E5 Clandestine Laboratory Capability: Actual vs. Theoretical

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After attending this presentation, attendees will understand the different methods a forensic chemist will use to determine the capacity of a clandestine methamphetamine laboratory. The analysis of the samples and evidence provided will determine how to calculate the capacity and ultimately the amount of methamphetamine to charge the defendant and which sentencing guidelines apply.

This presentation will impact the forensic science community by providing the attorney with the tools necessary to collaborate with the forensic scientist in determining the capacity of a clandestine laboratory – which is vital for an appropriate court outcome. The attorneys' understanding of how a forensic chemist determines the capacity of a clandestine laboratory through the analysis of a methamphetamine sample and the other evidence necessary will result in the proper charging and sentencing.

This past year there has been a decreased in the number of clandestine laboratories; however, it is still a significant problem. "Domestic methamphetamine production will most likely increase moderately in the near term**.**" The expected increase is due to the resurgence of small-scale methamphetamine production to meet the need caused by the reduced Mexican methamphetamine production, although there has been a relocation of some Mexican methamphetamine producers from Mexico to California. While recent regulation of pseudoephedrine by most states has limited the amount available, there has been a new emergence of large-scale pseudoephedrine smurfing operations throughout the country. Smurfing is the officially accepted law enforcement term for individuals or criminal groups circumventing state and federal pseudoephedrine sales restrictions by making numerous small-quantity pseudoephedrine product purchases from multiple retail outlets, all creating conditions conducive to a moderate increase in domestic methamphetamine production (*National Methamphetamine Threat Assessment 2009,* National Drug Intelligence Center, December 2008).

There are two main types of clandestine methamphetamine labs. The first is the "super" lab sometimes referred to as Mexican National Labs. They are large, highly organized laboratory operations that can manufacture ten or more pounds of methamphetamine per production cycle. To date, super labs are concentrated in southern California and Mexico. The other type is small-scale laboratories, often referred to as "mom and pop" or "Beavis and Butthead" labs. These laboratories usually manufacture only one to four ounces of methamphetamine per production cycle. Their operators typically produce enough drugs for their own and close "associates" use, and just enough extra to sell to others to finance the purchase of production chemicals. There is a third far less common type of clandestine laboratory that has emerged in recent years. It is being called a "dirt lab." They are very small-scale lab operations that seek out areas where super labs dump their toxic waste, dig up the soil, and try to extract the residual methamphetamine.

The more common small-scale laboratories currently use one of three synthetic methods to convert ephedrine or pseudoephedrine to methamphetamine. The first of these is the hydriodic acid (HI) and red phosphorus (red P) method; the second is commonly referred to as the "Cold Cook" (the iodine (I_2) and red phosphorus method); and the third is known as the "Birch Reduction" method (using anhydrous ammonia (NH_4) and either sodium (Na) or lithium (Li) metal). All of these procedures require either ephedrine or pseudoephedrine as the primary precursor. Additionally, each of the three procedures can have several variations. The Cold Cook method is sometimes heated in the microwave or placed in a pressure cooker. Clandestine laboratory operators use several different ratios of ephedrine, iodine, and red phosphorus (e.g., 1:2:3, 1:1:2 and 2:1:1 are just three). The Birch Reduction method is occasionally encountered using pseudoephedrine and lithium, dry-mixed together with anhydrous ammonia sprayed on the mixture to form a paste. This procedure decreases the actual yield, but is used because it is very rapid. Given the ease of clandestinely manufacturing methamphetamine and the similarities in the varieties of chemical syntheses procedures, recognition and positive identification of the manufacturing process can present challenges.

Production capability can only be based on the precursor chemicals. A precursor is incorporated into the final compound therefore only *l*- ephedrine or *d*-pseudoephedrine can be considered. All the other chemicals are either reagents or solvents that assist in the reactions but not added to the final product. Therefore, amount of the reagents cannot be used to determine production capability without a specific recipe. The forensic chemist can use three different methods in determining the clandestine laboratory's manufacturing capacity**.** The **Actual Yield Determination** which is ideal requires that the forensic chemist must have the amount of precursor used, and the amount of finished product with its purity determined. The 'recipe' or synthesis formula providing details as to the amount of precursor and the amounts or ratios of reagents used and the procedure is optional but very helpful. The absence of this information would require the chemist to use the second **Reconstructed Yield Determination** method. Here the forensic chemist will use scientific assumptions to fill in the needed information. This information is obtained from notes indicating weight of final product; lists of the operator's sales; sales receipts of chemical purchases; statements including elocutions; and agent's reports.

However, the recent Supreme Court decisions have moved the clandestine laboratory capacity

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determination from the sentencing phase where the preponderance of the evidence and qualified reasonable expectations are allowed to the trial in chief or guilt phase where the standard is beyond a reasonable doubt with some factual qualified assumptions. Thus, the **Theoretical Yield Determination** which calculates the 100% yield from the primary precursor is the only beyond a reasonable doubt method. Production capability is based on the precursor chemicals and calculated at 100% yield and 100% purity. Yield and purity are two independent concerns both expressed as a percentage. When calculating the theoretical yield of any reaction it is always at 100% purity.

Methamphetamine, Clandestine Laboratories, Sentencing Guidelines

