

Unit VI-Engineering Perspective of Biological Sciences

- Biology and Engineering crosstalk
- Fermentation technology
- Plant tissue culture
- Animal tissue culture
- Tissue engineering: principles, methods and applications
- Introduction to Bio-mimetic and bio-mimicry
- Nano-biotechnology

Biology and Engineering crosstalk

Engineering Ideas

- 1. Mechanical Work
- 2. Electronic system
- 3. Electrical Signal
- 4. Chemical Energy

Biological Process

- (i). Muscle Assembly
- (ii). Signal Transduction
- (iii). Neurotransmission
- (iv). Enzyme catalysis

Implementation

- (a). Drug delivery
- (b). Bioprosthetics
- (c). Biosensors
- (d). Biopesticides
- (e). Organ-on-Chip
- (f). Universal Health Record

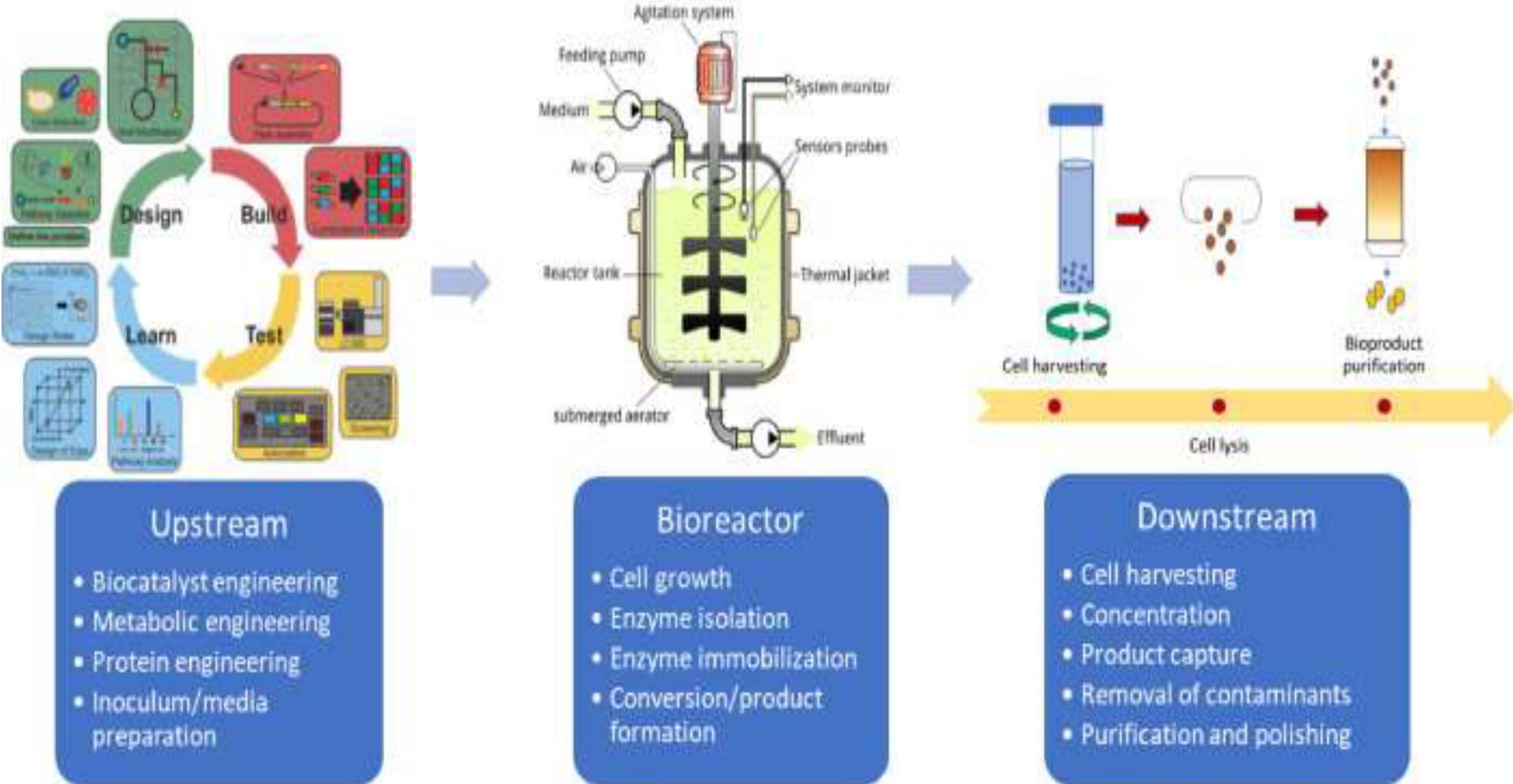
Contribution of biology in engineering



Fermentation technology

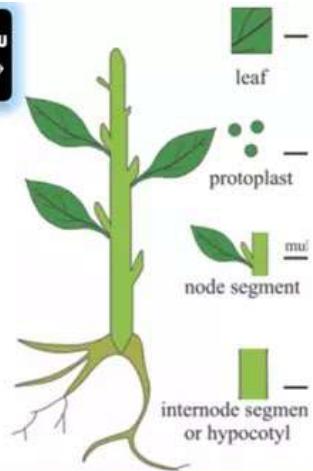


Fermentation Technology



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Plant tissue culture

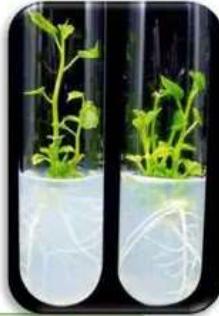


