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Comparison of Drug Confirmation Methods (Part 2)

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Over the past 20 years, there has been an evolution in the management of pain. With the increasing number of prescriptions for opiates in the treatment and management of pain written for patients participating in a drug treatment program, it has been a challenge with the identification and detection of hydrocodone, hydromorphone, oxycodone and oxymorphone. Thin Layer Chromatography (TLC) was an excellent confirmation choice for morphine and codeine, with a little problem differentiating between the isobaric compounds of hydrocodone and hydromorphone. These compounds have the same molecular weight with different molecular configurations. Specifically, the presence of high amounts of hydrocodone can mask the presence of codeine, and high amounts of morphine can mask the presence of hydromorphone. Further, in some instances, patients have prescriptions for more than one opiate. Varying concentrations of different opiates within a sample can make it difficult to resolve the compounds with similar molecular weight via TLC.

All three confirmatory methods have their own advantages and disadvantages. It is best to know what type of confirmatory method would be most suitable for the clinic, the patient, or a specific result. Below is a brief summary of the main difference between TLC, GC/MS and HPLC/MS/MS confirmations.

	TLC	GC/MS and HPLC/MS/MS
Name	Thin Layer Chromatography	Gas Chromatography / Mass Spectrometry and Liquid Chromatography / Mass Spectrometry
Process	• The drugs are removed from the urine and concentrated in a tiny amount of solvent. The solvent is dried as a tiny spot at one end of a TLC plate, which is a post card sized plastic sheet coated with a special powder like coating. The same thing is done on the plate with a known standard containing the drugs of interest. • One end of the plate is dipped in a special solution that rises up the plate by capillary action. When the plate has fully "developed" the solvent has risen to the top. Each drug rises with the solvent at a different speed and is therefore found at a different "level" on the plate. • The plate is sprayed with reagents that "visualize" the drugs. The drugs are identified using location and color versus the standard known specimen.	• The drugs are removed from the urine and concentrated in a tiny amount of solvent. • The GC/MS and LC/MS/MS instruments analyze the solvent. Highly sophisticated instruments are used that have the capacity to separate the drugs from each other and bombard each drug with electrons to produce a distinct molecular fragmentation pattern that is unique to each drug. • The instrument compares the fragmentation pattern to the standard drug mixture analyzed with each batch of specimens. • The instrument is able to identify the drugs present and quantitate how much is there.
Sensitivity	• Good Sensitivity	• Very Good Sensitivity
Quantitation	• Not quantitative	• Quantitative
Legal Defensibility	• Good for routine non-legal work	• Considered "state of the art" and required where litigation is an issue. Done properly with a chain of custody and forensic procedure it is extremely defensible in court.
Cost	• Economical	• Higher cost due to expensive equipment and reagents. More labor intensive.