

**MAYO CLINIC**  
Mayo Medical Laboratories

## Controlled Substance Monitoring and the Opioid Epidemic



Paul J. Jannetto, Ph.D., DABCC, FACB, MT(ASCP)  
Mayo Clinic, Rochester, MN  
Director, Clinical and Forensic Toxicology Lab  
Director, Clinical Mass Spectrometry Lab  
Director, Metals Lab

ASCLS 2018  
Chicago, IL

## Disclosure

- Relevant Financial Relationships:
  - None
- Off Label Usage:
  - None

MAYO CLINIC  
Mayo Medical Laboratories

## Objectives


- Summarize the clinical utility and limitations of urine screening assays and definitive tests for controlled substances.
- Identify the challenges of correctly interpreting urine drug testing results
- Assess the role of adulterant/specimen validity testing and the use of alternative specimen types.

MAYO CLINIC  
Mayo Medical Laboratories


## Participating with Poll Everywhere

This is intended to be an interactive session:

- You will be able to answer using either web voting or you can text answers to the questions/case studies using your smartphone or laptop.



Web voting




Text voting

MAYO CLINIC  
Mayo Medical Laboratories

## Why Do Physicians Use UDTs to Monitor Controlled Substances/Pain Management Patients?

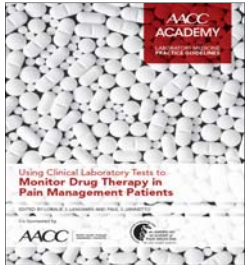

1. Clinical Practice Guidelines:
  - American Society of Interventional Pain Physicians (ASIPP) Guidelines
    - Urine drug testing (UDT) must be implemented from initiation along with subsequent adherence monitoring to decrease prescription drug abuse or illicit drug use when patients are in chronic pain management therapy (Evidence: Good)
      - Verify adherence/compliance to prescribed medications
      - Identify undisclosed drugs
      - Discourage drug misuse, abuse, diversion
  - CDC Recommendations (2016)
    - When prescribing opioids for chronic pain, clinicians should use urine drug testing before starting opioid therapy and consider urine drug testing at least annually to assess for prescribed medications as well as other controlled prescription drugs and illicit drugs.



MAYO CLINIC  
Mayo Medical Laboratories

Manchillo L, Rice S, Atila E, et al. American Society of Interventional Pain Physicians (ASIPP) guidelines for responsible opioid prescribing in chronic non-cancer pain. Part 2: guidance. Pain Physician 2012; 15: 267-1164. Manchillo L, Manchillo S, Manoharini S, Dwyer M, Swanson D, Bekerman C, Cole K. Opioid adherence monitoring reduces controlled substance abuse in chronic pain patients? Pain Physician 2008; 11: 17-22. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2718939/pdf/00017a1000.pdf>

## Laboratory Medicine Practice Guideline

MAYO CLINIC  
Mayo Medical Laboratories

<http://aacc.aaccnhs.org/content/4/489>

### 26 Evidence-based Recommendations

Table 8. Summary of Evidence-Based (EBP) Recommendations

#	Recommendation	Grading: Strength of recommendation, Quality of evidence	Target Group		
			Lab	Clinician	Policy*
1	Testing biological specimens for drugs/drug metabolites is recommended and effective for detecting the use of relevant over-the-counter, prescribed and non-prescribed drugs, and illicit substances in pain management patients. Laboratory testing does not specifically identify most other outcomes, but should be used in conjunction with additional information to detect other outcomes in pain management patients.	A, I	X	X	X
2	Urine testing to detect the use of relevant over-the-counter medications, prescription and non-prescribed drugs, and illicit substances in pain management patients is recommended and effective for detecting the use of relevant over-the-counter, prescribed and non-prescribed drugs, and illicit substances in pain management patients. Laboratory testing does not specifically identify most other outcomes, but should be used in conjunction with additional information to detect other outcomes in pain management patients.	B, II	X	X	X
3	Urine testing to detect the use of relevant over-the-counter medications, prescription and non-prescribed drugs, and illicit substances in pain management patients is recommended and effective for detecting the use of relevant over-the-counter, prescribed and non-prescribed drugs, and illicit substances in pain management patients. Laboratory testing does not specifically identify most other outcomes, but should be used in conjunction with additional information to detect other outcomes in pain management patients.	A, II	X	X	X
4	Urine testing to detect the use of relevant over-the-counter medications, prescription and non-prescribed drugs, and illicit substances in pain management patients is recommended and effective for detecting the use of relevant over-the-counter, prescribed and non-prescribed drugs, and illicit substances in pain management patients. Laboratory testing does not specifically identify most other outcomes, but should be used in conjunction with additional information to detect other outcomes in pain management patients.	A, II	X	X	X