Step 1: Selection of Explant



Step 2: Surface Sterilization

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Step 4: Shooting & rooting

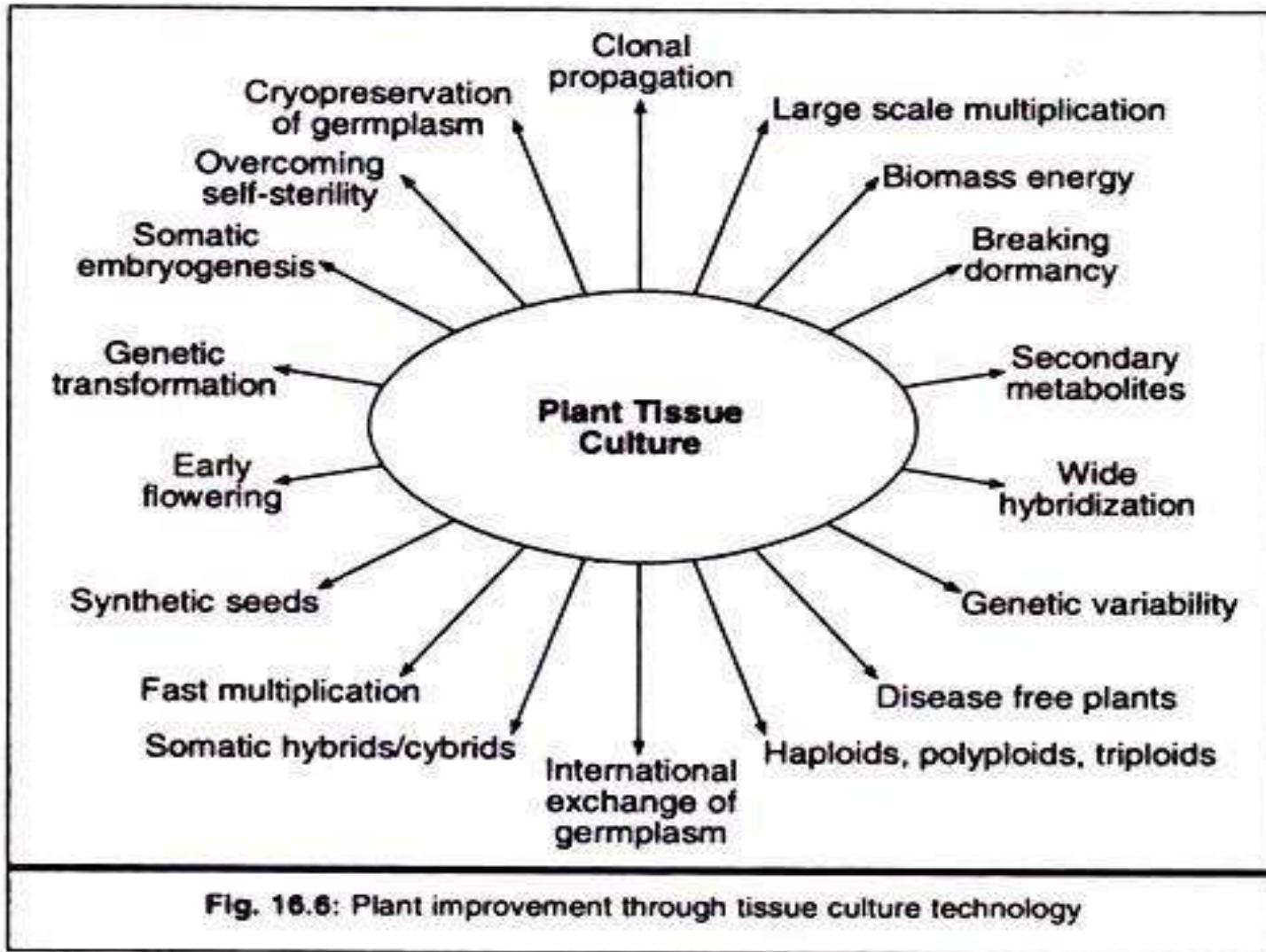


Step 3: Inoculation

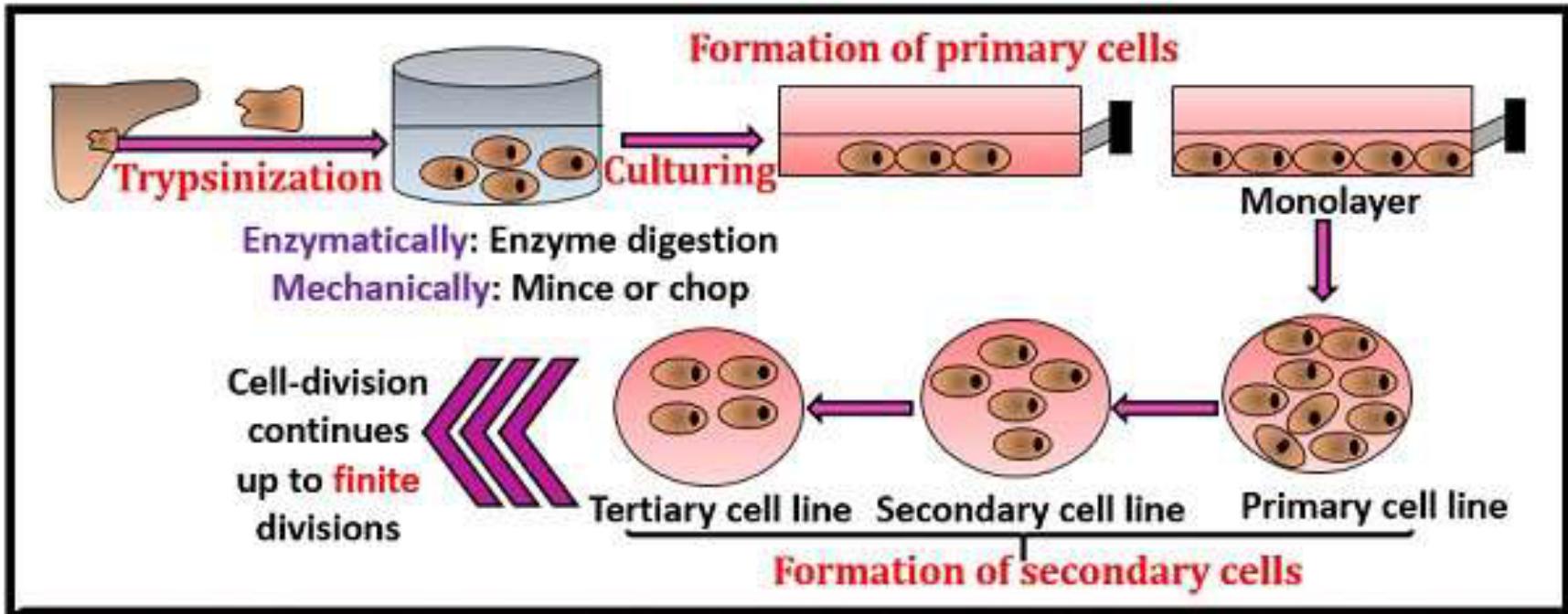


Step 5: Hardening

Applications of PTC



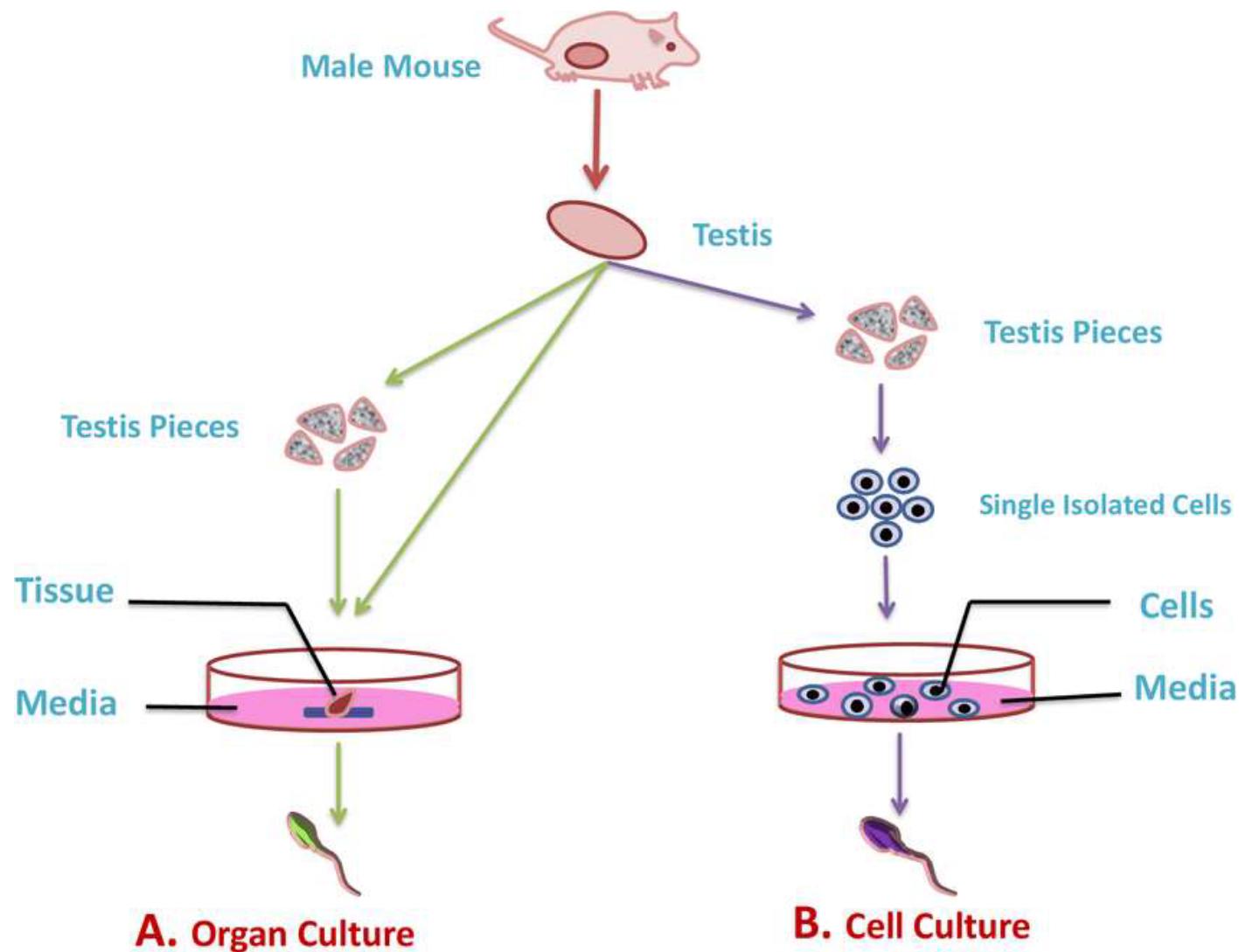
Animal cell culture



Properties of normal animal cell culture

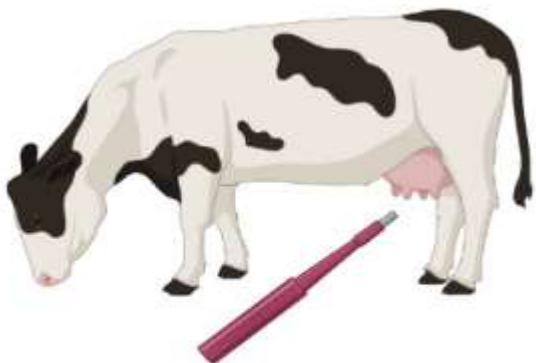
- Substrate dependency
- Contact inhibition
- Limited cell divisions

