station 50, U. H.

11:00 - 12:00 Cancer Clinic; K. Stenstrom and A. Kremen; Eustis Amphitheater, U. H.

12:15 - 1:20 Obstetrics and Gynecology Journal Club; Staff Dining Room, U. H.

12:30 - Physiology Seminar; Mechanisms of Ion Exchange Reactions; H. P. Gregor, Assistant Professor of Physical Chemistry at the Polytechnic Institute of Brooklyn; 214 Millard Hall.

1:30 - 2:30 Pediatric-Neurological Rounds; R. Jensen, A. B. Baker and Staff; U. H.

4:00 - Pediatric Seminar; Correlation of Certain Physiological Data with Electrocardiogram; Harry Orme; Sixth Floor West, U. H.

4:30 - 5:30 Dermatological Seminar; M-346, U. H.

4:30 - Public Health Seminar; 15 Owre (Medical Sciences) Hall.

5:00 - 5:50 Clinical Medical Pathologic Conference; Todd Amphitheater, U. H.

5:00 - 6:00 Urology-Roentgenology Conference; C. D. Creevy, O. J. Baggenstoss, and Staff; Eustis Amphitheater.

Minneapolis General Hospital

7:30 a.m. Fracture Grand Rounds; Dr. Zierold, Station A.

11:00 - Pediatric Rounds; Dr. Top; 7th Floor.

12:30 p.m. Surgery Grand Rounds; Dr. Zierold; Station E.

1:00 - 2:00 X-ray Conference; Classroom, 4th Floor.

1:30 - Pediatric Rounds; Dr. Ulstrom; 4th Floor.

Veterans Administration Hospital

9:00 - G. I. Rounds; R. V. Ebert, J. A. Wilson, Norman Shrifter; Bldg. I.

Monday, November 19 (Cont.)

Veterans Administration Hospital (Cont.)

11:30 - X-ray Conference; Conference Room; Bldg. I.

2:00 - Psychosomatic Rounds; Building 5.

3:30 - Psychosomatic Rounds; Building 1, Dr. Aldrich.

Tuesday, November 20

Medical School and University Hospitals

8:30 - Conference on Diet Endocrines and Cancer; M. B. Visscher; Physiology Library.

9:00 - 9:50 Roentgenology-Pediatric Conference; L. G. Rigler, I. McQuarrie and Staffs; Eustis Amphitheater, U. H.

9:00 - 12:00 Cardiovascular Rounds; Station 30, U. H.

12:30 - 1:20 Pathology Conference; Autopsies; J. R. Dawson and Staff; 102 I. A.

12:30 - Selected Topics, Permeability and Metabolism; Nathan Lifson; Physiology Library.

3:15 - 4:20 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54,U.H.

4:00 - 5:00 Pediatric Rounds on Wards; I. McQuarrie and Staff; U. H.

4:00 - 5:00 Physiology-Surgery Conference; Todd Amphitheater, U. H.

5:00 - 6:00 X-ray Conference; Presentation of Cases by University Hospital Staff; Eustis Amphitheater, U. H.

*8:00 p.m. Minnesota Pathological Society Meeting; Pathology of Pulmonary Hypertension; Jesse E. Edwards; Medical Science Amphitheater.

Ancker Hospital

8:00 - 9:00 Fracture Conference, Auditorium.

1:00 - 2:30 X-ray Surgery Conference; Auditorium.

Minneapolis General Hospital

8:00 - Pediatric Rounds; Dr. Gibbs; 5th Floor Annex.

10:00 - Psychiatric Grand Rounds; J. C. Michael and Staff; 3rd Floor Annex.

11:00 - Pediatric Rounds; Dr. Platou; 7th Floor.

Veterans Administration Hospital

7:30 - Anesthesiology Conference; Conference Room, Bldg. I.

Tuesday, November 20 (Cont.)

Veterans Administration Hospital (Cont.)

8:30 - Infectious Disease Rounds; Dr. Hall.

8:45 - Surgery Journal Club, Conference Room, Bldg. I.

9:30 - Surgery-Pathology Conference; Conference Room, Bldg. I.

10:30 - Surgery Tumor Conference, Conference Room, Bldg. I.

1:00 - Surgery Chest Conference; T. Kinsella and Wm. Tucker; Conference Room, Bldg. I.

1:30 - Liver Rounds; Samuel Nesbitt.

2:00 - 2:50 Dermatology and Syphilology Conference; H. E. Michelson and Staff; Bldg. III.

3:30 - 4:20 Autopsy Conference; E. T. Bell and Donald Gleason; Conference Room, Bldg. I.

Wednesday, November 21

Medical School and University Hospitals

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-109, U. H.

8:00 - 9:00 Roentgenology-Surgical-Pathological Conference; Allen Judd and L. G. Rigler, Todd Amphitheater, U. H.

11:00 - 12:00 Pathology-Medicine-Surgery Conference; Medicine Case; O. H. Wangensteen, C. J. Watson and Staffs; Todd Amphitheater, U. H.

12:30 - 1:20 Radio-Isotope Seminar; Blood Volume Determination - Radio-iodinated albumin; Drs. Chou, Marvin, and Shultz; 12 Medical Sciences.