### 7 Consensus-based Recommendations

Table 9. Summary of consensus-based expert opinions

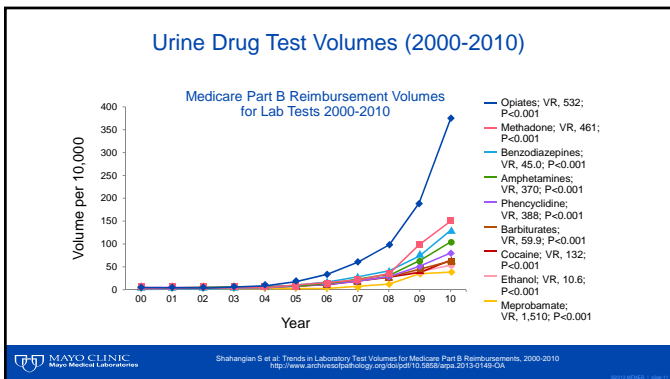
#	Expert Opinion	Grading: Strength of recommendation, Quality of evidence	Target Group		
			Lab	Clinician	Policy
1	Based on level II evidence, random drug testing should be performed prior to initiation of acute or chronic controlled substance therapy. In addition, random drug testing should be performed at a minimum of one to two times a year for chronic patients. Based on a history of past substance abuse treatment, chronic pain status, and signal on screening urinalysis, with increasing frequency for higher risk patients prescribed controlled substances.	A, II		X	X
2	Serum or plasma is an acceptable alternate matrix for the detection of relevant over-the-counter medications, prescribed and non-prescribed drugs, and illicit substances in pain management patients with and without a history of substance abuse. For chronic patients, the blood specimen should be collected prior to therapy. The test results may also be used for selected drugs (e.g., amphetamines, barbiturates, buprenorphine, hydrocodone/buprenorphine, oxycodone, hydrocodone, hydroxyzine, methadone, morphine, oxycodone, and tramadol).	A, II	X	X	X
3	Random urine testing for relevant over-the-counter medications, prescribed and non-prescribed drugs, and illicit substances is recommended to detect outcomes in pain management patients.	A, II (pain management), II (substance abuse screening, prescribing)		X	X
4	The use of lower limit of detection (LLD) concentrations can be more effective to detect use (either partial or full compliance) on the lack of evidence from the current medications, prescribed and non-prescribed drugs, and illicit substances in pain management patients, especially during acute therapy.	B, II	X	X	X
5	Randomly chosen urine and/or salivary laboratories consult with the laboratory receiving potential abuse test and evidence of pain analysis highlights for urine drug tests, as well as the expected impact on results.	III		X	
6	Laboratories ultimately need to measure the appropriate analytes based on the matrix (e.g., serum vs. urine). In urine, the conjugated form is most prevalent and is often better measured separately or combined with the abundant unconjugated form when available.	III		X	
7	For pain management, regulatory bodies, and health insurance companies, random urine testing should be performed using urine drug test	A, II	X	X	X

### Why Do Physicians Use UDTs to Monitor Controlled Substances/Pain Management Patients?

- Clinical Practice Guidelines:
- Financial Reasons:
  - Non-adherence to opioid therapy leads to increased healthcare utilization and costs
  - Early monitoring of opioid adherence using UDTs may provide substantial cost savings associated with health care issues incurred in non-adherent chronic pain patients

### Why Do Physicians Use UDTs to Monitor Controlled Substances/Pain Management Patients?

- Clinical Practice Guidelines:
- Financial Reasons:
- Regulatory Scrutiny (State and Federal Regulations):
  - State Level:**
    - Physicians can prescribe controlled substances w/ state board issued medical license.
    - Some states may require additional registration
    - Most states also have a regulation, guideline, or policy statement for prescribing opioid analgesics for pain
    - Some states discourage or prohibit physicians from prescribing opioids to patients whom they know or should know are using controlled substances for nontherapeutic purposes
  - Federal Level:**
    - Must first satisfy state requirements of licensure and registration
    - DEA issues a federal controlled substances registration
    - Federal regulations do NOT prohibit the use of opioids to treat pain if a patient is abusing controlled substances



