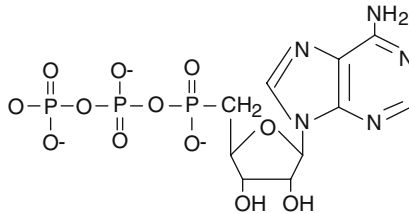


GLOSSARY

Absorption: The movement of a chemical from the site of contact across a biological barrier.

Active transport: A biochemical process requiring energy where compounds are moved across the cell membrane, commonly against a concentration gradient.

Adenosine triphosphate (ATP): A high-energy containing molecule that allows organisms to transfer energy.



Aerobe: A microorganism whose growth requires the presence of air (oxygen). *Acetobacter* is an example of an obligate (‘must have’) aerobe.

Aerobic respiration: A sequential series of biochemical processes (glycolysis, Krebs cycle, and oxidative phosphorylation) where glucose is oxidized to CO₂, H₂O and energy in the form of ATP.

Agar: A complex carbohydrate material refined from marine algae and used to produce semisolid media. Solidified agar has the texture of a gelatin dessert. It solidifies at temperatures between 40°C/104°F and 45°C/113°F and will not remelt until it is boiled. Most liquid media can be solidified by the addition of 1.5% to 2% w/v agar.

Amino acid: Organic compound that contains both acid (COOH) and amine (NH₂) groups. Amino acids serve as the basic unit within proteins and enzymes.

Anaerobe: A microorganism that grows only or best in the absence of air (oxygen). Many lactic acid bacteria are considered to be facultative (not required) anaerobes; these microorganisms grow well under anaerobic conditions but can also grow in the presence of some oxygen.

Anaerobic jars: As most laboratories do not have anaerobic incubators due to cost, a good substitute is plastic jars that contain racks that hold disposable CO₂ generators. Alternatively, some winemakers rely on "candle jars" in which a candle is lit inside of the jar prior to being sealed (the flame will remove the oxygen that is present before being extinguished).

Anamorph: Asexual or "imperfect" form of a yeast. Although anamorphs and teleomorphs are the same microorganism, these forms differ in their inability (anamorphs) or ability (teleomorphs) to form spores. Microbiologists assign separate names (genus and sometimes species) to differentiate the ability of a yeast to produce (or not) spores.

Ascospores: The sexual spore that many yeasts can produce as a mean of reproduction.

Ascus: A structure formed by many yeasts that contains ascospores.

Aseptic technique: Any technique or procedure in which precautions against microbial contamination is taken. Once media or instruments are sterile, they are kept free of microorganisms using this technique.

Autoclave: A pressure vessel capable of reaching temperatures in excess of 100°C/212°F by using steam. Autoclaves are used to sterilize media and instruments.

Autotroph: A microorganism that can produce through biochemical processes all required organic components from inorganic sources.

Bactericidal: Chemicals that are lethal to bacteria.

Bacteriophage: A virus that infects bacteria. Phage are strain specific and are lethal to bacteria.

Bacteriostatic: Chemicals that inhibit bacteria without necessarily being lethal.

Biohazard: Biological or infectious material such as a microbiological pathogen (e.g., *Salmonella*).

°Brix (°Balling): Measurement used to express the concentration of soluble solids, primarily sugars, and expressed on a weight/weight basis (g sucrose per 100 g liquid).

Brownian motion: Random movement and motion of microorganisms when viewed in a wet mount under a microscope.

