

# Urinalysis and Body Fluids CS

## Unit 3 Chemical Examination of Urine

### Part 7, Automation, Function Tests, and Calculi

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## 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

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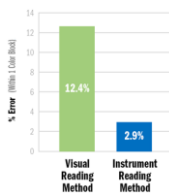
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## Urine Automation

- **published by Bayer**
  - Error can be reduced by @ 10% by appropriate use of automation



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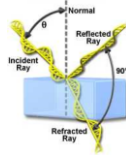
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## Urine Automation

- 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.



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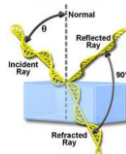
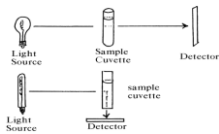
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## Urine Automation

- 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.



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## Urine Automation

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



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## Siemens Medical Solutions Diagnostics

Siemens Medical Solutions Diagnostics manufactures the Clinitek® Status.



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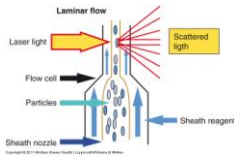
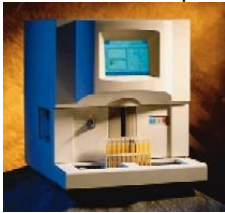
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## Urine Automation - Sysmex UF-100

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



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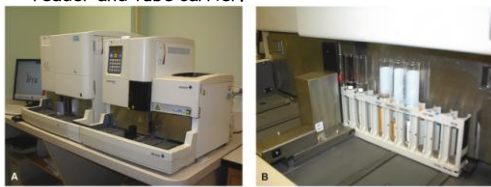
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## Iris Diagnostics Division

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



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## Kidney Function Tests

- Old concentration and dilution tests
  - Fishberg concentration
- Phenosulfanaphthalein 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)

$$\frac{\text{urine creat. in mg/dl}}{\text{serum creat. in mg/dl}} \times \frac{\text{urine vol. in ml}}{\# \text{ of min. collected}} \times 1.73 \left( \frac{\text{an average person's surface area}}{\text{pts surface area in sq. meters}} \right)$$

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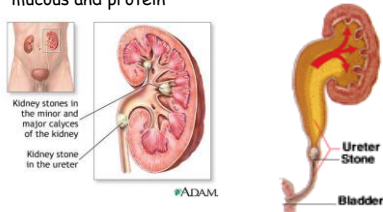
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## Urinary Calculi (Renal Lithiasis)

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




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## Urinary Calculi

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

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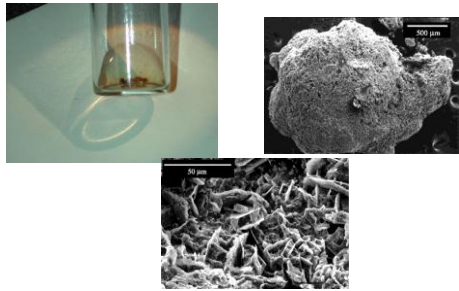
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## Urinary Calculi



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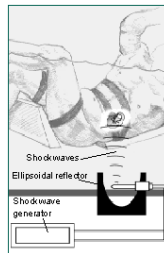
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## Urinary Calculi

- **Treatments :**
  - Lithotripsy



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## Urinary Calculi - treatment

- 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.



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## 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: Staphylococcus, E. coli

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## 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.

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## Renal disorders summary

- Renal disorders summary
  - Pyelonephritis
    - 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

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