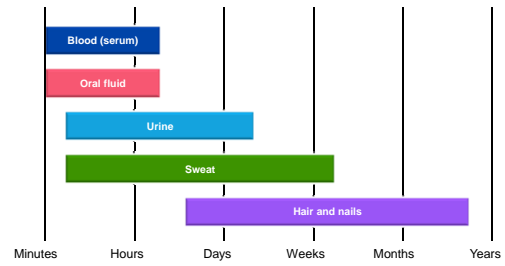
### Issues With Laboratory Testing for Controlled Substances/Pain Management

- Where are tests done?
  - Office vs. lab
- What specimen should be used?
- Qualitative vs. Quantitative Tests?
- Interpretation of test results
  - Screen vs. Definitive assays
  - Complicated metabolic pathways/metabolite ratios
  - Compliance vs. more information (dose)
- Follow-up testing
  - To "confirm" or "not to confirm" screening assays
- Regulatory/reimbursement issues

### What Specimen is Best?

Specimen	Advantages	Disadvantages
Urine	Ease of collection Good detection window Testing widely available	Easy to adulterate Doesn't identify frequency of dosing Doesn't reliably estimate dose taken
Blood (serum/plasma)	Recent usage Difficult to adulterate Correlates better to dose/clinical symptoms	Invasive Short detection window Limited availability
Oral fluid (saliva)	Recent usage Noninvasive Ease of collection	Low concentrations Limited availability \$\$\$ Mainly parent drug
Hair	Long detection time	Limited availability \$\$\$

### Approximate Detection Times By Specimen Type



### Specimen Types

- Based on numerous guidelines, urine is preferred matrix for the detection of relevant over-the-counter medications, prescribed and non-prescribed drugs, and illicit substances.
- Serum or plasma is an acceptable alternative matrix in patients with end-stage renal failure (anuria).
  - For dialysis patients, the serum/plasma should be collected prior to dialysis.
- Oral fluid can be used for selected drugs (e.g. amphetamine, benzodiazepines, buprenorphine, tetrahydrocannabinol, cocaine, codeine, hydrocodone, hydromorphone, methadone, morphine, oxycodone and oxymorphone) but it also has limitations

### Types of UDTs

- |  |  |
|--|--|
| <b>Screening assays</b> <ul style="list-style-type: none"> <li>Identify drugs and/or drug metabolites with variable specificity often by drug class</li> <li>Typically immunoassay-based</li> <li>POC or laboratory-based</li> <li>Economical</li> <li>Quick TAT (&lt;24 hours)</li> <li>Qualitative results</li> <li>Limited sensitivity and specificity</li> <li>Higher cutoffs</li> </ul> | <b>Definitive assays</b> <ul style="list-style-type: none"> <li>Identify and/or quantify the drug and/or drug metabolite with high specificity</li> <li>Typically GC-MS or LC-MS/MS</li> <li>Laboratory-based</li> <li>More labor intensive (higher cost)</li> <li>Longer TAT (2-7 days)</li> <li>Qualitative or Quantitative results</li> <li>Optimal sensitivity and specificity</li> <li>Lower cutoffs</li> </ul> |
|--|--|

### Cross-Reactivity Issues With Immunoassays

- Urine Opiate immunoassay target:
  - Morphine

Concentration required to trigger a "positive" Opiate result:

Drug	300 ng/mL cutoff; % Cross reactivity	2,000 ng/mL cutoff; % Cross reactivity
6-acetylmorphine	386 ng/mL 78%	2,598 ng/mL 77%
Codeine	224 ng/mL 134%	1,541 ng/mL 130%
Hydrocodone	1,086 ng/mL 28%	7,166 ng/mL 28%
Hydromorphone	1,425 ng/mL 21%	10,768 ng/mL 19%
Oxycodone	>75,000 ng/mL <0.4%	>670,000 ng/mL <0.3%

### What Does a Positive Urine Drug Screen (Immunoassay) Result Really Mean?

- Patient is compliant/adherent (took the prescribed drug as directed)
- Patient added drug to the urine after collection
- Patient took one dose prior to collection (partial compliance)
- Patient took another drug which also cross-reacts with the test
- Collection or laboratory error/mix-up
- False-positive result



