

# Appendix C

## Glossary of Terms

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- absorption spectrum:** a plot of the amount of light absorbed by a gas, liquid, or solid at particular wavelengths versus the wavelengths examined.
- acetone:** a solvent used to extract pesticides from foods.
- acetonitrile:** a solvent used to extract pesticides from foods.
- adsorbent:** a material that gathers a gas, liquid, or dissolved substance on a surface in a condensed layer.
- adsorption chromatography:** chromatography based on the interaction between a chemical dissolved in a solvent and an adsorptive surface, such as the surface of a diatomaceous earth particle.
- affinity:** The strength of the interaction between chemical and antibody. The higher the affinity of the antibody for the target chemical, the greater the sensitivity of the immunoassay.
- alkali flame ionization detector (AFID):** a detector that measures the presence of nitrogen and phosphorus within a molecule.
- alumina:** the natural or synthetic oxide of aluminum.
- analytical columns:** columns that are used to separate chemicals at the microgram level or below.
- aromatics:** chemical compounds containing one or more benzene rings.
- atomic emission spectrometric detector:** a detector that measures light emitted from atoms, ions or molecules following excitation by electrical energy, flame, or high temperatures; see flame photometric detector.
- capillary column:** long, open tubes ranging from 0.01 to 0.03 inch in internal diameter and from 30 to 500 feet in length; the inside wall of the tube is coated with a thin film of involatile liquid.
- chemiluminescence detector:** a detector that measures the emission of light produced by a chemical reaction.
- cholinesterase:** an enzyme that hydrolyzes choline esters.
- chromatogram:** the record obtained from a chromatographic analysis.
- chromatography:** the separation of mixtures into their constituents by preferential adsorption to, and elution from, a solid support.
- compliance samples:** commodities collected by FDA when a violation of pesticide residue tolerance levels is suspected or known.
- derivatization, chemical:** modification of a chemical, usually by the addition to or modification of, a functional group to enhance or permit detection of the compound.
- detector, chromatographic:** a device for measuring the amount of a chemical following chromatographic separation.
- diatomaceous earth:** a fine siliceous earth composed chiefly of the cell walls of diatoms (any of numerous microscopic, unicellular, marine, or freshwater algae having siliceous cell walls) used for adsorption chromatography.
- distillation:** the volatilization or evaporation and subsequent condensation of a liquid, as when water is boiled in a retort and the steam is condensed in a cool receiver.
- electroactive functional groups:** chemical groups of a molecule that can be oxidized or reduced electrochemically.
- electrochemical detector:** a detector that measures the flow of electrons that occurs with the oxidation or reduction of the chemical analyzed.
- electron capture detector (ECD):** a detector that measures amount and electron affinity of the chemical analyzed.
- elute:** to remove an absorbed material from an adsorbent by means of a solvent.
- emulsion:** an intimate mixture of liquids, one of which (the disperse phase) is distributed in large or small globules throughout the other (the continuous phase). The emulsifying agent, the third component, is present at the interface between the two liquids.
- exploratory projects:** a survey done by FSIS to determine if a pesticide not currently detected or a method not currently used should be included in a monitoring program.
- fixed wavelength UV absorbance detector:** a detector that can measure the absorbance of light by a chemical at one single wavelength.
- flame photometric detector:** a type of atomic emission spectrometric detector employing a flame as a source of excitation of the chemical.
- Florisil:** a diatomaceous earth adsorbent.
- fluorometer:** an instrument used to measure the intensity of fluorescence produced by a fluorophor.
- fluorophor:** a molecule or portion of a molecule that is capable of excitation by high-energy radiation and will subsequently emit low-energy radiation.

