

Virginia Western Community College

MDL 140

Urinalysis and Microscopy

Prerequisites

None.

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

Lab/Clinical/Internship Hours: 0

Required Materials

Textbook:

Graff's Textbook of Urinalysis and Body Fluids. Lillian A. Mundt & Kristy Shanahan. 3rd Edition.
ISBN: 9781496320162

Other Required Materials:

Internet Access

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
- Perform analysis of cerebrospinal, synovial, and amniotic fluids including cell counts

Topical Description

I: Urinary System Anatomy and Physiology and Urine Formation

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

II: Renal and Urinary Tract Diseases and Related Urinalysis Findings

- Anatomical Conditions Affecting the Urinary Tract
- Infections of the Lower Urinary Tract
- Urolithiasis
- Diseases of the Kidney
- Common Diseases of the Kidney: Vascular Disease and Diabetes
- Diseases Affecting the Glomerulus
- Tubular Disorders
- Tips for Categorizing Urinary Tract Diseases

III: Metabolic Diseases and Related Urinalysis Findings

- Newborn Screening
- Aminoaciduria
- Disturbances of Amino Acid Transport
- Disturbances of Amino Acid Metabolism
- Disorder of Carbohydrate Metabolism and Transport
- Fatty Acid Oxidation Disorders
- Porphyrinurias

IV: Urinalysis Clinical Laboratory Operations

- Federal Regulations and Regulatory Organizations
- Laboratory Standards
- Quality Assessment
- Safety in the Clinical Laboratory
- Physical Hazards
- Electrical Hazards
- Fire/Explosive Hazards
- Chemical Hazards

V: Microscopy

- The Microscope
- Components of a Microscope
- Types of Microscopy
- Adjustments to Illumination
- Methods to Increase Contrast
- Care and Preventive Maintenance

VI: Collection and Preservation of Urine

- Specimen Collection Methods
- Nonsterile Urine Collection Methods
- Sterile and Near Sterile Urine Collection Methods
- Urine Collection Systems
- Unacceptable Urine Collection Methods
- Timing of Collection
- Specimen Preservation
- Preservatives

VII: Physical Examination of Urine

- Urine Color
- Urine Clarity
- Miscellaneous: Foam and Odor
- Urine Concentration/Specific Gravity
- Examination Methods

VIII: Chemical Analysis of Urine

- Urinary pH
- Urinary Protein
- Glucose and Other Reducing Substances
- Clinitest Procedure
- Urine Ketones
- Reagent Test Strips
- Acetest Tablets
- Occult Blood
- Myoglobinuria
- False Positive and False Negative Reagent Test Strips Results
- Bilirubin Testing/Ictotest
- Urobilinogen
- Nitrites
- Leukocyte Esterase Test
- Additional Urine Reagent Strip Tests

IX: Microscopic Examination of Urine Sediment I

- Sediment Preparation
- Microscopic Observation and Enumeration
- Cells

X: Microscopic Examination of Urine II

- Crystals
- Casts
- Miscellaneous Structures
- Artifacts and Contaminants

XI: Introduction to Body Fluids

- Body Fluid Composition
- Types of Body Fluids
- Accumulation of Excess Body Fluids
- Body Fluid Collection
- Cell Counts in Body Fluids
- Cellular Morphologies and Differentials
- Crystal Analysis

XII: Cerebrospinal Fluid

- Cerebrospinal Anatomy
- Specimen Collection
- Laboratory Examination
- Chemical Analysis

XIII: Amniotic Fluid

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

XIV: Miscellaneous Urine and Body Fluid Tests

Urine Pregnancy Tests

- Urine Eosinophils
- Bronchoalveolar Lavage and Bronchial Washings
- Ear Fluid
- Vitreous Fluid
- Other Fluids

XV: Automation in Urinalysis and Body Fluids Examination

- Rationale for Automating Urinalysis and Body Fluids
- Automated Urinalysis Systems
- Automation of Urine Pregnancy
- Automation of Fecal Occult Blood

Laboratory Topics

- Introduction and Microscopy
- Renal/Urinary Anatomy and Physiology
- Urine collection and Appearance
- Urine Dipstick Tests I
- Urine Dipstick Tests II and Bilirubin (Ictotest)
- Urine Sediment Microscopy I: Cells and Bacteria
- Urine Sediment Microscopy II: Crystals
- Urine Sediment Microscopy III: Casts
- Miscellaneous Urine Sediments: Artifacts and Fibers
- Gastric and Fecal Occult Blood
- Cerebrospinal Fluid and Body Fluid Cell Counts
- Automated Urinalysis

Note to Instructors