### Limitations of Immunoassays

False Positives

Screening test (drug class)	Agents that can give a positive result
Amphetamine/Methamphetamine	Phentermine Pseudoephedrine Adderall Selegiline Benzphetamine Vicks inhaler
Benzodiazepine	Oxaprozin Sertraline
Opiates	Poppy seeds Naloxone
PCP	Chlorpromazine Dextromethorphan

MAYO CLINIC Mayo Medical Laboratories

### What Does a Negative Urine Drug Screen (Immunoassay) Result Really Mean?

- Patient is NOT compliant/adherent
- Patient took the drug incorrectly (i.e., less frequently/lower dosage)
- Altered pharmacokinetic variables
  - Drug wasn't absorbed
  - Altered metabolism or elimination
- Dilute or adulterated urine
- Test doesn't cross-react with drug of interest (i.e., opiate assay and Methadone; wrong test for the drug of interest)
- Collection or laboratory error/mix-up
- Drug present, but below the cutoff/detection limit (false-negative result)

MAYO CLINIC Mayo Medical Laboratories

### Limitations of Immunoassays

False Negatives and Detection Limits

- Important variables that need to be considered
  - Assay cutoff
  - Assay vendor
  - Drug formulation/dose
  - Patient pharmacokinetics
  - Sample type
  - Collection time from last dose
  - Specimen integrity/quality

MAYO CLINIC Mayo Medical Laboratories

### When is Quantitative (Confirmatory) Testing Indicated?

- Unexpected qualitative (screening) results
- Drug prescribed doesn't cross-react with qualitative screen
- Legal/Forensic implications
- Evaluate patient pharmacokinetics and dose (blood/serum preferred)
- Concentrations may be required to interpret the results or make management decisions
  - Helps determine what drug(s) was taken
  - May identify drug-drug interactions or changes in pharmacokinetics
  - May help interpret serial monitoring for an individual patient
  - May identify adulteration
  - May identify pharmaceutical impurities

MAYO CLINIC Mayo Medical Laboratories

### Case Study #1: Where's Waldo?

- **Case History:**
  - 45 year old male
- **Medical History:**
  - ADHD
  - Anxiety
  - Low back pain
- **Medications:**
  - Clonazepam (Klonopin)
  - Methylphenidate (Ritalin)
  - Oxycodone/Acetaminophen (Percocet; 5:325 mg qid)
- **Clinical Evaluation:**
  - VAS: Originally 6/10, Now 3/10

MAYO CLINIC Mayo Medical Laboratories

### Case#1 Continued

- **Routine UDT results (Immunoassay):**
  - July 2018

Screening Test	Urine Cutoff	Result
Amphetamine/Methamphetamine	500 ng/mL	Negative
Barbiturates	200 ng/mL	Negative
Benzodiazepine	200 ng/mL	Negative
Cocaine Metabolite	300 ng/mL	Negative
Methadone	300 ng/mL	Negative
Opiates	300 ng/mL	Negative
Oxycodone	100 ng/mL	<b>Presumptive Positive</b>
PCP	25 ng/mL	Negative
THC (Marijuana)	20 ng/mL	Negative

- **Oxycodone LC-MS/MS Confirmation (Definitive Test):**

Definitive Test	Urine Detection Limit	Result
Oxycodone	100 ng/mL	<b>1,250 ng/mL</b>
Oxymorphone	100 ng/mL	<b>350 ng/mL</b>

MAYO CLINIC Mayo Medical Laboratories

### Are these lab results consistent with therapy? How would you interpret these results?

**Medications:**

Clonazepam (Klonopin), Methylphenidate (Ritalin), Oxycodone (Percocet)

- Patient is NOT compliant
  - No clonazepam, methylphenidate
  - Oxymorphone (Opana) present
- Patient is Partially compliant
  - Taking Oxycodone (Percocet)
  - Not taking clonazepam, methylphenidate
- Call the laboratory; unsure of results

Screening Test	Urine Cut-off	Result
Amphetamine/Methamphetamine	100 ng/mL	Negative
Barbiturates	200 ng/mL	Negative
Benzodiazepine	200 ng/mL	Negative
Cocaine Metabolite	300 ng/mL	Negative
Marijuana	200 ng/mL	Negative
Opoids	300 ng/mL	Negative
Oxycodone	100 ng/mL	Pharmacologic Positive
PCP	25 ng/mL	Negative
THC (Marijuana)	20 ng/mL	Negative