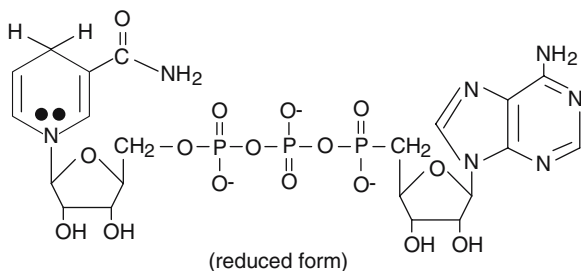
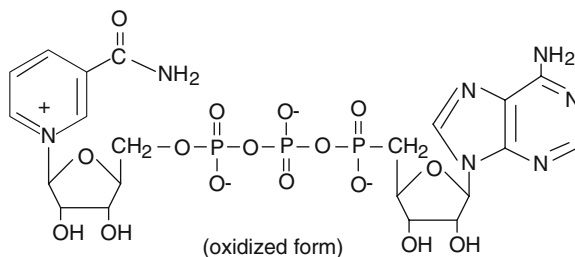
Budding: Asexual reproduction of yeasts involving the formation of daughter cells (buds) off of the mother cell. Yeasts can reproduce by bipolar (buds only appear at end of cell) or multipolar/multilateral (buds can appear on all surfaces of cell).

Carcinogen: A chemical or physical agent capable of causing cancer in animals or humans.

Chemical compatibility: The ability of different reagents to potentially react with one another resulting in a safety concern. Some chemicals should not be stored in close proximity due to their reactivity (acids and bases).

Cocci: Cells that microscopically appear as being "round" or slightly oval.

Coenzyme: A compound that "assists" enzymes catalyzing reactions, commonly by donating or receiving electrons. For instance, nicotinamide adenine dinucleotide can exist in the oxidized form (NAD^+) or the reduced form with an added electron ($\text{NADH} + \text{H}^+$).



- Colonies:** When a viable cell is deposited on the surface of a solidified agar medium, it reproduces and forms a cluster (or colony) of cells, which are counted for enumeration. However, these colonies may also initially arise from pairs, chains, or clumps of cells depending on the morphology of the microorganism. In these cases, the population should be recorded as "colony-forming units" per mL (CFU/mL) rather than cells per mL.
- Contamination:** The result of materials, chemical substances, or microbes entering systems causing a reduction in quality or a safety hazard.
- Corrosive:** A substance that causes visible damage to humans at the site of contact.
- Dilution blank:** A sterilized solution consisting of 0.1% w/v peptone water used to dilute samples that contain large numbers of viable microorganisms. Samples are normally serially diluted (1:10, 1:100, 1:1000, 1:10,000, etc.) prior to plating using solidified agar.
- Durham tube:** A small test tube (9.5 × 50 mm) placed inverted in a liquid broth and used to detect CO₂ formation by physically trapping the gas.
- Ecology:** The study of the interrelationships between an organism and the environment.
- Enzyme:** A protein catalyst that causes changes in other molecules without undergoing any alterations itself. For example, the enzyme catalase acts on hydrogen peroxide (H₂O₂) as a substrate to form water (H₂O) and oxygen (O₂). Enzyme names commonly have the suffix "ase" (e.g., catalase, pectinase, etc.).
- Eukaryote:** An organism (e.g., yeast) that has cellular organization including a membrane-bound nucleus and internal organelles.
- Fastidious:** Microorganisms that require many different nutrients due to their inability to synthesize these compounds.
- Fermentation:** The breakdown of organic molecules such as sugars into other products, commonly under anaerobic conditions.
- Genus:** A taxonomic category of related organisms, usually containing several species. The genus is the first name of an organism within the binomial system of taxonomy.
- Glycolysis:** The anaerobic process of breaking down glucose to form pyruvic acid or lactic acid and energy in the form of ATP.
- Gram stain:** A differential staining procedure that classifies microorganisms as either Gram-positive or Gram-negative based on retention of a specific dye (crystal violet). Using brightfield microscopy, Gram-positive cells appear "purple" whereas Gram-negative ones appear "red."
- Haploid:** A single cell that has only one set of chromosomes, as opposed to diploids which have two sets.

Hazard: Any physical, chemical, or biological material or situation that can potentially cause injury or death. Examples are flammable or corrosive chemicals or some biological agents.

Heterothallic: Organisms in which the two sexes reside in different individuals. By contrast, homothallic organisms possess both sexes in the same individual.

Hexose: A six-carbon sugar. In grape musts, glucose and fructose are the most common examples.

Hockey stick: A glass rod bent into the shape of an L that is used to evenly spread samples onto solidified media.

Hyphae: The filaments or threads formed by a number of yeasts and molds that form a mat (mycelium).

