Drug Testing in the Workplace
Markets
Our customers

Hospital
Fire services
Oil and gas industry
Mining
Chemical industry
Other markets
Intro

- Worldwide issue

- Drug and alcohol consumption is established in our cultural life and is part of all our societies.

- Trend to more potent drugs, but also to legalization

- Working population is mirror of society; working people all over the world use alcohol and drugs
The User changed as well
The User changed as well
The User changed as well
The User changed as well
There aren’t always clear Indications
Cannabis - Consumption

- Smoking
- Eating

Marihuana cigarette, joint, reefer

Bong, Bubbler

Cakes, Cookies

Vaporizer

Cannabis pipe
An individual is in a physical, mental and emotional state that enables them to perform the essential tasks of their work assignment in a manner which does not threaten the safety or health of oneself, co-workers, property or the public.
Adulteration/Substitution

Google
“beat a drug test”
2003: 153,000+ hits
2006: 11,000,000+ hits
2013: 53,000,000+ hits
2018: 83,300,000+ hits

Witnessed Collection
Difficult Sample Substitution
1. Absorption (Consumption), i.e. via lung or veins into blood stream

2. Distribution through the blood system in the body; effects

3. Metabolism, (Degradation) mainly in the liver

4. Elimination (Excretion); from the body i.e. by the urine, which is produced in the kidney
The Path of Drugs in the Human Body

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Cannabis - Pharmacology

Cannabinoids

> 500 chemicals &
109 Cannabinoids, like:

- Cannabigerol, CBG
- THC-cannabivarin, THCV
- Cannabidiol, CBD
- Cannabinol, CBN
- TetraHydroCannabinol, δ9-THC
Cannabis - Pharmacology
Main Metabolism Route

**THC** → *Degradation in the body* → **Carboxy-THC**

- **Active molecule, causing effects**
- **Inactive molecule, no effects**
Cannabis - Pharmacology
Effects

**Acute Subjective Behavioral Effects:**
- Euphoria / Relaxation
- Altered perception of time
- Lack of concentration
- Impairment of learning / memory
- Executive function
- Divided attention
- Mood changes, like panic reaction, paranoia

**Acute Physiological Effects:**
- Tachycardia
- Dry mouth
- Increased appetite
- Vaso- / Bronchodilation
The active THC... (The psycho-active part of the drug that causes impairment)
... passes the blood-brain barrier and binds to cannabinoid (CB1) receptors → modulates endogenous cannabinoid & other neurotransmitter system intensivation of feelings

Important neurobiological functions, like:

- Cognition: divided attention, short term memory, Learning
- Psychomotor control, coordination
- Hunger
- Body temperature control
- Brain reward system
Cannabis - Pharmacology
Main Metabolism Route

THC

\[
\text{Degradation in the body}
\]

Carboxy-THC

**Active molecule, causing effects**

**Inactive molecule, no effects**

THC is detectable in:
- blood
- oral fluid
- hair

Carboxy-THC is detectable in:
- blood
- urine
Detection times of various drugs in blood, oral fluid, urine

Dräger DrugTest 5000

Alain Verstraete, Ther Drug Monit., Vol 26, April 2004

<table>
<thead>
<tr>
<th>Drug</th>
<th>Blood</th>
<th>Urine</th>
<th>Saliva</th>
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<td>5d</td>
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<tr>
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<tr>
<td>OPI</td>
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</tbody>
</table>
Analysis Material and Detection Window
Specimen Types

Selection depends on the intent/purpose of the test

- Oral Fluid
- Urine
- Hair

**Risk of “Impairment” or “Fit for Duty”**

**Recent to Mid-Term Consumption**

**Drug History**

**DISRUPTIVE TECHNOLOGIES**
Blood is very well suited to testing for drugs and medication.

- Contains the drug immediately, transports it to places where the substance takes effect (brain) → indication of recent use
- Cannot be tampered with
- Homogeneous composition → Blood found entry in most DUID legislations

- Taking of a blood sample is highly invasive
- Needs a physician resp. facility
- No on-site test available
Hair

- Historic timeframe available; helps identify long term abuse
- No onsite test available

- Detection of active drugs/metabolites
- Hair growth: approx. 1 cm/month (.4 inches)
- Takes 5-7 days to emerge above the scalp
• **Produced in the kidney** as place of detoxification; Elimination of drugs, medicines etc., after they have been transformed into inactive metabolites in the liver
Urine

- Approx. 100 fold higher substance concentration in urine than in blood
- Industry Standard with good scientific support
- Internationally available guidelines

- No quantitative result over time possible, (bladder is collection container): Cannot measure frequency of illicit drug use

- Mainly (inactive) metabolites, like carboxy-THC: does not indicate severity of impairment
- Facilities needed
- Some find urine testing intrusive
- High Risk of Adulteration
Transfer Blood - Saliva

Transport (per passive Diffusion) of non-ionized, non-protein bound drugs

- Target analyte in saliva: mainly parent drugs
- Substances with high plasma protein binding hardly detectable (like THC)

Oral Contamination
Saliva - Oral Fluid

Components

- water
- electrolytes,
- mucus,
  with glycoproteins like mucins
- enzymes,
- antibacterial compounds
  (such as secretory IgA and lysozyme)
- mixed with cellular debris,
  residue of ingested products etc.

