Journal of Biomedical Engineering and Medical Devices

OPEN ACCESS Freely available online

Opinion Article

Bioreactor Concepts: Types, Design and Application

Fergal Plunkett*

Department of Chemical and Biomedical Engineering, Royal College of Surgeons in Ireland, Dublin, Ireland

ABOUT THE STUDY

An example of a fermentation vessel is a bioreactor, which is employed in the synthesnumerous chemicals and biological processes. In order to remove the waste biomass of cultured microorganisms as well as their products, it is a closed container with suitable arrangements for aeration, agitation, temperature control, and pH control. The microbial cellular is a miniature bioreactor; different examples encompass shake flasks, Petri dishes, and commercial fermenters. Diagnostic merchandise based on enzymatic reactions, farm silos for silage fermentations, bread pans with fermenting yeast, and the soil in a Kansas wheat discipline may also be viewed as bioreactors. In the field of cell-based medicine, bioreactors have evolved into essential tools. They are necessary to generate physiologically accurate *in vitro* models for pharmacologic agent testing or to provide regular, repeatable cell-based products for regenerative medicine applications. To use complete cells or cell-free enzymes, bioreactors can convert input materials into biochemical products and less undesired byproducts. A tiny bioreactor is the microbial cell itself; additional examples include shake flasks,petri plates, and commercial fermenters.

Bioreactor used for cell proliferation

A bioreactor works by way of pumping vitamins into an answer of water and microorganisms, which include microorganism, algae, yeast, fungi, or protozoa. The organisms consume the vitamins until they reach a certain density, at which factor they produce additional waste merchandise. Bioreactors can be used to produce hydrogen for gas cells, ethanol from sugarcane molasses, or artificial chemical substances. The necessity for a cell-manufacturing industry to supply therapeutic allogeneic cells has been prompted by the therapeutic promise of stem cell-based technologies for the treatment of disorders ranging from hair loss 1 to blindness 2. The cost will likely be too high for conventional hospitals and care centers, and will instead take the form of centralized facilities that specialize in providing high-quality cells with verifiable characteristics due to the extensive infrastructure requirements and stringent standards set by regulatory agencies.

Application of bioreactor

- Bioreactors play a crucial component in bioprocess.
- Bioreactors with stirred tanks are regularly hired inside the procedure of fermentation.
- Because of the simplicity of generation and better yield, stable nation bioreactors are extensively used in the enterprise.
- Ethanol is produced with the aid of Saccharomyces cerevisiae, a fungus that lives.
- Organic acids e.g. butyric acid and acetic acid are produced in bioreactors through Eubacterium limo sum

Bioreactor design

- The layout and mode of operation of a bioreactor are primarily based on the manufacturing of an organism, top of the line situations required for preferred product formation, product fee, and its scale of manufacturing.
- A top bioreactor design will assist to enhance productivity and offer higher quality products at decrease expenses.
- A bioreactor is a device that consists of diverse functions consisting of an agitator system, an oxygen delivery machine, a foam control device, and a variety of other systems along with temperature and pH manage device, sampling ports, cleaning, and sterilization device, and lines for charging & emptying the reactor.

Types of bioreactor

Continuous stirred tank bioreactors : The Continuous Stirred Tank bioreactor is the classical layout and still the maximum extensively used bioreactor. Most production centers and FDA accredited production strategies for biopharmaceuticals are based on the stirred tank bioreactors. The scale-up process from laboratory to manufacturing sized systems is consequently based on this layout as properly. This cylindrical bioreactor uses a pinnacle or backside installed rotating blending gadget. The thing ratio is typically between 3:5.

Correspondence to: Fergal Plunkett, Department of Anatomy, Royal College of Surgeons in Ireland, Dublin, Ireland, E - mail: Fergal.plunkett@ucdconnect.ie

Received: 13-Jun-2022, Manuscript No BEMD-22-18686; **Editor assigned:** 16-Jun -2022, PreQC No. BEMD-22-18686 (PQ); **Reviewed:** 01-July -2022, QC No.BEMD-22-18686; **Revised:** 11- July -2022, Manuscript No.BEMD-22-18686 (R); **Published:** 18-July -2022, DOI: 10.35248/ 2475-7586.22.07:230

Citation: Plunkett F (2022) Bioreactor Concepts: Types, Design and Application. J Biomed Eng & Med Dev. 07:230

Bubble column bioreactors: Bubble column bioreactors are tall column bioreactors wherein gas is added in the bottom phase for mixing and aeration purposes. The vessel used for bubble column bioreactors is generally cylindrical with an element ratio of 4-6.

Airlift bioreactors: Air-carry bioreactors are much like bubble column reactors, but vary through the truth that they include a draft tube. The draft tube is continually an internal tube or an outside tube which improves move and oxygen switch and equalizes shear forces inside the reactor.

Fluidized bed bioreactors: Fluidized bed bioreactor is similar to bubble column bioreactor except the top function is accelerated to reduce the speed of the fluid. The design of the fluidized bioreactors is such that the solids are retained within the reactor at the same time as the liquid flows out. These bioreactors are appropriate to be used to carry out reactions involving fluid suspended biocatalysts inclusive of immobilized enzymes, immobilized cells, and microbial flocks.

Packed bed bioreactors: A mattress of solid debris, with biocatalysts on or in the matrix of solids, packed in a column constitutes a packed mattress bioreactor. The solids used may be porous or nonporous gels, and they'll be compressible or inflexible in nature. A nutrient broth flows continuously over the immobilized biocatalyst. The products acquired in the packed bed bioreactor are launched into the fluid and removed. While the glide of the fluid can be upward or downward, down waft under gravity is preferred.

CONCLUSION

By functioning as a conduit between raw materials and finished goods, bioreactors play a crucial part in biotechnological processes. The majority of biological systems contain intricate chains of reactions that need to be streamlined and coordinated in a very particular setting. Data back up the alternative theory. When compared to the raceway pond, the tubular photo bioreactor showed more growth. The carbon dioxide level when pumped through the tube, raceway pond, and airlift bioreactors had little significance.