Animal tissue culture

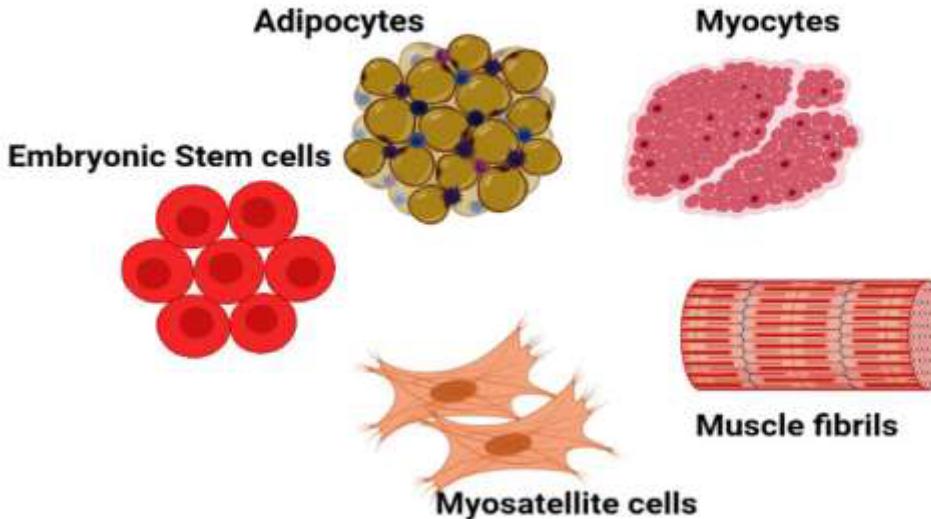




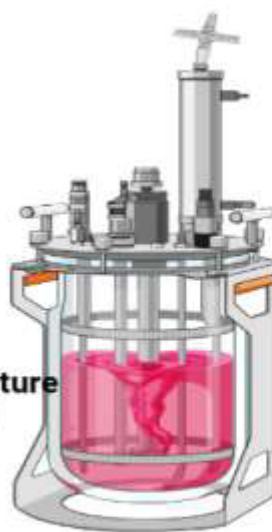
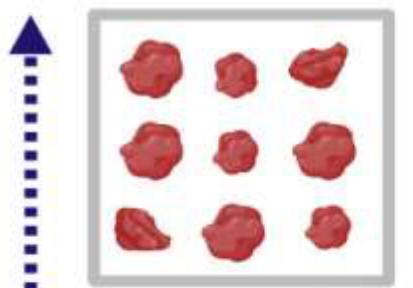
1. Harvest of cells through biopsy from live animal



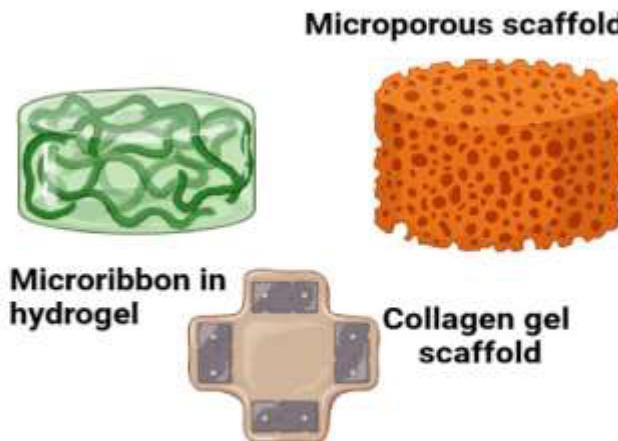
2. Selection of different types of cells from the host