- fouling (detector):** contamination of a detector with material that decreases the sensitivity or stability of the detector response.
- gas chromatography:** chromatography in which the substance to be analyzed is vaporized and diffused along with a carrier gas through a liquid or solid adsorbent for differential adsorption.
- gel chromatography:** the separation of molecules on a column on the basis of size following their movement into and out of, or their total exclusion from, pores in the gel column.
- Hall microelectrolytic conductivity detector (HECD):** a detector that measures the presence of halogens (e.g., Cl, Br), sulfur or nitrogen in a molecule.
- haptin:** a chemical compound so small that it must be conjugated to a larger molecule before it can stimulate antibody production.
- herbicide:** a chemical for killing plants, especially weeds.
- Hill reaction:** the evolution of oxygen from a chloroplast in the presence of ferric ion following the introduction of light.
- hybridoma:** a cell type produced by the fusion of spleen cells and myeloma tumor cells which can produce monoclonal antibodies.
- hydrocarbons:** any of a class of compounds containing only carbon and hydrogen.
- immiscible:** incapable of being mixed.
- immunoassay:** the use of antibodies to identify and possibly quantify a substance.
- integrators:** computers used with gas and liquid chromatography in part to determine a chemical's retention time and quantity.
- ion trap detector (ITD):** a miniaturized mass spectrometer used in the detection of gas chromatography eluants.
- ionic:** pertaining to electrically charged atoms or groups or atoms.
- liquid phase:** the chemical that is bound to the inert supporting phase in a gas chromatographic *column* that separates the various components of a mixture placed on the column.
- market basket:** a selection of foods that represents the typical diet of a U.S. household.
- mass selective detector (MSD):** a miniaturized mass spectrometer used in the detection of gas chromatography eluants.
- mass spectrometry (MS):** an analytical technique in which a chemical is broken into fragments with positive or negative charge(s) and the mass and relative abundance of these fragments are analyzed to produce a mass spectrum.
- matrix:** the material in which the chemical to be analyzed is found, e.g., pesticides in food.
- metabolize:** a compound produced from another (known as a parent compound) as a result of physical and chemical processes acting on the original compound.
- microgram:**  $10^{-6}$  grams.
- mobile phase:** the solvent that flows through a chromatographic column.
- monoclonal antibodies:** antibodies produced by a single strain of cloned cells (e.g., hybridomas) in culture.
- multiresidue method (MRM):** analytical method that can detect more than one pesticide during an analysis of a sample.
- nanogram:**  $10^{-9}$  grams.
- nanometers:**  $10^{-9}$  meters; used to describe wavelengths of light that are used to excite molecules and that measure the light absorbed by or emitted from an excited molecule.
- neutral:** having no electrical charge, positive or negative.
- nitrogenous pesticides:** pesticides containing one or more nitrogen atom(s).
- oxidize:** to combine with oxygen; to take away hydrogen.
- p-value:** a measure of the partition characteristics of a pesticide between two immiscible organic phases (solvents).
- packed columns:** hollow tubing ranging in internal diameter from 2-4 mm and in length from a few inches to 50 feet, filled with particles coated with an involatile liquid.
- partitioning:** the process of distributing between two immiscible solvents so that the pesticide will appear in one phase and potential interferences in another, which can then be discarded.
- pesticides:** toxic chemicals used against insects (insecticides), fungi (fungicides), weeds (herbicides), and other pests.
- Pesttrak:** FDA computerized data base used to track whether pesticides can be analyzed using one of FDA's five routinely used multiresidue methods.
- photo-diode array detector:** a detector that contains several diodes arranged in series that respond to the characteristic emitted light of the chemical being analyzed.
- photo-ionizable functional groups:** chemical groups such as halides (e.g., Cl, Br) that can be removed from a larger molecule by the effect of light.
- photoconductivity detector:** a detector that measures the change in the conductivity of a chemical in solution produced by the decomposition of the chemical by light.
- photolyze:** the degradation or structural transformation of a chemical by light.

- photoreaction:** a chemical reaction caused by the reaction of the chemical with light.
- polar:** that chemical characteristic that favors a chemical's volatility in water.
- polyclonal antibodies:** heterogeneous antibodies derived from different B lymphocyte cells in the serum of a vertebrate.
- ppm:** micrograms of chemical per gram of material in which the chemical is found.
- preparative chromatography:** the use of columns having the capability of separating milligram or larger quantities of chemicals.
- pyrolysis:** decomposition of chemicals under the influence of high temperatures.
- qualitative:** of or pertaining to the quality or identity of a substance.
- qualitative test:** identifies a pesticide residue if it occurs at concentrations above a pre-established level.
- quantitative:** of or pertaining to the measuring of the quantity of a substance.
- relative retention time:** the time that a compound is eluted from a chromatographic column expressed relative to that of a standard compound.
- resolution:** the true separation of two consecutive chromatographic peaks.
- retention data:** retention volume (volume of a carrier gas required to elute a compound from a column) and retention time (time required to elute a compound from a column).
- semiquantitative:** intermediate between quantitative and qualitative.
- semiquantitative test:** identifies a pesticide residue over a pre-established concentration and determines the range of their concentrations.
- silica gel:** a highly adsorbent gelatinous form of silica.
- single residue method:** analytical method that detects only one pesticide during an analysis of a sample.
- size-exclusion chromatography:** see gel chromatography.
- solid phase extraction:** a technique for concentrating chemicals by absorption and subsequent elution from a liquid phase that is chemically bonded to silica.
- solvating power:** the ability of a solvent to interact with a solute to form a solution.
- solvent:** a substance that dissolves another to form a solution.
- standard:** a chemical, of known concentration and purity, used as a reference substance in analytical work.
- Subdivision "O" Guidelines:** guidelines provided by the U.S. Environmental Protection Agency which describe the data to be submitted as part of the tolerance-setting process.
- supercritical fluid chromatography (SFC):** chromatography in which supercritical fluids are used as the mobile phase.
- supercritical fluids (SF):** fluids that are more dense than gases but not as dense as liquids.
- support:** the material to which the stationary phase is attached in a chromatographic column.
- surveillance samples:** for FDA, these are samples of food and feed that have been collected for general monitoring purposes; for FSIS these are meat samples suspected or known to violate pesticide tolerances.
- thermionic detectors (NPD and AFID):** detectors that measure those elements in a chemical compound that are ionized by heated rubidium (NPD; nitrogen and phosphorus are selectively detected) or by a heated alkali metal (AFID; nitrogen and phosphorus are selectively detected).
- tolerance:** the maximum legal level of a specific pesticide residue on a specific type of commodity, established by EPA.
- Total Diet Study:** FDA study that monitors the dietary intake of pesticides in a "market basket" of foods by various age-sex groups in the U.S.
- UV absorbance detector:** a detector that measures the absorbance of light in the ultraviolet range by chemicals moving through it.
- unidentified analytical response (UAR):** responses that appear on a chromatogram which do not coincide with standards of the pesticides or pesticide metabolites under investigation.
- validating:** the process by which one chemist or more test(s) the suitability of a particular method for collecting analytical data.
- validation:** the verification that a technology or method provides useful analytical data and operates within acceptable performance parameters.
- variable wavelength detector:** a detector in which a wide range of wavelengths of light can be detected.
- violation rate:** percentage of samples analyzed that violate tolerances.
- volatile:** evaporating rapidly.
- wide bore columns:** a type of capillary column used in gas chromatography that has an internal diameter ranging from 0.53 to 0.75 mm.