TECHNICKÁ UNIVERZITA V KOŠICIACH
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KATEDRA BIOMEDICÍNSKEHO INŽINIERSTVA A MERANIA

OVERVIEW ARTICLE: BIOREACTORS DESIGNED FOR 3D BIOPRINTED TISSUE AND PROCESS PARAMETERS

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BIOREACTOR :

Bioreactor is a devices that uses the setting of physical process to influence biological process.

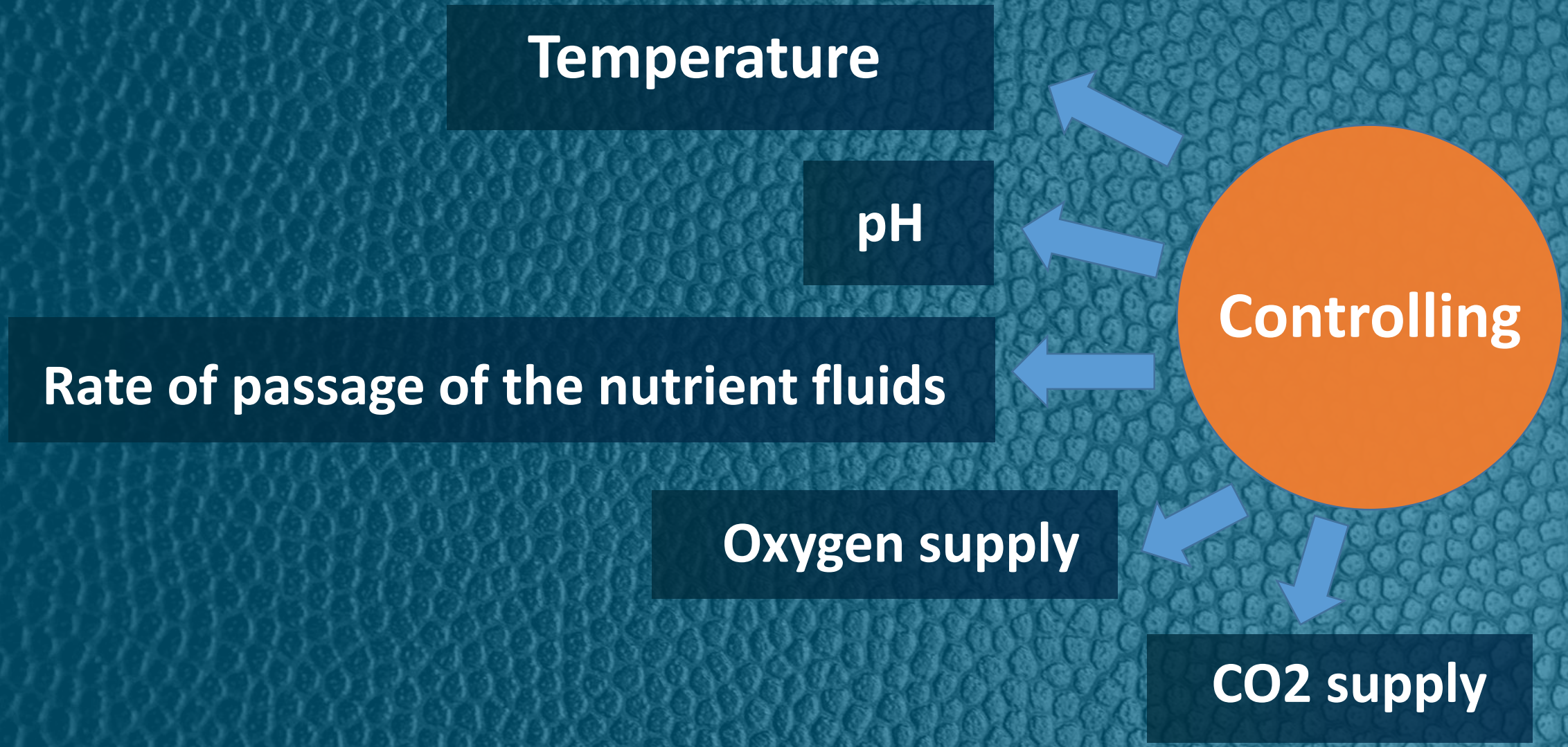
By phase (liquid only, or also gas and particles)

According to technical design (open, closed, with membrane)

According to the method of mixing (mixed, unmixed, hydraulically mixed)

According to the method of cultivation – supplementation of nutrients (for one filling, with gradual addition of nutrients)