5. Lab cultured meat

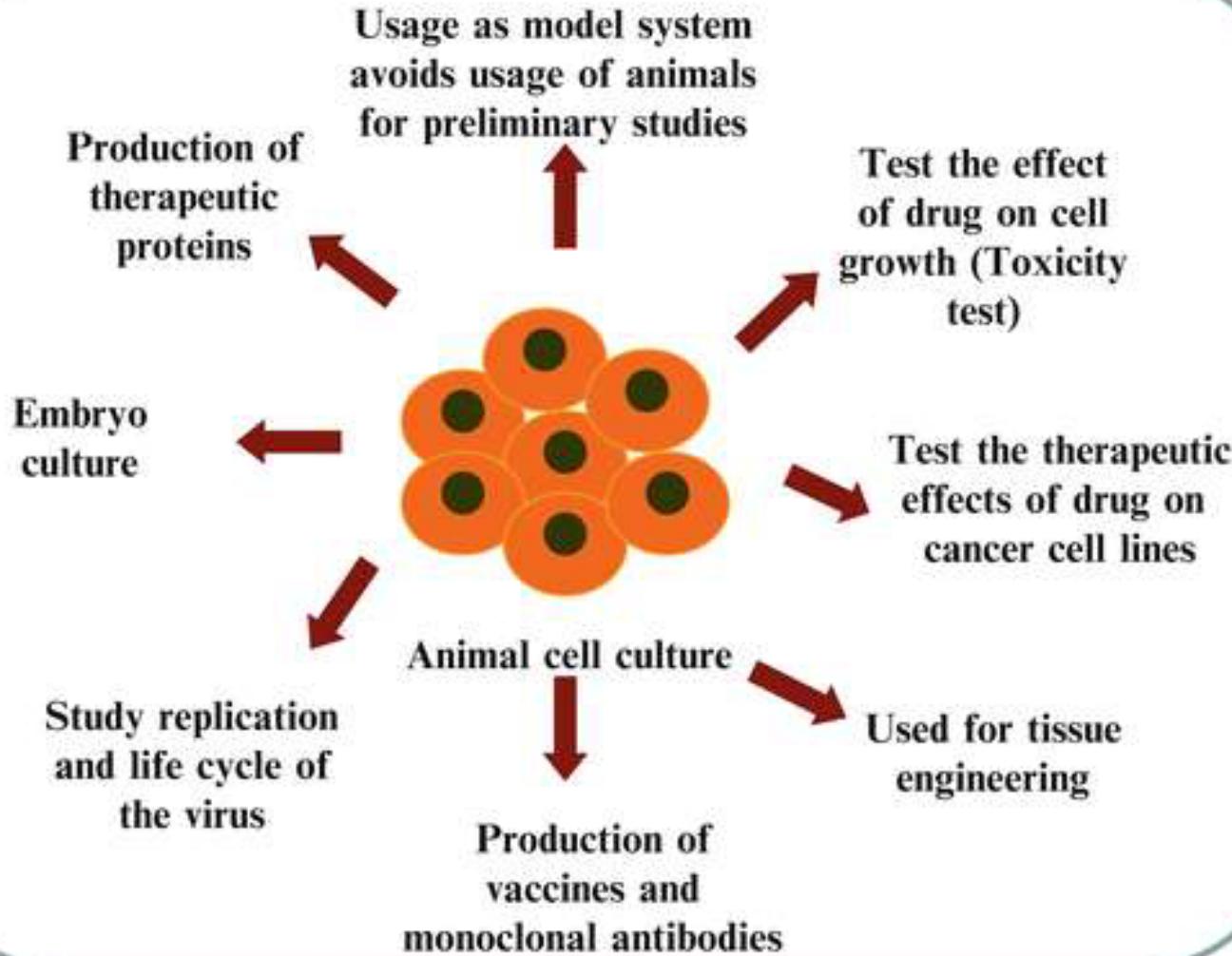


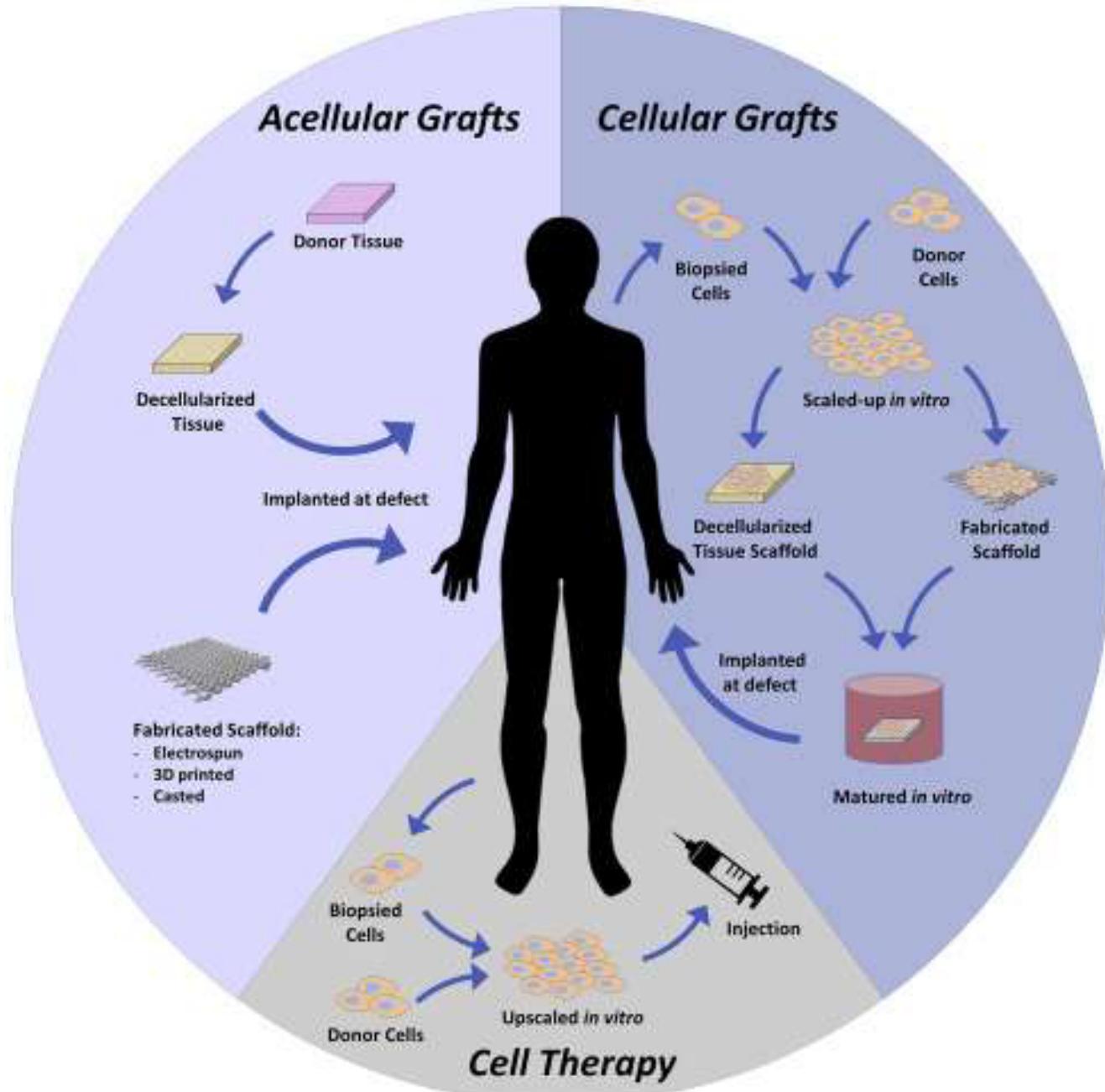
4. Culture in suspension bioreactor for continuous cell culture



