B111 Food Microscopy for Forensic Scientists

Scott F. Stoeffler, MSFC, McCrone Associates, 850 Pasquinelli Drive, Westmont, IL 60559*

After attending this presentation, attendees will understand microscopical techniques for characterizing and identifying a variety of foods and food-related materials.

This presentation will impact the forensic community and/or humanity by providing information and education on a somewhat neglected area of trace evidence, for which training is rarely available.

The goal of this presentation is to acquaint forensic scientists with microscopical methods for the identification of various common food products, either in bulk, or as stains or traces. Characteristic features of a variety of foods and food-related materials will be described.

Food products and related materials such as herbs, spices, and seasonings are occasionally encountered as trace evidence, in stomach contents or in cases of adulteration. A great deal of information about such materials can be gained by examination using the stereomicroscope and polarized light microscope, and in many cases, identification is possible without the need for more involved chemical analysis.

Many powders and other dry materials can often be identified by simple visual examination under a low power stereomicroscope. Products such as herbs, spices, coffee, and tea have distinctive morphological features that allow them to be identified definitively, with the use of appropriate reference materials. Further examination of optical properties with the polarized light microscope can provide more specific identification of materials such as starches and other white powders. Starches are easily recognized by their distinct black cross between crossed polars, and examination of shape, size, hilum appearance and surface striations can help to identify specific varieties. Crystalline materials such as salt, sugar, and baking powder can be identified by their morphology, refractive indices, and other optical properties. Stereomicroscopy and polarized light microscopy are also useful for the identification of mixtures.

In some cases, suspected food materials cannot be specifically identified, but microscopical features can provide general information about the class of material present. Light microscopy can help to identify the presence of pigments such as chlorophyll, lycopenes, and carotenes, which are characteristic of particular types of plant material. A variety of staining techniques are available for distinguishing fat, protein, and carbohydrate components and for eliciting the microstructure of food products. The presence and distribution of fats and oils in a sample can be determined through the use of a specific stain such as Oil Red O or ruthenium tetroxide. Intact starch grains can be stained using a classic iodine solution or iodine vapor, while cooked starch and other carbohydrates, as well as meat products, can be differentially stained using toluidine blue.

Microscopy, Food, Trace Evidence

 ** Presenting Author*