Career Connections Expectations

• Let's see your whole face on the screen

• Please use your name

• Please mute yourself unless otherwise instructed

• Please eliminate distractions

• Please ask questions

• Please have something to write with
THE ORSO TEAM

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George Kudolo, Ph.D., CPC, FAIC, FAACC
School of Health Professions
Chair Department of Health Sciences

• Teaches clinical chemistry and research courses in the undergraduate Medical Laboratory Sciences program

• Teaches laboratory medicine to the Masters in Physician Assistant program and the only instructor for the Graduate Toxicology program

• Expertise in laboratory medicine and forensic toxicology; conducting research studies animal models and human clinical trials with orthodox medications as well as the herbal supplement Ginkgo biloba extract
Making Plans For the Future at a Young Age

George B. Kudolo, PhD, FAACC
Distinguished Teaching Professor
Medical Laboratory Sciences
UTHSCSA
Objectives

- Describe briefly my professional journey and interests
- Describe how to motivate yourself and set goals at a young age
- Describe briefly the profession of drug testing in forensic toxicology
- Describe briefly the advantages and disadvantages of urine and hair toxicology
Introduction

- Born in Ghana, West Africa
  - Illiterate parents
- Graduate School in England on scholarship
- Worked with the World Health Organization in Kenya East Africa
Keys to Achieving Your Goals

▪ Stay in school, Set goals and Timelines
  ▪ Don’t worry when you stumble - Stay the course

▪ Read good books - motivational books, autobiographies
  → Secrets are often hidden in books
  → Learn from smart, inspiring people

▪ Have a hobby – do fun things

▪ Develop a habit
Keys to Achieving Your Goals

Associate with the right people

Focus your energy

My Personal Philosophy

- If you want something you’ve had, you must be willing to do something you’ve done.

Thomas Jefferson
My Interests

- Biomedical Research
  - Animal models
  - Human
  - Reproduction
  - Herbal Medicine & supplements
  - Diabetes

- Teaching
  - Laboratory Medicine
  - Toxicology
Toxicology

All substances are poisons; there is none which is not a poison, the right dose differentiates a poison and a remedy.

Paracelsus (1493-1541)
Why Do Toxicology?

- Over 250,000 therapeutic & household products
- Billions spent on over-the-counter and on prescription drugs
  - 25-50% of patients make errors when taking properly prescribed drugs
  - 30% of “reliable patients” take <70% of prescribed drugs
- Drugs of abuse destroys lives
- Work place drug testing

Report: Americans spent 8.5 percent more on prescription drugs in 2015

$309.5 billion in 2015
The Fate of Drugs in the Body & Toxicology Testing
Commonly Used Samples

- Urine
- Blood
- Hair
- Saliva
- Breath
- Stomach contents

- Least expensive and most common type of testing in the living
- Detects historical use but does not relate to impairment
- Easily discovered when people attempt to cheat
- Often temperature tested to prevent cheating
Commonly Used Samples

- **Blood**
- **Urine**
- **Hair**
- **Saliva**
- **Breath**
- **Stomach contents**

- Most expensive method of testing
- The most intrusive in the living
- Most accurate for relating drug concentrations to clinical symptoms
- Least common method of testing in the living person
Common Samples Used for Forensic Toxicology

- **Hair**
  - Easy and non-invasive collection
  - Good alternative to urine testing
  - Drugs are incorporated into hair
  - Measures long-term drug use – even years
    - Very stable for decades
  - Only indicates history of use
  - Expensive !!

- **Blood**
- **Hair**
- **Saliva**
- **Breath**
- **Stomach contents**
Hair

- Hair grows on average approx. 1.3 cm (0.5 inch)/month.
- Drug ingested today will appear 3 cm above scalp in 3 months
- Samples are taken about 3 cm above scalp
- Disadvantages:
  - Hair growth rate in races
  - Hair color based on race/ethnicity
### Effect of Melanin on Hair Opiate Levels

<table>
<thead>
<tr>
<th>Race/Hair Color</th>
<th>Codeine Concentration (pg/mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian Red</td>
<td>69 ± 11</td>
</tr>
<tr>
<td>Caucasian Blonde</td>
<td>99 ± 10</td>
</tr>
<tr>
<td>Caucasian Brown</td>
<td>208 ± 17</td>
</tr>
<tr>
<td>Caucasian Black</td>
<td>865 ± 162</td>
</tr>
<tr>
<td>Asian Black</td>
<td>2564 ± 170</td>
</tr>
</tbody>
</table>
So who fails Hair Tox test?

<table>
<thead>
<tr>
<th>Race/Hair Color</th>
<th>Codeine Concentration (ng/mg)</th>
<th>Federal Cutoff: 200 ng/mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian Red</td>
<td>69 ± 11</td>
<td>All Pass</td>
</tr>
<tr>
<td>Caucasian Blonde</td>
<td>99 ± 10</td>
<td>50% FAIL</td>
</tr>
<tr>
<td>Caucasian Brown</td>
<td>208 ± 17</td>
<td>100% WILL FAIL</td>
</tr>
<tr>
<td>Caucasian Black</td>
<td>865 ± 162</td>
<td></td>
</tr>
<tr>
<td>Asian Black</td>
<td>2564 ± 170</td>
<td></td>
</tr>
</tbody>
</table>

## Approximate Detection Period for Common Drugs Of Abuse

<table>
<thead>
<tr>
<th>Drug</th>
<th>Urine Test</th>
<th>Blood Test</th>
<th>Hair Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methamphetamine</td>
<td>3-5 days</td>
<td>1-3 days</td>
<td>90 days</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>1-3 days</td>
<td>12 hours</td>
<td>90 days</td>
</tr>
<tr>
<td>MDMA (Ecstasy)</td>
<td>3-4 days</td>
<td>3-4 days</td>
<td>90 days</td>
</tr>
<tr>
<td>Morphine</td>
<td>2-4 days</td>
<td>1-3 days</td>
<td>90 days</td>
</tr>
<tr>
<td>Methadone</td>
<td>7-10 days</td>
<td>24 hours</td>
<td>90 days</td>
</tr>
<tr>
<td>Marijuana (THC)</td>
<td>3-4 days (Light users) 30 days (heavy users &amp; users w/ high body fat)</td>
<td>2-3 days (light users) Up to 14 days (heavy users)</td>
<td>90 days</td>
</tr>
</tbody>
</table>
How are Forensic Drug Tests Performed?

1. Screen
   - Eliminate Negatives
   - Maximum cross-reaction
   - Detection of class of drugs

Example: **Positive for Opiates**  ➔ **BUT WHICH ONE?**
How are Forensic Drug Tests Performed?

2. Confirmation

Using a very sophisticated instrument
– Chemical finger printing
  - GC/MS – “Gold standard”
How do we Identify Specific drugs? Chemistry!

- **HEROIN** (Diacetylmorphine)
- **6-Monoacetylmorphine** (6-MAM)
- **MORPHINE**
- **CODEINE**
Take Home Message

- You are not too young to start planning for your future
- Toxicology - Anything can be a poison
- Toxicology is a very exciting profession, requiring good knowledge of chemistry
- Toxicology is an expanding field which teaches you lessons for living