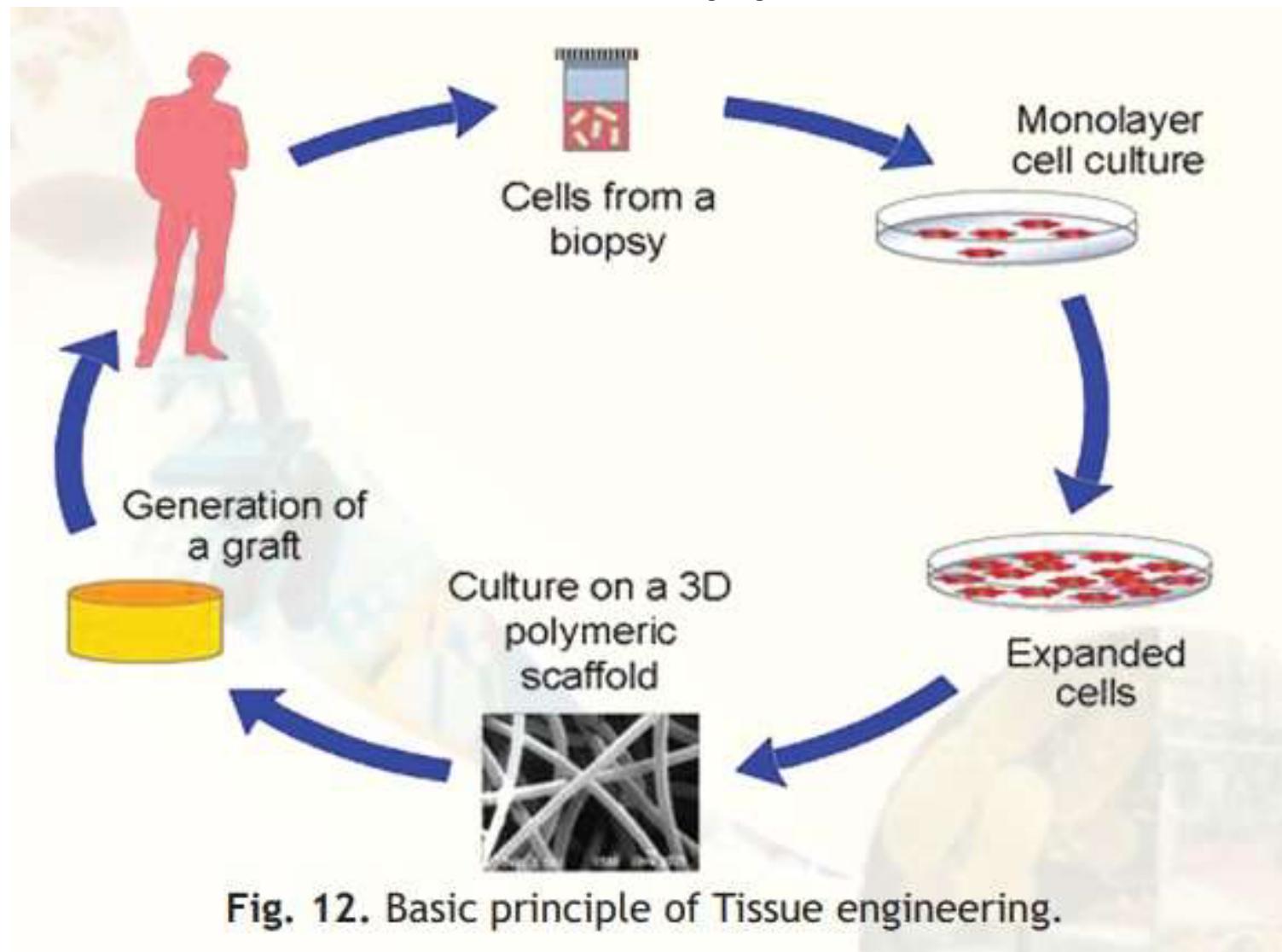
3. Scaffolding techniques

Applications of ATC

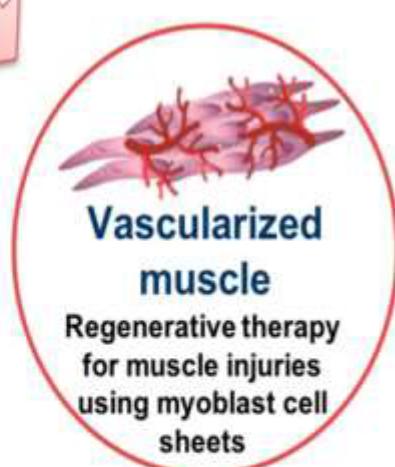
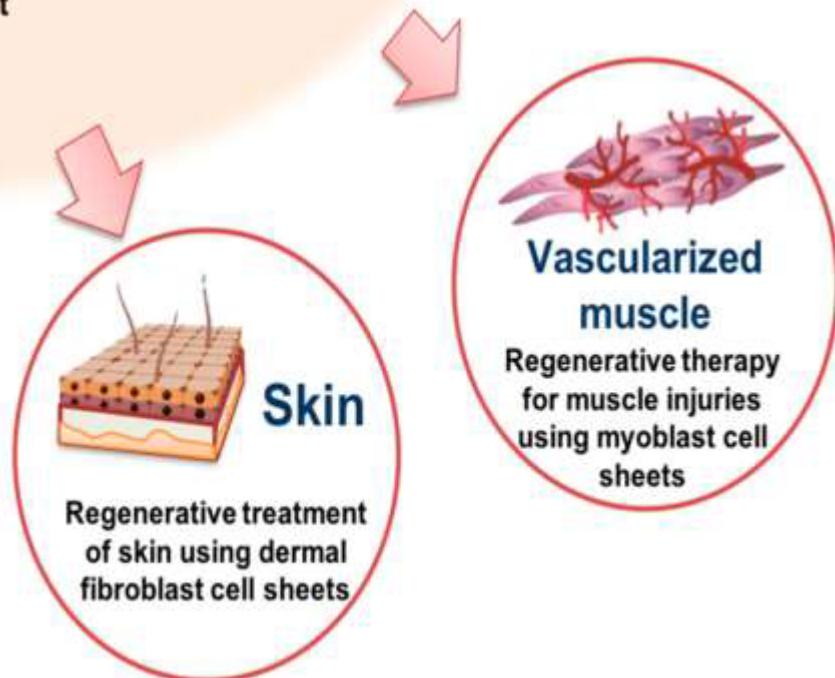
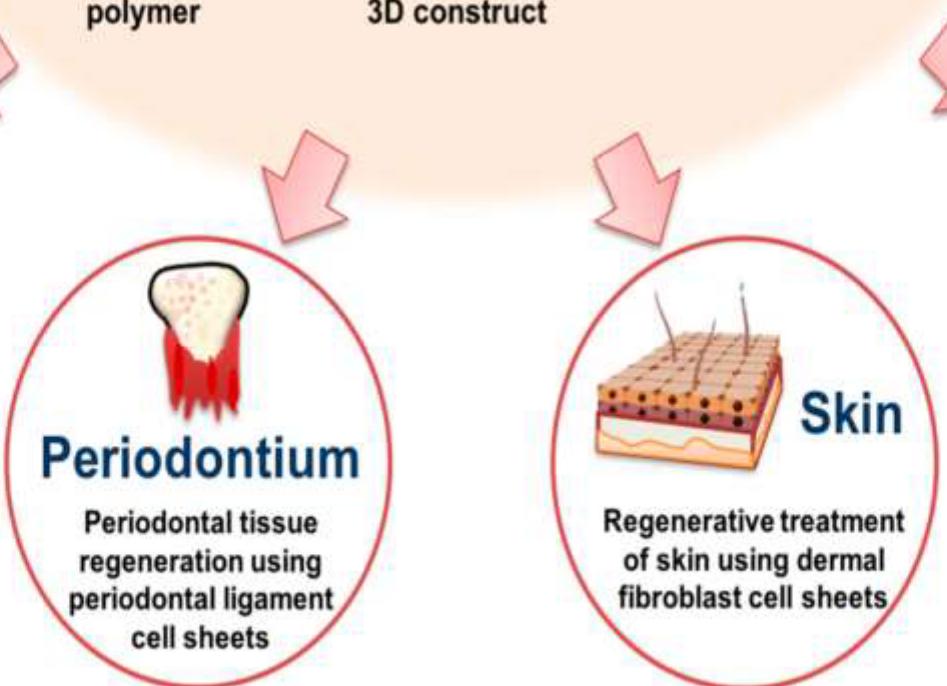
