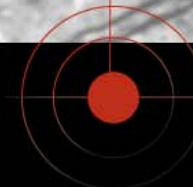


Education – Cell Culturing

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My Life. My Work. My Choice

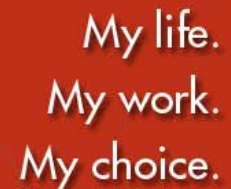
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My work.
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The word "Introduction" is centered in the upper half of the slide in a red, sans-serif font. The background behind the text is a grayscale image of a laboratory incubator.


This training session is designed to provide the essential knowledge necessary to increase your incubator sales.

- The human body plays host to millions of bacteria, both harmful and helpful. Bacteria, whether good or bad, are targets for biological research.
- To simulate the human body, an incubator must maintain three important conditions. First, since 37°C represents "Normal" body temperature, the incubator must maintain that temperature uniformly throughout the chamber. Secondly, because the human body is saturated with water, a similar humidity level has to be established. Finally, the body's pH (acidity) level is approximately 7.37. The incubator, through CO₂ regulation, must maintain a safe alkaline range of 7.2 to 7.4. These three conditions, once met, mechanically simulate the human body's conditions.

The slogan "My life. My work. My choice." is positioned in the bottom right corner. It is written in a white, sans-serif font against a dark red background. To the left of the text is a graphic of three concentric circles, with the innermost circle being a solid red dot.

Cell Organization

- All cells need moisture to grow. Since water is the most abundant molecule in the cell, it accounts for 70% of the cell's weight. Other molecules contain carbon, hydrogen, oxygen, and nitrogen found in cell building blocks and vital in energy metabolism.
- Cells have varying degrees of complexity - Molecules, Macromolecules, Organelles, Cells, and Organisms.
- The hierarchy of cell structure begins with the molecule. Molecules join together to form macromolecules. Macromolecules (large molecules) join in specific patterns to form cell structures called organelles (specialized cell parts). Each organelle has one or more functions in the cell.

A graphic of three concentric circles with a red dot in the center, resembling a target or bullseye, is positioned in the bottom right corner.

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Cell Organization

- After macromolecules and organelles, cells represent the next step up in the biological ladder. All cells are Eucaryotic (have a nuclear membrane) except bacteria. Bacteria are procaryotic (no nuclear membrane) cells. Eucaryotic cells are larger and have a number of structures absent in procaryotic cells, such as the nuclear membrane.
- Cells join in increasingly complex organisms to form organisms. Organisms are : Unicellular (single cell), Multicellular (cells begin to specialize), Tissue (a group of cells work together for a specific function), and Organ (different tissues combine for vital functions).

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Cell Culturing

- Many research laboratories are involved in tissue culturing. Tissue Culturing means growing cells in vitro ("in-glass", outside the body). A culture started from cells, tissues, or organs taken directly from the body is a primary cell culture. When the primary culture is sub-cultured,* it becomes a cell line.
*Subculture means producing a second batch of cells from the first. Primary cells are usually taken from rats, mice, rabbits, guinea pigs, and sometimes humans.
- For cells to grow in a culture, their in vitro ("in-glass", outside the body) environment must simulate their former in vivo (inside the body) environment. Cells need 37°C, high humidity, and usually an increased CO₂ level. Some cells also need higher or lower oxygen (O₂) levels.

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Cell growth & pH level

- For cells to grow, a certain level of acidity is required. Different cells like different levels of acidity. Acidity is measured by pH. The pH range that supports optimum cell growth is generally narrow and varies with the type of cell. For example, some bacteria can excrete enough acidity into their environment to slow their own growth.
- Buffers can be added to stabilize pH levels. A buffer is a mixture that combines with very acidic and non-acidic fluids, keeping pH levels consistent. Buffers are added to the medium in which the cells grow. To supplement media, growth factors are used. They are often derived from animal blood, such as calf serum (FBS).
- Typical cell culture media contain a mixture of defined low-molecular weight nutrients dissolved in a buffered physiological saline solution. The term nutrient refers to the substance that enters the cell and contributes to biosynthesis or metabolism. Most media also contain non-nutrients such as phenol red as a pH indicator or HEPES as a buffer.

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Organisms & CO₂

- Almost all organisms link with or fix carbon dioxide (CO₂). Fixing CO₂ requires energy. Autotrophic (self-nourishing) organisms get their energy from light and inorganic compounds and their carbon from CO₂. Heterotrophic organisms need organic compounds such as sugar for energy. In sparse cell populations, an outside source must provide CO₂. In crowded cultures or when CO₂ loss is minimal, cells metabolically generate enough CO₂.
- Keeping an adequate concentration of carbonic acid and bicarbonate in the medium requires keeping an increased partial pressure on CO₂. However, an excess of CO₂ in the culture dish can cause over-acidification. For clonal cultures and crowded culture where better pH control is desired, the culture chamber is gassed with a mixture of humidified CO₂ in the air. Most culture media are designed for use with 5% CO₂, similar to the value found in body fluids. Some culture media are used with as much as 10% CO₂.

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Environment for Culture Medium

- Rapid adjustment between the culture medium and the gaseous CO₂ air mixture in the chamber is often important. This means that culture dishes usually can't be sealed tightly. To prevent desiccation (drying out), essentially all evaporation must be prevented during the time the dishes are in the incubator. Limiting the evaporation requires maintaining the relative humidity (RH) very close to saturation (greater than 95%) in the incubator chamber.
- Cells have specific temperature ranges within which they grow. They grow best at the upper end of the range but quickly die above it. Cell cultures from warm-blooded animals grow at 37°C. Cell cultures from cold-blooded animals grow at the upper limit of that animal's ideal body temperature.

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Conclusion

- We hope these short learning segments will reinforce your knowledge of Cell Culturing.
- Our goal was to increase your knowledge retention of this subject to further enhance your Sanyo CO2 Incubator Sales

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