

Revised: Fall 2016

MDL 140

Urinalysis and Microscopy

COURSE OUTLINE

Prerequisites:

N/A

Course Description:

Introduces the principles of urinalysis with a discussion of the physiology and pathophysiology of the renal and urinary systems. Discusses how to perform all aspects of a routine urinalysis, including the interpretation of urine dipstick and microscopic results. There is also a discussion of body fluids, including cerebrospinal fluid, synovial joint fluid, and amniotic fluid along with cell counting in these fluids.

Semester Credits: 2

Lecture Hours: 1

VIRGINIA WESTERN COMMUNITY COLLEGE
PO Box 14007
Roanoke, VA 24038
(540)-857-7273



Urinalysis and Microscopy MDL 140

Course Outcomes:

At the completion of this course, the student should be able to:

- Understand the physiology and pathophysiology of the human renal and urinary systems
- Know how to instruct a patient in the proper collection of a urine sample and how to store the sample
- Manually perform a complete urinalysis including macroscopic and microscopic examinations
- Perform a urinalysis by automated methods and interpret results in a timely manner
- Interpret the results of a urine dipstick test, realizing that there are several different brands and types of dipsticks available
- Correlate an abnormal dipstick result to a possible clinical condition, such as the presence of blood cells or hemoglobin in the urine or the presence of proteins in the urine
- Accurately identify types of cells that can appear in urine, including red and white blood cells and epithelial cells
- Accurately identify types of renal casts that can appear in urine, and be able to correlate the appearance of casts to various disease states
- Identify the presence of bacteria and parasites in the urine and be able to correctly identify the types of parasites
- Differentiate normal urine artifacts and contaminants such as fibers from abnormal cells, casts and parasites
- Identify and differentiate acidic and basic urine crystals and amorphous solids
- Be familiar with instrumentation used to perform urinalysis and know the protocols for proper instrument quality control
- Be able to perform analysis of cerebrospinal, synovial, and amniotic fluids including cell counts

VIRGINIA WESTERN COMMUNITY COLLEGE
PO Box 14007
Roanoke, VA 24038
(540)-857-7273



Internet access required

Textbook:

Graff's Textbook of Urinalysis and Body Fluids 3rd edition by Lillian A. Mundt and Kristy Shanahan

ISBN: 978-1-4963-2016-2

Course Outline

I. Urinary System Anatomy and Physiology and Urine Formation

- A. Renal Anatomy; Anatomy and Physiology of the Nephron
- B. Renal Blood Flow and the Glomerulus
- C. The Formation of Urine; Tubular Reabsorption; Tubular Secretion
- D. Hormonal Effects on the Kidney and on Urine Production
- E. Final Urine Volume and Composition
- F. Assessing Renal Function
- G. Assessing Glomerular Filtration Rate Using Creatinine Clearance Testing
- H. Classifying the Stages of Chronic Kidney Disease with the GFR
- I. Additional Test to assess Kidney Function
- J. Assessing Renal Secretory Function

II. Renal and Urinary Tract Diseases and Related Urinalysis Findings

- A. Anatomical Conditions Affecting the Urinary Tract
- B. Infections of the Lower Urinary Tract
- C. Urolithiasis
- D. Diseases of the Kidney
- E. Common Diseases of the Kidney: Vascular Disease and Diabetes
- F. Diseases Affecting the Glomerulus
- G. Tubular Disorders
- H. Tips for Categorizing Urinary Tract Diseases

III. Metabolic Diseases and Related Urinalysis Findings

- A. Newborn Screening
- B. Aminoaciduria
- C. Disturbances of Amino Acid Transport
- D. Disturbances of Amino Acid Metabolism
- E. Disorder of Carbohydrate Metabolism and Transport
- F. Fatty Acid Oxidation Disorders
- G. Porphyrinurias

VIRGINIA WESTERN COMMUNITY COLLEGE
PO Box 14007
Roanoke, VA 24038
(540)-857-7273



IV. Urinalysis Clinical Laboratory Operations

- A. Federal Regulations and Regulatory Organizations
- B. Laboratory Standards
- C. Quality Assessment
- D. Safety in the Clinical Laboratory
- E. Physical Hazards
- F. Electrical Hazards
- G. Fire/Explosive Hazards
- H. Chemical Hazards

V. Microscopy

- A. The Microscope
- B. Components of a Microscope
- C. Types of Microscopy
- D. Adjustments to Illumination
- E. Methods to Increase Contrast
- F. Care and Preventive Maintenance

VI. Collection and Preservation of Urine

- A. Specimen Collection Methods
- B. Nonsterile Urine Collection Methods
- C. Sterile and Near Sterile Urine Collection Methods
- D. Urine Collection Systems
- E. Unacceptable Urine Collection Methods
- F. Timing of Collection
- G. Specimen Preservation
- H. Preservatives