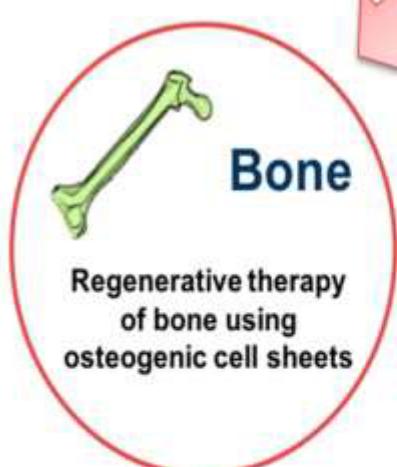
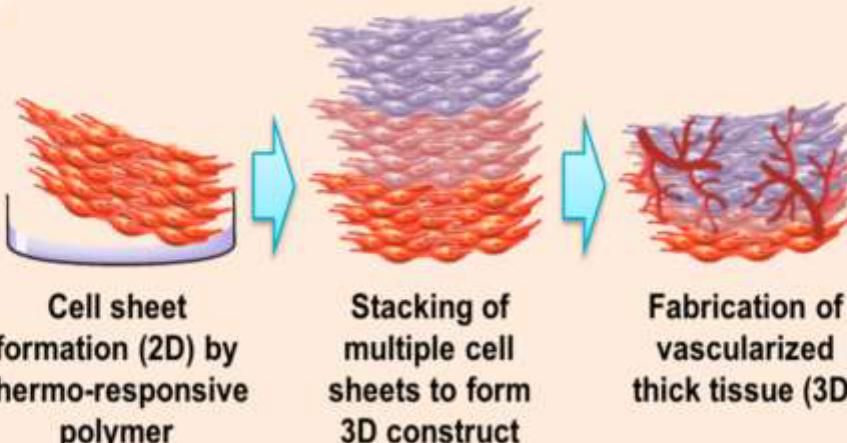




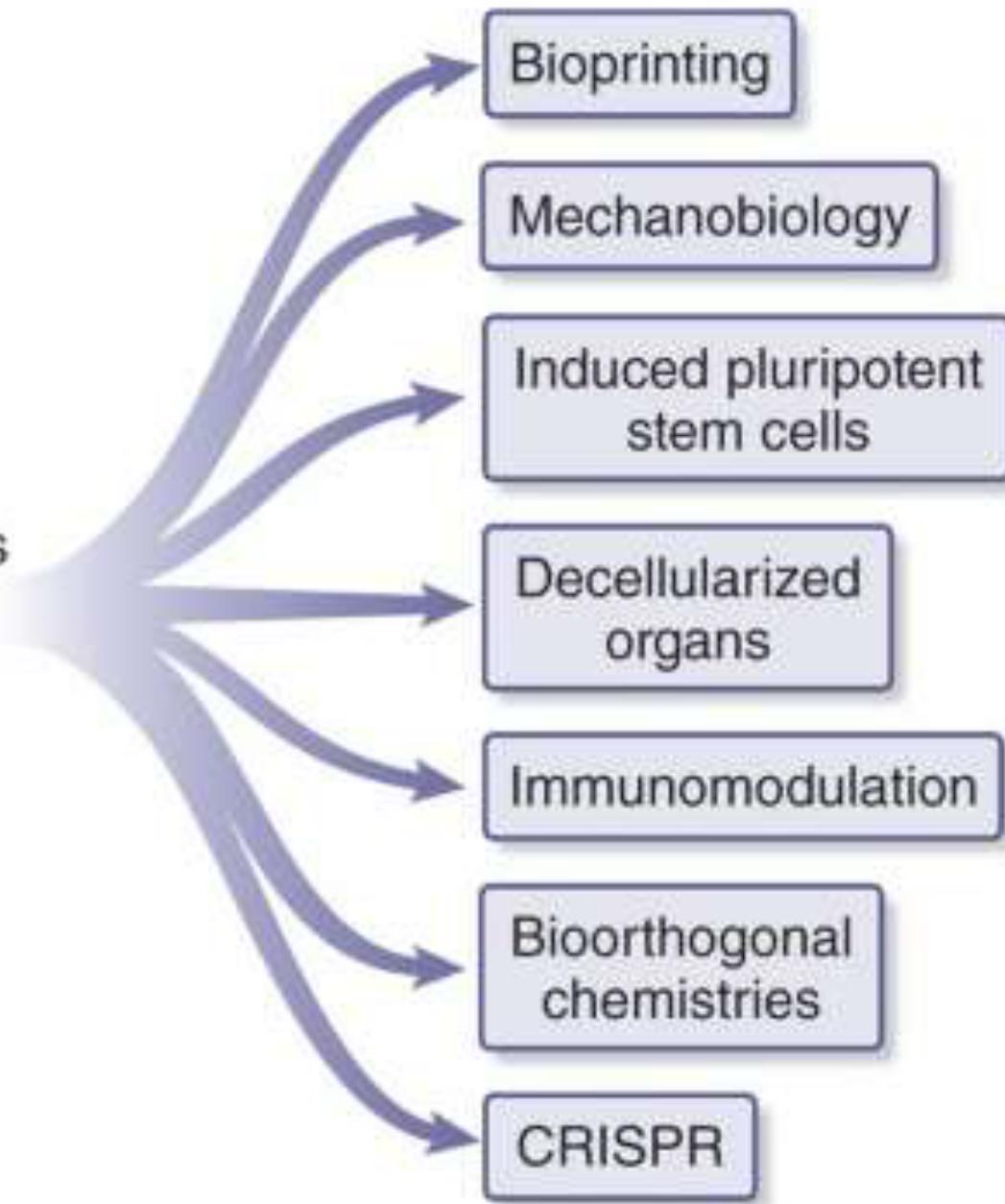
Tissue engineering: principles, methods and applications