Definitive Test	Urine Detection Limit	Result
Oxycodone	100 ng/mL	1,250 ng/mL
Oxymorphone	100 ng/mL	350 ng/mL

### Remember Cross-Reactivity Issues with Immunoassays

- Patient prescribed Clonazepam (Klonopin)
- Common Benzodiazepine immunoassay targets:
  - Oxazepam
  - Nordiazepam
  - Lormetazepam

Drug	200 ng/mL cutoff
7-aminoclonazepam	5,700 ng/mL
$\alpha$ -hydroxyalprazolam	100 ng/mL
Diazepam	44 ng/mL
Lorazepam glucuronide	>10,000 ng/mL
Medazepam	150 ng/mL
Midazolam	130 ng/mL
Temazepam	140 ng/mL

### Simplified Benzodiazepine Metabolism



### Case #1 Continued

**Benzodiazepine LC-MS/MS Confirmation, Urine**

Definitive Test	Urine Detection Limit	Result
7-NH-Clonazepam	100 ng/mL	3,250 ng/mL
7-NH-Flunitrazepam	100 ng/mL	<100
Alpha-OH-Alprazolam	100 ng/mL	<100
Alpha-OH-Triazolam	100 ng/mL	<100
OH-ethyl-Rurazepam	100 ng/mL	<100
Lorazepam	100 ng/mL	<100
Nordiazepam	100 ng/mL	<100
Oxazepam	100 ng/mL	<100
Temazepam	100 ng/mL	<100

- Patient is taking Clonazepam (Klonopin)



### Where is the Methylphenidate (Ritalin)?

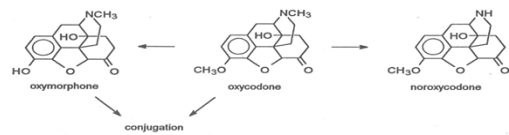
- Amphetamine/Methamphetamine Screening Assay:
  - Designed to detect:
    - Amphetamine
    - Methamphetamine
    - Methylenedioxymethamphetamine (MDMA)
    - Methylenedioxyamphetamine (MDA)
- Order methylphenidate & metabolite urine confirmation test:
 


Definitive Test	Urine Detection Limit	Result
Methylphenidate	10 ng/mL	250 ng/mL
Ritalinic Acid	50 ng/mL	1,730 ng/mL
- Conclusion:
  - Patient is taking methylphenidate

### Where did the Oxycodone (Opana™, Numorphan™) come from?

- Oxycodone metabolism:
  - In Urine:
    - 13-19% Free oxycodone
    - 7-29% Conjugated oxycodone
    - 8% Free oxymorphone
    - 13-14% Conjugated oxymorphone

Definitive Test	Urine Detection Limit	Result
Oxycodone	100 ng/mL	1,250 ng/mL
Oxymorphone	100 ng/mL	350 ng/mL







**Case #1: Conclusion**

**Waldo is compliant with all medications**

MAYO CLINIC Mayo Medical Laboratories



**Case Study#2**  
**Waldo's Brother**



MAYO CLINIC Mayo Medical Laboratories

**Case #2 Waldo's Brother**

- Prescribed Medications:
  - Hydrocodone (Vicodin) 10:325 qid

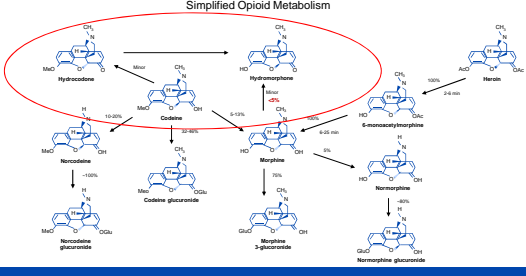
Screening Test	Urine Cutoff	Result
Amphetamine/	500 ng/mL	Negative
Methamphetamine		
Barbiturates	200 ng/mL	Negative
Benzodiazepine	200 ng/mL	Negative
Cocaine Metabolite	300 ng/mL	Negative
Mephedrone	300 ng/mL	Negative
Opiates	300 ng/mL	<b>Presumptive Positive</b>
Oxycodone	100 ng/mL	Negative
PCP	25 ng/mL	Negative
THC (Marijuana)	20 ng/mL	Negative

