



# How Drug Checking Technologies Work

## Fentanyl and Benzo Test Strips

### What do they do and how do they work?

- Test strips give a reliable yes or no answer for whether certain drugs are in a sample (as long as testing instructions are followed carefully)
- These tests work in a similar way to pregnancy tests and are called lateral flow chromatographic immunoassay strips
- There are antibodies (proteins) in the strips that only bond with a certain type of drug
- A tiny amount of the sample is mixed with water. The strip is then dipped in the water, and the water travels up the paper strip carrying the sample with it
- If the target drug is present, the antibodies in the strip will attach to it; this makes the test line disappear and leaves only the control line visible
- If the target drug is not present, both the test line and the control line will be present
- In some cases, the control line disappears resulting in an invalid test, so the sample should be tested again



# Test Strips Continued...

## How sensitive are they?

- Test strips are highly sensitive, which means that they can detect target drugs at very low concentrations
  - This means we do not have to use very much of a sample to get an accurate result
  - It also means it's important to dilute the sample with enough water
- Using too much sample or too little water can result in false positives
- Fentanyl strip tests have sensitivity of 20 ng/ml
- Benzo strip tests have a sensitivity of 300 ng/ml
- Both benzo and fentanyl strip tests target drugs with similar chemical structures rather than single molecules
  - This means that fentanyl strip tests can pick up fentanyl and structurally similar analogues such as carfentanil, acetyl fentanyl, butyryl fentanyl, remifentanil, ocfentanil, sufentanil, p-fluoro fentanyl, furanyl fentanyl, valeryl fentanyl, 3-methyl fentanyl
  - Benzo strip tests also work for benzo analogues, but the concentrations needed for each kind of benzo to show a positive strip test vary more than the concentrations needed for fentanyl and its analogues to show a positive test
  - Unfortunately, this means that benzo strip tests can be less reliable than fentanyl strip tests, since there are fewer benzo analogues validated to react with the strips, and concentrations needed can vary



Use an eppendorf tube for benzo strips.



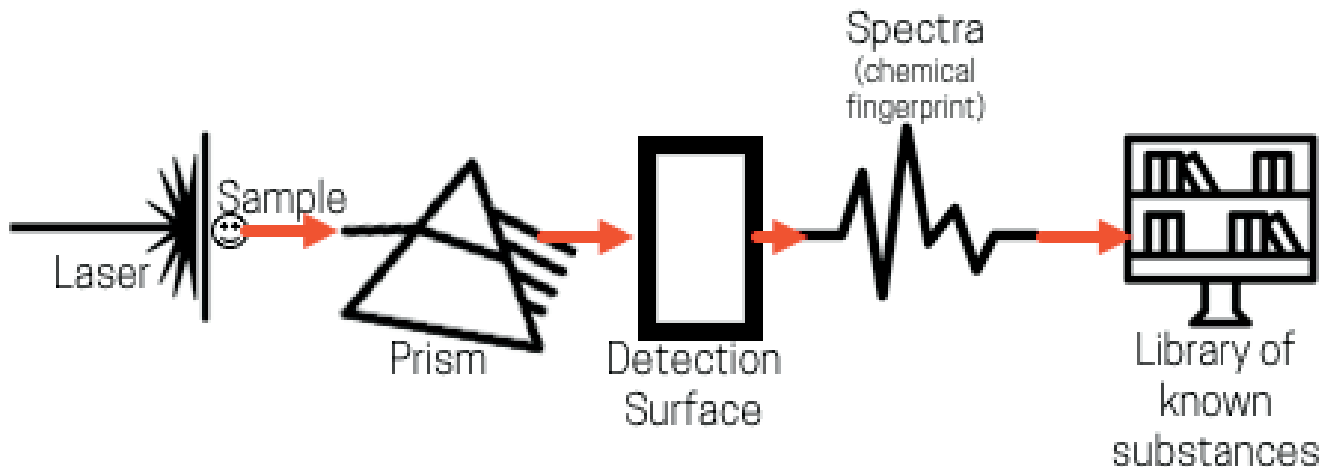
Use ~30ml of water for fent strips.

# Raman Spectrometer



## What does it do and how does it work?

- Raman spectroscopy shines a laser on a sample and collects the scattered light
- The scattered light is like a substance's chemical fingerprint. This chemical fingerprint is compared to a library of known substances to see if there's a match
- Raman spectroscopy is non-contact, non-destructive, requires minimal sample prep, and can produce results in a few minutes. It can also work through barriers like plastic bags and baggies
- Useful for identifying etizolam (a benzo analogue) in down samples



## How sensitive is it?

- It's best at bulk components, but can detect things as low as 5% concentration
- Surface Enhanced Raman Scattering (SERS) is a type of Raman spectroscopy that involves a particular way of preparing the sample. SERS can detect substances at lower concentrations.

