

# Fish Cell Culture

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# Definition

- Essentially, **cell culture** involves the distribution of cells in an artificial environment (in vitro) which is composed of the necessary nutrients, ideal temperature, gases, pH and humidity to allow the cells to grow and proliferate.
- **Explant** – Piece of live tissue as a source of primary cells
- **In vivo** - When the study involves living biological entities within the organism.
- When cells have been obtained directly from the organism/animal tissue (or even plant tissue) through enzymatic or mechanical techniques, such cells are referred to as **primary cells**. However, cells that continue to proliferate indefinitely (after the first subculture) under special conditions are referred to as **cell lines**.

- **Cell culture refers to the removal of cells from an animal or plant and their subsequent growth in a favourable artificial environment.** The cells may be removed from the tissue directly and disaggregated by enzymatic or mechanical means before cultivation, or they may be derived from a cell line or cell strain that has already been established.
- **Primary culture**
- Primary culture refers to the stage of the culture after the cells are isolated from the tissue and proliferated under the appropriate conditions until they occupy all of the available substrate (i.e., reach **confluence**). At this stage, the cells have to be **subcultured** (i.e., **passaged**) by transferring them to a new vessel with fresh growth medium to provide more room for continued growth.

- **Cell line**
- After the first subculture, the primary culture becomes known as a **cell line** or **subclone**. Cell lines derived from primary cultures have a limited life span (i.e., they are **finite**; see below), and as they are passaged, cells with the highest growth capacity predominate, resulting in a degree of genotypic and phenotypic uniformity in the population.
- **Cell strain**
- If a subpopulation of a cell line is positively selected from the culture by cloning or some other method, this cell line becomes a **cell strain**. A cell strain often acquires additional genetic changes subsequent to the initiation of the parent line.

- **Culture Conditions**

- Culture conditions vary widely for each cell type, but the artificial environment in which the cells are cultured invariably consists of a suitable vessel containing the following:
  - A substrate or medium that supplies the essential nutrients (amino acids, carbohydrates, vitamins, minerals) e.g. L15 (Leibovitz) for fish cell lines
  - Growth factors (e.g. Foetal bovine serum)
  - Hormones
  - Gases ( $O_2$ ,  $CO_2$ )
  - A regulated physico-chemical environment (pH, osmotic pressure, temperature (fish 28 C and mammals 37 C))

- **Applications of Cell Culture**
- Cell culture is one of the major tools used in cellular and molecular biology, providing **excellent model systems** for studying the normal physiology and biochemistry of cells (e.g., metabolic studies, aging), the **effects of drugs and toxic compounds** on the cells, and mutagenesis and carcinogenesis. It is also used in **drug screening and development**, and **large scale manufacturing of biological compounds** (e.g., vaccines, therapeutic proteins). The major advantage of using cell culture for any of these applications is the consistency and reproducibility of results that can be obtained from using a batch of clonal cells.

- For study of viruses as they require living cells to grow and can't be grown on chemically defined media.
- [L-15 Medium \(Leibovitz\) is the most common media for fish cell culture.](#)
- **National Repository of Fish Cell Lines (NRFC) under ICAR-National Bureau of Fish Genetic Resources**