Definitive Test (LC-MS/MS)	Urine Detection Limit	Result
Codeine	100 ng/mL	<b>112 ng/mL</b>
Hydrocodone	100 ng/mL	<b>68,153 ng/mL</b>
Hydromorphone	100 ng/mL	<b>42,780 ng/mL</b>
Morphine	100 ng/mL	<100
Oxycodone	100 ng/mL	<100
Oxymorphone	100 ng/mL	<100

MAYO CLINIC Mayo Medical Laboratories

**Where did the Hydromorphone/Codeine Come From?**

Simplified Opioid Metabolism



MAYO CLINIC Mayo Medical Laboratories. A. Wasi, C. Egan, C. K. Brinkland, J. Interpretation of Urine Drug Testing in Pain Patients. Pain Med 2012;13:968-985

**Are these lab results consistent with therapy?**  
**How would you interpret these results?**

**Medications:**

- Hydrocodone (Vicodin)

Definitive Test (LC-MS/MS)	Urine Detection Limit	Result
Codeine	100 ng/mL	<b>112 ng/mL</b>
Hydrocodone	100 ng/mL	<b>68,153 ng/mL</b>
Hydromorphone	100 ng/mL	<b>42,780 ng/mL</b>
Morphine	100 ng/mL	<100
Oxycodone	100 ng/mL	<100
Oxymorphone	100 ng/mL	<100

- Patient is NOT compliant
  - Codeine was confirmed
- Patient is Partially compliant
  - Taking Hydrocodone
  - Also taking codeine
- Patient is compliant
- Unsure of results; Call the laboratory

MAYO CLINIC Mayo Medical Laboratories

**Other Considerations When Interpreting UDTs Include Pharmaceutical Impurities**

Allowable Pharmaceutical Impurities Found in Opioids

Drug (generic name)	Pharmaceutical process impurities (NOTE: These are NOT metabolites)	Allowable pharmaceutical impurity limit (%)
Hydrocodone	Codeine	0.15
Hydromorphone	Morphine Hydrocodone	0.15 0.10
Morphine	Codeine	0.50
Oxycodone	Hydrocodone	1.00
Oxymorphone	Hydromorphone Oxycodone	0.15 0.50

**Patient #2 Results:**

- Hydrocodone: 68,153 ng/mL
- Hydromorphone: 42,780 ng/mL
- Codeine: 112 ng/mL

MAYO CLINIC Mayo Medical Laboratories. A. Wasi, C. Egan, C. K. Brinkland, J. Interpretation of Urine Drug Testing in Pain Patients. Pain Med 2012;13:968-985



## Case #2: Conclusion

**Waldo's Brother is compliant with all medications**

## Ways to Adulterate Urine

1. Substitution
2. In vivo adulterants
3. In vitro adulterants



## Substitution

- Certified drug-free urine available through the internet
- Urine can be introduced by external plumbing hereby a small pouch can be hidden in anus, vagina, or under penis
- Donors catheterize themselves to insert drug-free urine directly into bladder



## In Vivo Adulterants

- Dilutional adulterants
  - Water
  - Diuretics (Lasix)
  - Natural products Xanthine compounds (caffeine, theophylline, theobromine) found in coffee, tea, cocoa to increase GFR
  - Goldenseal

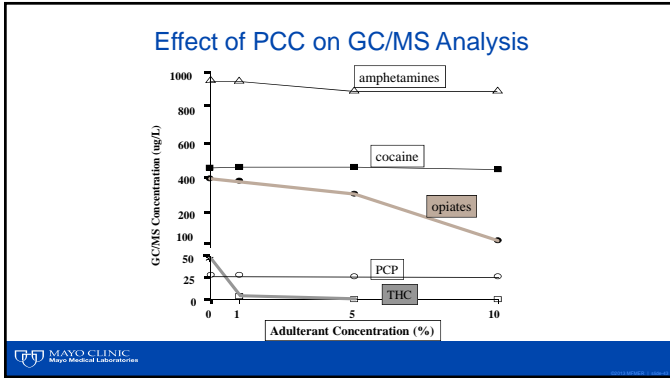


## In Vitro Adulterants (Doping)

- Originally found in bathrooms, purses, pockets, etc., as last minute adulterants
- Lemon juice, vinegar, detergents, soaps, can alter pH to affect conditions for optimum immunoassay screening
- Bleach, Drano, etc. oxidize drugs to other compounds
- Visine interfere with THC by forming micelle bodies

