Automation: Introduction

- **Advantages**
  - Saves time
  - Allows for standardization of procedures
  - Reduces transcription errors

- **Disadvantages**
  - Negative strip reading may mean significant microscopic findings will be overlooked

- Urine and body fluid instruments include
  - Semi-automated instruments
  - Automated instruments

Urine Automation

- *published by Bayer*
  - Error can be reduced by @ 10% by appropriate use of automation
Urine Automation
• Instruments - the dipstick readers:
  • Principle of reflectance photometry
    • narrow beam of monochromatic light (from a LED) is focused on the dipstick pad.
    • the amount of light reflected from the chemical reaction is (indirectly proportional to the analyte's concentration...) measured.

Urine Automation
• Instruments
  • Principle of reflectance photometry
    • The darker the pad turned the less light reflected etc.
    • The reflected light is detected by a photodetector, creating a signal that can be quantitated.

Urine Automation
• Ames Co. (bought by Bayer / Miles Diagnostics and now Siemens Medical Solutions Diagnostics)
  • Cliniteks (ie. Clinitek 50 & big brother the 500)
Siemens Medical Solutions Diagnostics

Siemens Medical Solutions Diagnostics manufactures the Clinitek® Status.

Urine Automation – Sysmex UF-100

• The Sysmex UF-100 automated analyzer that performs a microscopic urinalysis by flow cytometry

Iris Diagnostics Division

• Iris Diagnostics Division iQ®200 Automated Urinalysis System (AUTION plus iQ®200).
• Iris Diagnostics close-up of the AUTION barcode reader and tube carrier.
Kidney Function Tests

- Old concentration and dilution tests
  - Fishberg concentration
- Phenolsulfanaphthalein Test (PSP Dye Excretion)
- Glomerular filtration rate / Clearance Tests
  - used to determine the extent of nephron damage and monitor it; is a measure of the filtering capacity of the glomeruli.
  - Creatinine – most popular and still performed
    - Creatinine – a byproduct of muscle metabolism
    - Filters easily and produced in consistent amounts according to persons muscle mass
  - NV = 88-137 mL/min (ave @100 mL/min)
  - urine creat. in mg/dl
  - serum creat. in mg/dl
  - urine vol. in ml
  - # of min collected
  - pts surface area in sq. meters

Urinary Calculi (Renal Lithiasis)

- Composition
  - Crystalloids embedded in a binding substance of mucous and protein

Urinary Calculi

- Usual constituents
  - Calcium oxalate - 75%  makeup of most stones – dietary controls
  - Phosphate
  - Magnesium
  - Ammonium
  - Apatite (calcium phosphate and carbonate)
  - Uric acid
  - Cystine
Urinary Calculi

- Treatments:
  - Lithotripsy

Percutaneous Nephrolithotomy
- also known as PCNL, PNL, and percutaneous nephrolithotripsy
- is the most effective treatment for large kidney stones, staghorn calculi, cystine stones, kidneys with multiple stones, and stones associated with UPJ obstruction (a type of renal outlet obstruction).
- Also used for patients who have tried lithotripsy but still have a large stone burden.
Diseases & UA correlation

- Pathways of renal infections
  - Ascending
    - Any condition that restricts the downward urine flow or incomplete emptying of the bladder will promote
    - Most often infectious agents ascend up the urethra - bladder - ureters - into the kidney (if unchecked)
    - Common organisms: E. coli, Proteus, & Enterobacter
  - Descending
    - Infection result of circulating organisms getting trapped in kidney.
    - Common organisms: Staphlococcus, E. coli

Renal disorders summary

- Renal disorders summary
  - Pyelonephritis
    - Acute and chronic (more serious and permanent damage can result)
    - Cause - infection of upper urinary tract
      - UTI bacteria progress upwards
      - Any condition that restricts downward urine flow or incomplete emptying of bladder will promote.

- Renal disorders summary
  - Dipstick – pos protein, pos WBC esterase, pos nitrate (depending on organism)
  - Micros – WBCs, WBC casts, bacteria, possible bacteria cast
  - Other info –
    - Acute - permanent renal damage seldom occurs. Symptoms include increased frequency and burning upon urination and lower back pain. Resolve with antibiotics.
    - Chronic - noticeable decrease in renal function; progresses to renal failure
Renal disorders summary

- Renal disorders
  - Nephrotic syndrome
    - Cause – damage resulting in increased glomerulus permeability
    - Dipstick – large amount of protein
    - Micros – many casts of varying types, possible oval fat bodies and free fat
    - Other info – hypoproteinemia, increased plasma lipids

Reference Listing

- Please credit those whose work and pictures I have used throughout these presentations.
- Lillian Mundt & Kristy Shanahan, Graff’s Textbook of Urinalysis and Body Fluids, 2nd Ed.
- Susan Strassinger & Marjorie Di Lorenzo, Urinalysis and Body Fluids, 5th Ed.
- Wikipedia, the free encyclopedia
- www.wikipedia.org
- Dipstick measurements of urine specific gravity are unreliable
- A Roessingh, A Drukker, and J Guignard
  - Renal Unit, Department of Paediatrics, University Medical Centre (CHUV), CH-1011 Lausanne, Switzerland.
- Evaluation of Ames Multistix-SG for urine specific gravity versus refractometer specific gravity.
  - Adams LJ

Chemical Exam of Urine