For reproducible testing, important to collect as much liquid (the saliva portion) as possible
Why Oral Fluid?
Advantages of Oral Fluid

Less Invasive
No Dignity or Gender Issues
Easy to Administer / Collect Sample
  Results within 10 minutes

Cost Benefits
  Reduce Downtime: Time, Logistics & People
  Reduce Administration & Testing Costs
Overview: Benefits of Oral Fluid Testing

✓ Rapid, easy, and non-invasive specimen collection, eliminates the need of a collection facility

✓ Less invasive: no dignity or gender issues

✓ Reduced risk of sample adulteration and dilution
Overview: Benefits of Oral Fluid Testing

✔ Rapid, easy, and non-invasive specimen collection, eliminates the need of a collection facility

✔ Less invasive: no dignity or gender issues

✔ Reduced risk of sample adulteration and dilution

✔ Better detection of recent drug use = Risk of being impaired

YES,

Oral Fluid Drug Testing is an option for the Workplace
Onsite vs. Lab-based

On-site Oral Fluid Screening Devices

Lab-based Oral Fluid Analysis
Onsite vs. Lab-based

Lab-based Oral Fluid Analysis

Quantitative results for a wide range of drugs

Turnaround time: hours, if not days

Costly

No target-oriented analysis, only in case of suspicion
Saliva Components

- water
- electrolytes,
- mucus, with glycoproteins like mucins
- enzymes,
- antibacterial compounds (such as secretory IgA and lysozyme)

→ more than 2000 components are identified in saliva

Formation approx. 0,5 - 1,5 liter/day
On-site Oral Fluid Screening Devices

Quick results (after minutes) on the spot; immediate action

Other price models

Indicator for following lab analysis

valuable and decision-supporting tool on-site!
The DrugTest 5000
Immunoassay Technology

Antigen = drug

Antibody

Antigen bound to Antibody

This method detects a substance by using **antibodies**.

Antibodies are proteins; they are responsible for immune reactions in the immune system of vertebrate animals - usually against pathogens.

Their special ability is to be highly selective to only molecules of a specific substance - this substance is the matching antigen for the designed antibody.
Dräger DrugTest® 5000

5 ng/ml THC (Δ⁹-tetrahydrocannabinol)
Immunoassay (Competitive Inhibition)
Electro-Optical Reader
Clear Results / No Interpretation
Integrated Data Management

First oral fluid screening device approved in Canada by the DOJ for roadside testing
Inside the Test Cassette

Sample Pad  Detector particles: Color-labeled antibodies  Capture zone with drug conjugates  Absorbent fleece

...without drugs  ...or with drugs

Basic design of a lateral flow test strip

Sample

Dräger
Oral Fluid when NO Drug is present
Oral Fluid when NO Drug is present

Sample pad  Labeled antibody  Detection zone with Embedded drug-conjugate  Absorbent pad

Signal = Negative
Oral Fluid when a DRUG is present

Sample pad  Labeled antibody

Detection zone with Embedded drug-conjugate

Absorbent pad

No signal to detector

Low or No Signal = Positive
Validation and Evaluation

As the analyser determines a positive or negative sample based on the intensity of the line, **line intensity is the key.** Its precise and reproducible occurrence is based on many factors, like the quality of the antibody, but also on the quality of marking reagents.

A faint signal may be negative or positive depending on intensity compared to calibration values stored in the barcode.

This technique makes the DrugTest® 5000 system more reliable than visually read tests.

Plus: Temperature control
Key Elements

Teamwork
Sales & Service Concept
Company
Match needs/wants of the customers

Expertise

Quick and comfortable
Printing option

Easy and safe operation
Product
Clear results without interpretation

Reliable analytical performance

How can this be proven??

Scientific evaluations

User studies

References

Country approvals
Selection of published Studies

Belgium
Belgium
Netherlands
Germany
Germany
USA
Oral Fluid Drug Testing

Implementation as part of a comprehensive fit-for-duty strategy

Not impairment testing, but for

Risk Identification & Risk Management

dignified

fast results

accurate

To improve Safety!
Conclusions for the Workplace
Completes the Drug Detection Window

**Oral Fluid**
- Recent drug use
  - reasonable cause
  - post-incident, post accident
  - pre-entry
  - random

**Urine**
- recent/mid-term consumption
  - pre-employment
  - random

**Hair**
- drug history
  - pre-employment
Standard Drug Testing Protocol

Drug Screen

- "Negative" Result
  - Applicant Hired / Back to Work

- "Non-Negative" Result
  - Sent to Laboratory
    - Laboratory Confirmation
      - (GC/MS – 99.99% Accurate)
        - Medical Review Officer Declares Positive or Negative
          - Employer Receives Results & Follows Company Protocol
Corporate Drug & Alcohol Policy

Well Documented
Well Communicated
Consistently Applied
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Thank you for your attention.