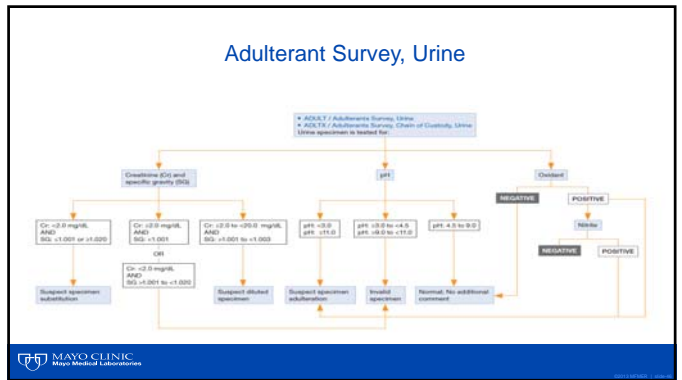
## Commercial Adulterants

- Whizzies/Klear:
  - Contains nitrite (850 mg) for use in 30–50 mL water
  - Oxidizes THC and THC internal standard at acid pH conditions
  - No interference for immunoassay screening. Low recovery of IS following GC/MS procedures
- Urine Luck, Sweet Pee's Spoiler, Klear II:
  - Pyridinium chlorochromate (PCC; 200 mmol/L)
  - Slowly oxidizes THC and morphine under neutral or slightly acid conditions
  - Low recovery of internal standards



- ### Countermeasures NIDA Regulations
- Household solvents/cleaners removed from urinals
  - Sources of water removed. Bluing agent in toilet.
  - Temperature checks performed within minutes of collection
  - Color and unusual odor noted

- ### Basic Lab Counter Measures
- Color
  - Temperature
  - Creatinine (Cr)
  - pH
  - Specific gravity (SG)
  - Oxidants
  - Witnessed collections
- 



- ### Case Study #3: Raging UTI
- 40 yo Female
  - Hx: Chronic back pain
  - Medications:
    - Hydromorphone (Dilaudid; 2 mg q6)
- 

### Case#3 Continued

- Routine UDT results (Immunoassay):
  - June 2018

Adulterant Test	Result	Reference Value
Creatinine	165 mg/dL	20-370 mg/dL
Specific Gravity	1.022	1.003-1.035
pH	5.2	3.0-11.0
Oxidants	Positive	Negative
Nitrites	Positive (>500 mcg/mL)	Negative

Testing stopped: **Suspect specimen adulteration.**

However, physician called and wanted to have opiate confirmation testing performed.



### Case#3 Continued

• Opiate LC-MS/MS Confirmatory Test:

Test	Detection Limit	Result
Codaine	25 ng/mL	<25 ng/mL
Morphine	25 ng/mL	<25 ng/mL
Dihydrocodeine	25 ng/mL	<25 ng/mL
Hydrocodone	25 ng/mL	<25 ng/mL
Norhydrocodone	25 ng/mL	<25 ng/mL
Hydromorphone	25 ng/mL	<b>3,245 ng/mL</b>
Oxycodone	25 ng/mL	<25 ng/mL
Noroxycodone	25 ng/mL	<25 ng/mL
Oxymorphone	25 ng/mL	<25 ng/mL
Noroxymorphone	25 ng/mL	<25 ng/mL
Naloxone	25 ng/mL	<25 ng/mL

### Case 3: Conclusion

- Physician confronts patient with results:
  - Patient doesn't have UTI; nitrite concentration (>500 mcg/mL) not physiological
  - Patient admits adding "Whizzies/Klear" to urine to try and hide her marijuana usage
  - Nitrite is interfering with confirmatory test for marijuana
- **Bad news:**
  - Patient is using marijuana
- **Good news:**
  - Patient doesn't have UTI
  - Patient is taking hydromorphone



### Summary

- Objective measures like laboratory tests are needed to:
  - Identify and evaluate recent drug use/abuse
  - Set and monitor clinical goals/expectations
- UDT results need to be interpreted in the context of the test, drug(s) prescribed, specimen type, specimen validity test results, and the patient
- Unexpected/unexplained results should be discussed with the patient/laboratory, and additional testing performed if needed

