Key Concepts of Chapter 14:

Chapter Objectives
- Identify various types of chemicals used to develop latent prints
- Understand different chemical reactions that result in the development of latent prints
- Understand role of different chemical processes on porous and non-porous surfaces

Introduction
- New chemical processes are being developed almost on a daily basis
- New developments in one-step preparation for LASER or forensic light source examination are currently being explored
  - Example: Using dye stains with the CA fuming process

Chemical Processing
- Divided into 3 categories:
  - Porous surfaces
  - Non-porous surfaces
  - Special application
- Chemical processes are more effective on porous surfaces than fingerprint powders

Chemical Processing: Porous Surfaces
- Iodine Fuming
  - Heated iodine crystals vaporize and produce fumes that are absorbed by fatty or oily matter
  - Develops yellowish-brown prints
  - Prints are not permanent and are photographed immediately
  - Not used very often as other methods may produce better results
- Ninhydrin Fuming
  - Reacts with amino acids present in perspiration
  - Can be sprayed, dipped, or brushed on objects
  - Moist heat from steam iron or humidity chamber applied to speed and improve reaction
  - Prints appear purple in color
  - Used since the 1950’s
  - One of the most popular chemicals to develop prints on porous surfaces like paper
  - Capable of developing 30-year old prints
  - Develops latent prints in trace blood on objects such as walls
  - Ninhydrin not used on dead bodies due to presence of amino acids everywhere on skin, which would result in a solid reaction
  - Developed prints are usually photographed with a green filter or digitally scanned if on paper
- Physical Developer (P.D.)
  - Silver-based reagent that reacts with components of sebaceous sweat
- Develops gray-colored prints on paper, cardboard, and raw wood
- Works well on papers submersed in water and dried, and on paper currency
- Developed prints are photographed

- **Silvery Nitrate**
  - Reacts to sodium chloride (salts) present in perspiration
  - Can be applied by spraying, dipping, or brushing
  - Prints developed through exposure to a high intensity light
  - Prints appear dark brown to black color
  - Usually last process used in sequence due to continuous reaction time that may result in entire surface turning dark
  - Developed prints are immediately photographed

**Chemical Processing: Non-Porous Surfaces**

- **Cyanoacrylate (Super Glue)**
  - Polymerization occurs as the glue vapors adhere to friction ridge residue, hardens and builds up the ridge detail as more particles condense on the impression
  - Enhances chances of developing latent prints on hard surfaces, plastic bags, other pliable plastics, and firearms
  - Other processes may be used after CA
  - Fingerprint powders or dye staining
  - Developed prints may be powdered and lifted or photographed on object
  - Non-porous surfaces must be super glued before laser dye staining to fix any prints to surface before staining

- **Vacuum Metal Deposition (VMD)**
  - Object placed in a vacuum chamber where small amounts of various metals are vaporized and adhere to prints
  - Very sensitive process that has developed up to 10-year old prints even after other processes did not produce prints
  - Most common metals used are gold and zinc
  - Developed prints are photographed

- **Forensic Light Sources: Laser Detection**
  - Light Amplification by Stimulated Emission of Radiation (LASER)
  - High-energy light source used to luminescence certain properties of perspiration and contaminates contained in latent prints
  - 2 methods to detect latent prints with LASER:
    - Inherent luminescence – print properties luminescence without treatment
    - Chemically induced luminescence – print properties luminescence with treatment
    - Examples: Rhodamine 6G and DFO (1,8-Diazafluoren-9-One)
  - Additionally, adjustable wavelength light sources can duplicate different wavelengths of light made by various types of LASERS and ultraviolet lights
  - Prints are photographed while luminescent with camera lens filter used to view print
Special Application Processes

- **Gentian Violet/Crystal Violet**
  - Used to develop latent prints on adhesive side of some tapes
  - Adhesive tape soaked in a solution of gentian violet
  - Developed prints are photographed

- **Ortho-Tolidine**
  - Used for detection of trace or latent prints in blood
  - Successful in developing prints off dead bodies
    - Example: In 1981, LAPD successfully developed a latent blood print on the back of female sexual assault murder victim
  - Certain derivatives of chemical can be hazardous and should be used under supervision of a trained criminalist

- **Liquid Nitrogen**
  - Used when tape has been balled up
  - Freezes the tape instantly
  - Tape can be gently pulled apart
  - Prints on tape are saved for processing

- **Small Particle Reagent (SPR)**
  - Solution of molybdenum disulphide particles in detergent
  - Sprayed onto object surface
  - Adheres to fatty constituents in latent prints
  - Gray powder separates from detergent and adheres to print
  - Print can be lifted or photographed
  - Primary application of SPR is on waxy surfaces and non-porous objects that are wet

- **Amido Black**
  - A dye stain that reacts to proteins present in blood
  - Prints developed are black-blue in color
  - Prints developed must be photographed
  - Disadvantage – only reacts with blood and not other constituents of latent prints
  - Prints only partially in blood will not fully develop
  - Process may be used as a replacement for ortho-tolidine for development of blood prints on dead bodies

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**REFERENCE**