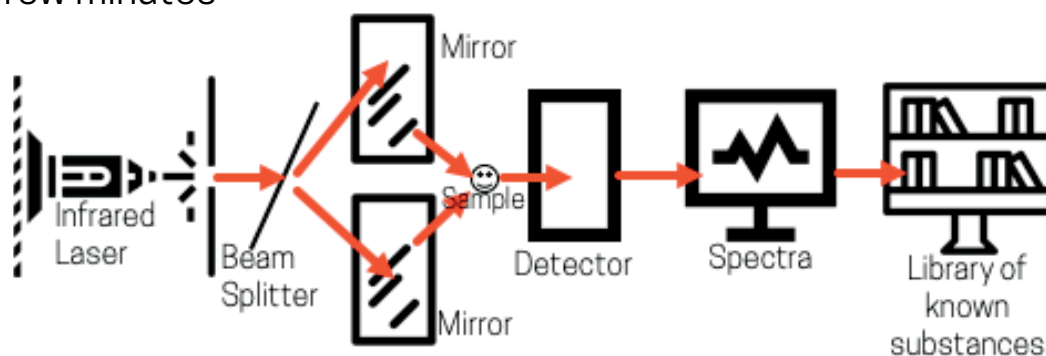


# FTIR Spectrometer



## What does it do and how does it work?

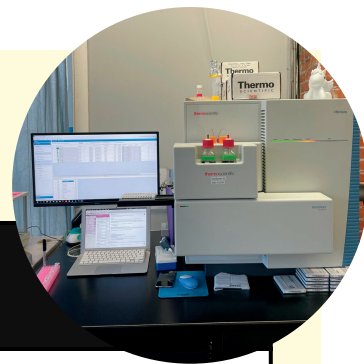
- FTIR stands for Fourier-Transform InfraRed spectroscopy
- This type of spectroscopy measures how much infrared radiation (a particular type of light) is absorbed by a substance
- The different chemical characteristics of a substance affect how it absorbs and reflects light
- When the light hits the substance, some of the light is absorbed, while the rest is reflected
- Similar to Raman spectroscopy, the reflected light is like a substance's chemical fingerprint
- Drug checking technicians compare the spectrum with others in the library to identify which substances are present (which substances match the spectrum)
- FTIR spectroscopy works for a wide variety of compounds, has a number of available libraries, requires minimal sample prep, and produces results in a few minutes



## How sensitive is it?

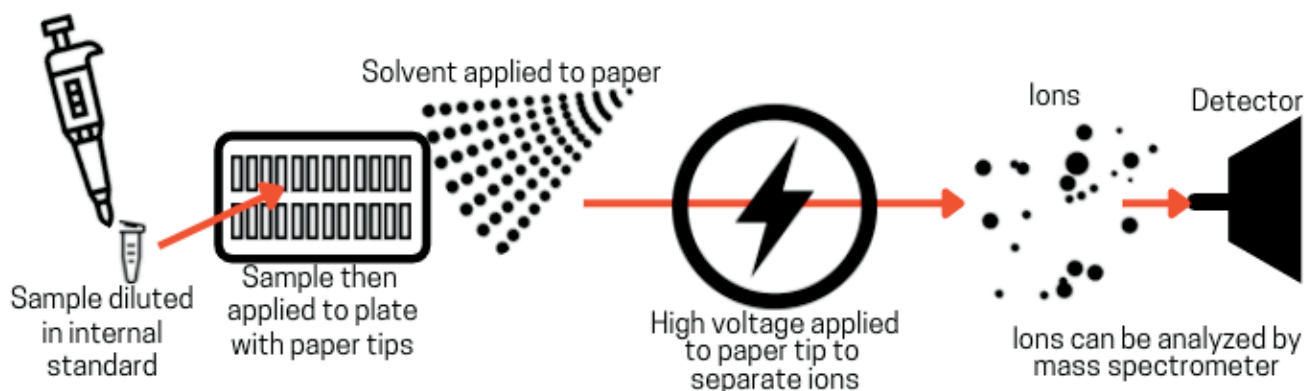
- FTIR spectroscopy can detect components at concentrations of 5%, sometimes lower
- This technique is limited in detecting trace-level components within samples (components in very low amounts)

# Paper Spray Mass Spectrometer (PS-MS)



## What does it do and how does it work?

- In PS-MS testing, the sample is dissolved in alcohol and the solution is applied to specialized piece of paper. The paper is then inserted into the machine
- High voltage is applied to the paper, causing the sample to “jump” or “spray” into an internal part of the machine
- Chemicals in the sample are separated out inside the machine based on their unique weight and electric charge
- PS-MS is considered a gold standard in laboratory settings, which means we are able to use this technique to confirm findings from the other instruments we use and to detect chemicals that the other instruments may have missed



## How sensitive is it?

- PS-MS is the most sensitive instrument we have. It can detect chemicals present at trace levels (~0.01% or ~0.005 mg per ml)
- PS-MS can also tell us what % of a chemical makes up the sample we test. This is called quantification.
- This technique is especially useful in detecting carfentanil and adulterants found at trace levels (very low amounts)