Inoculum: A small amount of viable microorganisms introduced into a medium or juice with the goal of growing the cells.

Krebs cycle: Also known as the citric acid (or tricarboxylic acid) cycle, this is a series of aerobic reactions by which the pyruvic acid produced in glycolysis is converted into energy (i.e., ATP and reduced molecules NADH and FADH₂), CO₂, and H₂O.

Long-Term Exposure Limits (LTEL): The maximum concentration to which a worker can be exposed to continuously for a defined long period (8 hour day or 40 hour week) without experiencing ill effects.

Loop: A device with a handle and a metal loop on the end used to transfer microorganisms. It is also known as a "laboratory loop" or a "transfer loop" and is sterilized by holding the metal loop in an open flame.

Material Safety Data Sheets (MSDS): Mandatory printed information provided by the manufacturer/distributor that identifies hazard/physical properties of chemicals as well as first aid treatment for exposure.

Medium: A formulation composed of various ingredients that will support the growth of different microorganisms. Such ingredients include glucose, peptone, yeast extract, liver extract, and others. A medium can be prepared as a liquid or solid, the latter with the addition of agar.

Methylene blue: A differential stain that can be added to a liquid suspension to evaluate yeast viability. Live yeasts will reduce the dye to a colorless form, whereas dead cells appear blue/black as viewed using a microscope.

Microorganism: A very small organism that can only be seen using a microscope. Although most microbes appear microscopically as a single cell, some form pairs or chains of many cells.

Milk dilution bottle: A square-sided bottle that is commonly used for larger dilution blanks. Though total volume can be up to 160 mL, these bottles most commonly contain 99 mL. Many brands will have an etched

line on the side of the bottle that represents a mark for 99 ± 1 mL volume.

Mold: A fungus that has a filamentous physical structure.

Mycelium: An interwoven mass of individual fungal filaments or hyphae.

NAD⁺/NADH: See “coenzyme.”

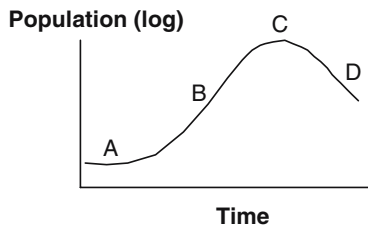
Needle: Needles attached to wooden handles are used to prepare stabs and can be resterilized using an open flame.

Pentose: A five-carbon sugar such as arabinose or ribose. Normally, these sugars are found in grape musts at low concentrations, <0.05%.

Personal protective equipment (PPE): Equipment used by employees to reduce or eliminate the potential for exposure to hazardous materials or situations. Such examples would include eye goggles, protective gloves, and the like.

Petri plates or dishes: Sterilized glass or plastic dishes with covers that are used to hold solidified media.

Phase (growth): Microbial growth in juice, wine, or a medium has four distinctive phases: (a) lag, (b) logarithmic, (c) stationary, and (d) death. During lag phase (A), cells are adjusting to the new environment and increase in size (no increase in cell numbers). Logarithmic phase (B) is the period when cell numbers rapidly increase. At some point, the growth rate decreases and the cells enter stationary phase (C) where growth and death rates are approximately equal. The accumulation of toxic wastes and the decreasing availability of nutrients eventually result in death of the cells (D).



Phase-contrast microscope: Rather than staining a culture in order to visualize the microorganisms using a brightfield microscope, phase-contrast microscopes allow direct viewing of microbes in liquid cultures. Light passing through a denser medium (a microbial cell) than another medium (the liquid) will be retarded. Phase-contrast enhances differences in refractive index between these two media (a cell and the liquid).

Pour plates: A pour plate is one in which the liquid sample to be micro-biologically enumerated is aseptically transferred into a Petri dish, and cooled (yet liquid) agar medium is added to the culture. The medium and the liquid sample must be well mixed prior to solidification of the agar gel.

Prokaryote: An organism whose cellular organization lacks a true nucleus and other internal organelles (e.g., bacteria).