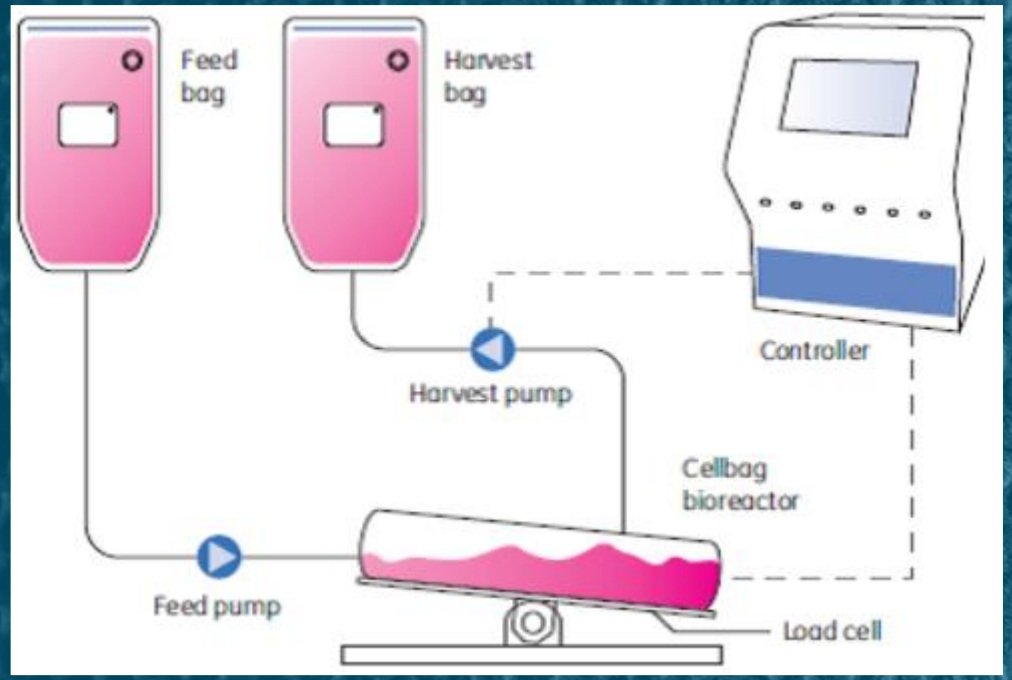
Conditions for the growth of the biological system in the bioreactor:



Tissue engineering studies that use the culture of living systems with bioreactors can be divided into :

- Stem cell culture research
- Cultured cell and tissue research for the analysis of physiological processes
- Research on the effect of bacteria on cell and tissue culture

The bioreactor in picture is not a closed loop of nutrient medium



During the process, it is necessary to observe stable required quantities of a particular bioreactor:

Acidity of the solution

Nutrient medium flow

Temperature of nutrient medium and chamber

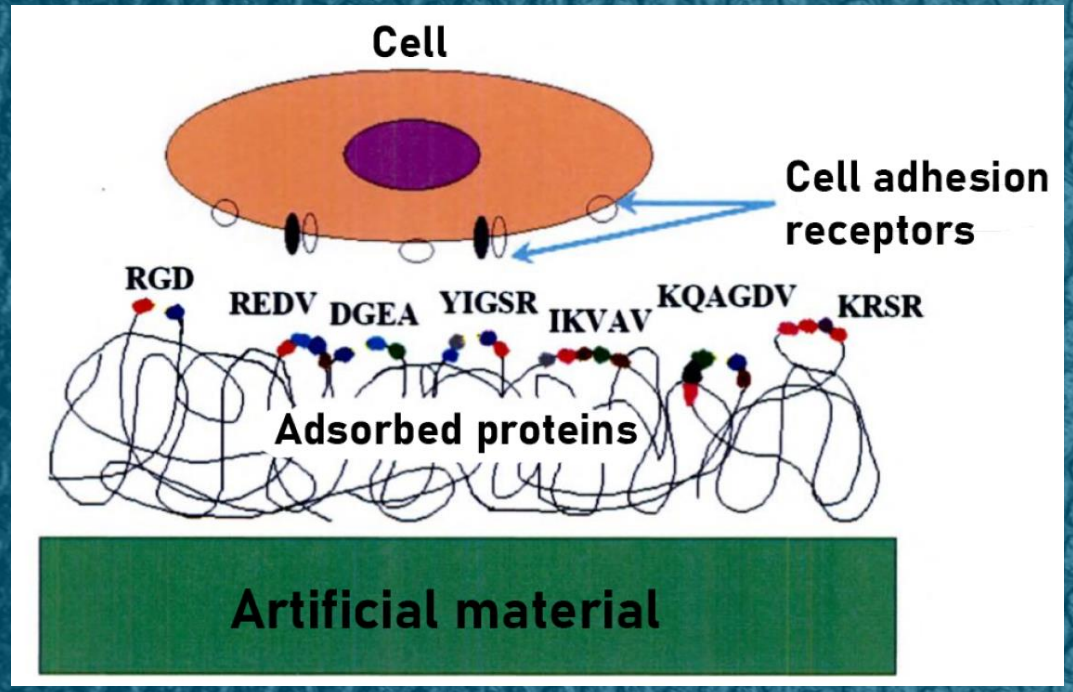
Movement of the chamber

Carbogen content and gaseous ratio

Control of substances in the nutrient medium

The extracellular matrix (ECM) is a non-cellular component that provides differentiation, morphogenesis and homeostasis of tissues.

ECM Molecules to attach to the material: fibronectin, collagen, vitronectin, elastin, osteoponin, tenascin, thrombospodine, and certain types of laminate



Certain amino acid sequences are typical of certain cells.

The amino acid sequences of Agr-Gly-Asp (RGD), which is found on fibronectin, and Asp-Gly-Glu-Ala (DGEA), which is present on collagen, are not specific for cells of a particular type.

For endothelial cells, the specific amino acid sequence is Arg-Glu-Asp-Val (REDV), which is also present on fibronectin.

For smooth muscle and vascular cells, the specific sequences are Lys-Gln-Ala-Gly-Asp-Va, (KQAGDV) which is present on vitronectin and Ala-Pro-Gly (VAPG) which is present on elastin.

Neuronal cells are specific sequences Tyr-Ile-Gly-Ser-Arg (YIGSR) and Ile-Lys-Val-Ala-Val which are typical for laminin.

Thank you for attention