VII. Physical Examination of Urine

- A. Urine Color
- B. Urine Clarity
- C. Miscellaneous: Foam and Odor
- D. Urine Concentration/Specific Gravity
- E. Examination Methods
 - Refractometer
 - Specific Gravity Reagent Strips
 - Osmometry



VIII. Chemical Analysis of Urine

- A. Urinary pH
- B. Urinary Protein
- C. Glucose and Other Reducing Substances
Clinitest Procedure
- D. Urine Ketones
- E. Reagent Test Strips
Acetest Tablets
- F. Occult Blood
 - Hematuria
 - HemoglobinuriaMyoglobinuria
- G. False Positive and False Negative Reagent Test Strips Results
- H. Bilirubin Testing/Ictotest
- I. Urobilinogen
- J. Nitrites
- K. Leukocyte Esterase Test
- L. Additional Urine Reagent Strip Tests
 - Ascorbic acid
 - Calcium
 - Creatinine
 - Microalbumin

IX. Microscopic Examination of Urine Sediment I

- A. Sediment Preparation
- B. Microscopic Observation and Enumeration
- C. Cells
 - Erythrocytes
 - Leukocytes
 - Epithelial Cells
 - Bacteria
 - Yeast
 - Parasites:
 - Schistosoma haematobium
 - Trichomonas vaginalis
 - Enterobius vermicularis



X. Microscopic Examination of Urine II

D. Crystals

- Calcium oxalate
- Uric Acid
- Amorphous Urates
- Hippuric Acid/Sodium Urates
- Calcium Sulfate Crystals
- Cystine Crystals
- Leucine Crystals
- Tyrosine Crystals
- Cholesterol Crystals
- Bilirubin Crystals
- Sulfonamide Crystals
- Radiographic Dye Crystals
- Triple Phosphates
- Amorphous Phosphates
- Calcium Carbonate
- Calcium phosphate
- Ammonium Biurates

E. Casts

- Hyaline Casts
- Red Blood Cell Casts
- White Blood Cell Casts
- Epithelial Cell Casts
- Granular Casts
- Waxy Casts
- Fatty Casts

F. Miscellaneous Structures

- Oval Fat Bodies
- Cylindroids
- Mucous Threads

G. Artifacts and Contaminants

- Starch Crystals
- Cloth fibers
- Oil Droplets
- Fecal contamination
- Talcum Powder



XI. Introduction to body Fluids

- A. Body Fluid Composition
- B. Types of Body Fluids
- C. Accumulation of Excess Body Fluids
- D. Body Fluid Collection
- E. Cell Counts in Body Fluids
- F. Cellular Morphologies and Differentials
- G. Crystal Analysis

XII. Cerebrospinal Fluid

- A. Cerebrospinal Anatomy
- B. Specimen Collection
- C. Laboratory Examination
 - Physical Characteristics
 - Microscopic Evaluation
 - Cell Counts
 - Differential Counts
- D. Chemical Analysis
 - Proteins
 - Glucose
 - Lactate
 - D-Dimers

XIII. Amniotic Fluid

- A. Anatomy and Physiology of Amniotic Fluid Formation
- B. Amniocentesis, Specimen Collection and Handling
- C. Differentiation of Amniotic Fluid from Maternal Urine

XIV. Miscellaneous Urine and Body Fluid Tests

- A. Urine Pregnancy Tests
- B. Urine Eosinophils
- C. Bronchoalveolar Lavage and Bronchial Washings
- D. Ear Fluid
- E. Vitreous Fluid
- F. Other Fluids



XV. Automation in Urinalysis and Body Fluids Examination

A. Rationale for Automating Urinalysis and Body Fluids

B. Automated Urinalysis Systems

- Iris International
- Siemens Medical Solutions Diagnostics
- Sysmex

C. Automation of Urine Pregnancy

D. Automation of Fecal Occult Blood

Laboratory Topics

Week	Lab Topic
1	Introduction and Microscopy
2	Renal/Urinary Anatomy and Physiology
3	Urine collection and Appearance
4	Urine Dipstick Tests I
5	Urine Dipstick Tests II and Bilirubin (Ictotest)
6	Urine Sediment Microscopy I: Cells and Bacteria
7	Urine Sediment Microscopy II: Crystals
8	Urine Sediment Microscopy III: Casts
9	Miscellaneous Urine Sediments: Artifacts and Fibers
10	Gastric and Fecal Occult Blood
11	Cerebrospinal Fluid and Body Fluid Cell Counts
12	Automated Urinalysis



VIRGINIA WESTERN COMMUNITY COLLEGE
PO Box 14007
Roanoke, VA 24038
(540)-857-7273