Pseudohyphae: Elongated forms or filaments between yeast buds that resemble hyphae. Constrictions between buds in the pseudohyphae differentiate these from true hyphae.

Pseudomycelium: Collective mass of pseudohyphae.

Redox: An abbreviation for reduction/oxidation, redox refers to simultaneous reactions in which one agent is oxidized (loss of an electron) and one is reduced (gain of an electron).

Residual: Chemicals remaining on equipment or floor surfaces after cleaning or sanitizing.

Rod: Cells that microscopically appear as being "rectangular" with two parallel sides of the microbe being longer than the other two sides.

Sanitation: Sanitation refers to reducing microbial populations in the winery and keeping the populations as low as possible. In contrast, sterilization implies destruction of all microorganisms.

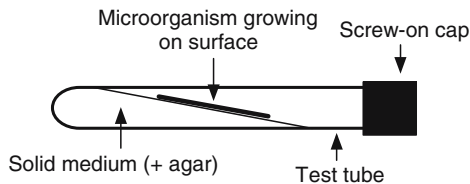
Secondary containment: A method by which additional leakage or spills are minimized if the primary container breaks. An example would be a tray in which a bottle of waste chemicals is placed.

Selective agent: This is a chemical that is added to a medium such that undesirable microorganisms will not grow while desirable microbes will grow.

Serum: Liquid remaining after solids have been removed, normally by centrifugation (e.g., tomato juice serum).

Short-Term Exposure Limit (STEL): The maximum concentration to which a worker can be exposed to continuously for a defined short period without experiencing ill effect.

Slant: Liquefied media containing agar is aseptically placed into a test tube. The test tube is placed at a slight angle on a tabletop while the agar media cools and sets. Slants are used to aseptically store yeast and bacteria cultures for longer periods of time.

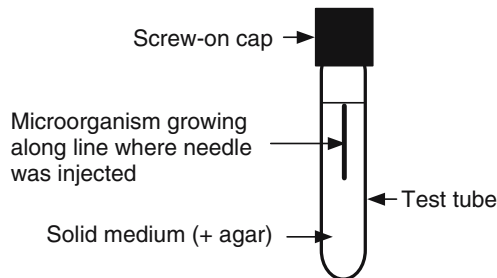


sp. or spp.: Normally placed after a genus name, these designations refer to one (sp.) or more (spp.) unidentified species.

Spore: A nonvegetative structure formed by some microorganisms that is resistant to stresses such as heat. Spores are capable of development into an individual viable microorganism when conditions are favorable for growth.

Spread plates: Spread plates are ones in which the sample is aseptically added onto the surface of media already solidified (gel formed) in Petri dishes. The sample, normally 0.1 mL, is evenly spread on the surface of the media by using a hockey stick.”

Stab: Similar to slant, stabs are used to store microorganisms for longer periods of time, especially those microbes that do not require oxygen.



Strain: Microorganisms that share sufficient biochemical, physiological, and genetic characteristics to be assigned the same species name but that possess minor but consistent variation(s) in certain properties. Such properties may include (but not necessarily) fermentation of a specific sugar, pH tolerance, and so forth.

Teleomorph: Refers to the sexual or spore-forming form of a given yeast (see anamorph).

Temper: Media containing agar needs to temperature equilibrate prior to pouring into Petri plates. Most microbiologists will place media into a water bath for an hour at 45°C/113°F to 50°C/122°F after autoclaving.

Too-Numerous-To-Count (TNTC): When counting colonies on pour or spread plates, the total count must be between 25 and 250 colonies. If greater than 250 colonies, the plate is deemed to be TNTC and a higher dilution plate should be examined.

Ullage: The empty space within a barrel above the wine surface. Ullage normally increases as wine is aged in barrels due to evaporative losses of ethanol and water.

Viable–But–Not–Culturable (VBNC): A physiological state of microorganisms where growth on conventional media is not observed but the microorganisms remain intact and remain viable.

Vortex (vortexer): A special type of device that rapidly mixes samples in centrifuge or test tubes by creating a vortex.

w/w or v/v: Symbols that refer to concentrations either on a weight/weight or a volume/volume basis.

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