1:30 - Conference on Circulatory and Renal Systems Problems; M. B. Visscher; Physiology Library.

4:00 - 5:00 Vascular Rounds; Davitt Felder and Staff Members from the Departments of Medicine, Surgery, Physical Medicine, and Dermatology; Sta. 42, U.H.

5:00 - 5:50 Urology-Pathological Conference; C. D. Creevy and Staff; Eustis Amphitheater, U. H.

5:00 - 6:00 Vascular Conference; Todd Amphitheater, U. H.

5:00 - 7:00 Dermatology Clinical Seminar; Dining Room, U. H.

7:00 - 8:00 Dermatology Journal Club; Dining Room, U. H.

8:00 - 10:00 Dermatological-Pathology Conference; Review of Histopathology Section; Robert Goltz; Todd Amphitheater, U. H.

Wednesday, November 21 (Cont.)

Ancker Hospital

8:30 - 9:30 Clinico-Pathological Conference; Auditorium.

3:30 - 4:30 Journal Club; Surgery Office.

Minneapolis General Hospital

9:30 - Pediatric Rounds; Dr. Platou; 7th Floor Annex.

11:00 - Pediatric Rounds; Dr. Top, 7th Floor.

12:00 - Surgery Seminar; Dr. Zierold; Classroom.

12:15 - Pediatric Conference; 4th Floor Annex.

1:30 - Pediatric Rounds; Dr. Huenekens and Dr. Ulstrom; 4th Floor Annex.

Veterans Administration Hospital

8:30 - 10:00 Orthopedic X-ray Conference; Conference Room, Bldg. I.

8:30 - 12:00 Neurology Rehabilitation and Case Conference; A. B. Baker.

2:00 - 4:00 Infectious Disease Rounds; Main Conference Room; Bldg. I.

4:00 - 5:00 Infectious Disease Conference; W. Spink; Conference Room, Bldg. I.

7:00 p.m. Lectures in Basic Science of Orthopedics; Conference Room, Bldg. I.

Thursday, November 22 - H O L I D A Y

Friday, November 23

Medical School and University Hospitals

8:30 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U.H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:50 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Department, U. H.

11:45 - 12:50 University of Minnesota Hospitals Staff Meeting; The Liver in Ulcerative Colitis; Frederick W. Hoffbauer, Clarence Dennia, and Karl Karlson; Powell Hall Amphitheater.

1:00 - 2:50 Neurosurgery-Roentgenology Conference; W. T. Peyton, Harold O. Peterson and Staff; Todd Amphitheater, U. H.

Friday, November 23 (Cont.)

Medical School and University Hospitals (Cont.)

2:00 - 3:00 Dermatology and Syphilology Conference; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

3:00 - 4:00 Neuropathological Conference; F. Tichy; Todd Amphitheater, U. H.

4:00 - 5:00 Dermatology Seminar; W-312, U. H.

4:00 - Neurophysiology Seminar; 113 Owre Hall, Medical Science Bldg.

5:00 - Urology Seminar and X-ray Conference; Eustis Amphitheater, U. H.

Ancker Hospital

1:00 - 3:00 Pathology-Surgery Conference; Auditorium.

Minneapolis General Hospital

8:00 - Pediatric Allergy Rounds; Dr. Nelson; 4th Floor.

11:00 - Pediatric Rounds; Dr. Top; 7th Floor.

11:00 - Pediatric-Surgery Conference; Drs. Wyatt and F. Adams; Classroom, Sta. I.

12:00 - Surgery-Pathology Conference; Drs. Zierold and Coe; Classroom.

1:30 - Pediatric Rounds; Dr. Ulstrom, 4th Floor.

Veterans Administration Hospital

10:30 - 11:20 Medicine Grand Rounds; Conference Room, Bldg. I.

1:00 - Microscopic-Pathology Conference; E. T. Bell; Conference Room, Bldg. I.

1:30 - Chest Conference; Wm. Tucker and J. A. Meyers; Ward 62, Day Room.

3:00 - Renal Pathology; E. T. Bell; Conference Room, Bldg. I.

Saturday, November 24

Medical School and University Hospitals

7:45 - 8:50 Orthopedic X-ray Conference; Wallace H. Cole and Staff; M-109, U. H.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; E-221, U. H.

9:00 - 10:30 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amphitheater, U. H.

9:15 - 10:00 Surgery-Roentgenology Conference; J. Friedman, O. H. Wangensteen and Staff; Todd Amphitheater, U. H.

Saturday, November 24 (Cont.)

Medical School and University Hospitals (Cont.)

10:00 - 11:30 Surgery Conference; Todd Amphitheater, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

Minneapolis General Hospital

8:00 - Pediatric Rounds; Dr. Gibbs; 5th Floor.

11:00 - 12:00 Pediatric Clinic; Dr. Thomas and Dr. May; Classroom, 4th Floor Annex.

Veterans Administration Hospital

8:00 - Proctology Rounds; W. C. Bernstein and Staff; Bldg. III.

8:30 - Hematology Rounds; P. Hagen and E. F. Englund.

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* Indicates special meeting. All other meetings occur regularly each week at the same time on the same day. Meeting place may vary from week to week for some conferences.