BIOLOGICAL EVIDENCE

Semen, Saliva, Urine and Feces
Semen

- Avg. ejaculate is 3.5mL
  - Each mL can contain between 10-50 million sperm cells

- Medical Conditions:
  - Oligospermia – low sperm count
  - Aspermia – no sperm
  - Vasectomy – surgical procedure that leaves the male incapable of producing sperm
Semen: Presumptive Tests

1. Alternate Light Source
   - semen fluoresces under ultraviolet light
   - blue-yellow fluorescence

- False positive: many other substances will fluoresce under the same light
Semen: Presumptive Tests

2. Acid Phosphatase Test (AP)

- Male prostate gland produces the enzyme *acid phosphatase* and secretes it into seminal fluid
- 2 reagents used:
  - Alpha-naphthyl acid phosphate
  - Brentamine Blue
- If acid phosphatase is present, it will turn dark purple/blue
- False positives: other body fluids like vaginal secretions contain this enzyme
Semen: Presumptive Tests

3. Prostate Specific Antigen (PSA) or P30
   - PSA or P30 is produced by the prostate gland
   - ABAcard test like Hematrace
   - False positives: P30 can be found in feces, sweat, and female urine and breast milk
Semen: Confirmatory Tests

1. Visual confirmation of sperm under the microscope
   - Christmas Tree Stain
     - Picroindigocarmine stains the neck and tail green
     - Nuclear Fast Red stains the head and acrosomal cap a reddish/pink color
Semen: Confirmatory Tests

2. RSID- Semen (Rapid Stain Identification)
   - Test for presence of semenogelin
   - No cross reactivity with other body fluids or animals
Saliva

- Human salivary glands produce 1.0-1.5 liters per day
  - Mostly water
  - *Amylase* – an enzyme that digests starch in the mouth and intestine
    - breaks down starch into simple sugars
- Two types of amylase
  - β – amylase
  - α - amylase
Saliva

- β – amylase (beta amylase)
  - plant and bacterial sources
- α – amylase (alpha amylase)
  - human sources
- found in saliva and pancreas
Saliva: Presumptive Tests

1. Starch-iodine assays

- E.g. Amylase overlay assay and amylase radial diffusion
- Tests for presence of starch
- If starch is present - will change to dark blue-black in the presence of iodine
Saliva: Presumptive Tests

*Starch-Iodine Assays*

- **False positive reactions**
  - any substance with amylase activity
    - e.g. bacteria, plants, vomit

- **Not species-specific**
  - reacts with saliva from any animal that produces it
    - cats and dogs DO NOT produce amylase
Saliva: Presumptive Tests

2. Phadebas method

- Add saliva stain to water
- Add tablet that consists of insoluble starch bound to a blue dye
- If amylase is present, it will break down the starch and release the blue dye
Saliva: Confirmatory Tests

- RSID- Saliva
  - Distinguishes between salivary and pancreatic amylase
  - Very sensitive
    - Your hands would probably test positive due to mouth-hand contact
  - False positive – will react with amylase from gorillas and rats
Urine

- Not tested for often in forensics
- All animals must get rid of excess nitrogen from the breakdown of proteins and amino acids
  - Aquatic animals get rid of nitrogen as ammonia
  - Birds and terrestrial animals use uric acid
  - Mammals use **urea** and expel it in urine
Urine: Presumptive Tests

1. Urease Test

- Uses Whatman Filter Paper
- If urea is present, then urease will catalyze the reaction of urea to ammonia
- The paper will turn blue
Urine: Presumptive Test

2. RSID-Urine
   - tests for a glycoprotein abundant in urine
   - NOT HUMAN SPECIFIC

- No confirmatory tests for urine!
Feces

- Waste product called bilirubin is excreted in feces...gives it the brown color.
- Bacteria in the gut also break down bilirubin into urobilinogen.
Feces: Presumptive Test

- Tests for the presence of urobilinogen
- If present, will fluoresce under UV light
  - Fluoresces green
Feces: Confirmatory Tests

- Microscopic Test
  - Look for the presence of animal and plant cells due to digestion