Engineered cell sheets for tissue regeneration

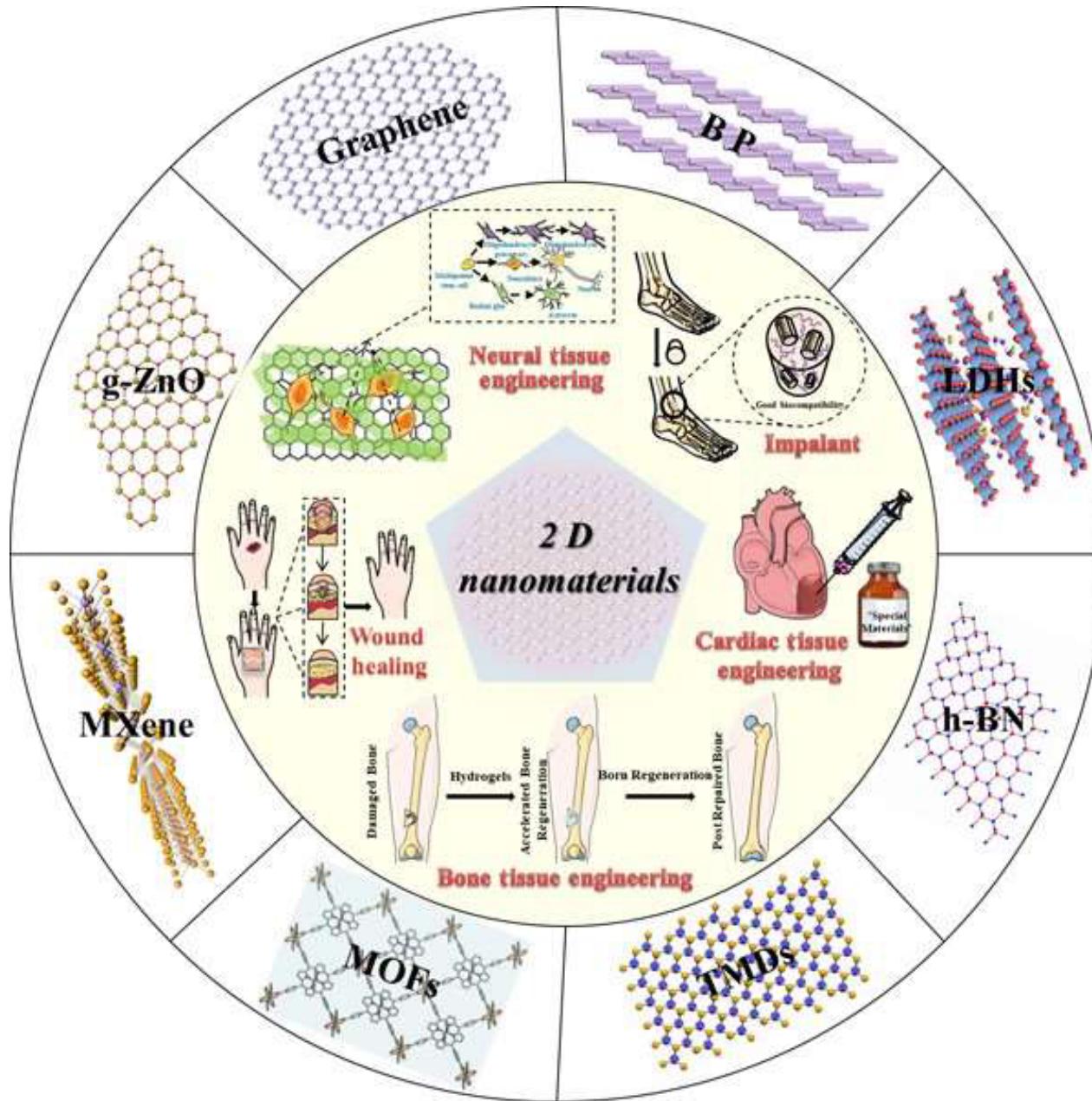


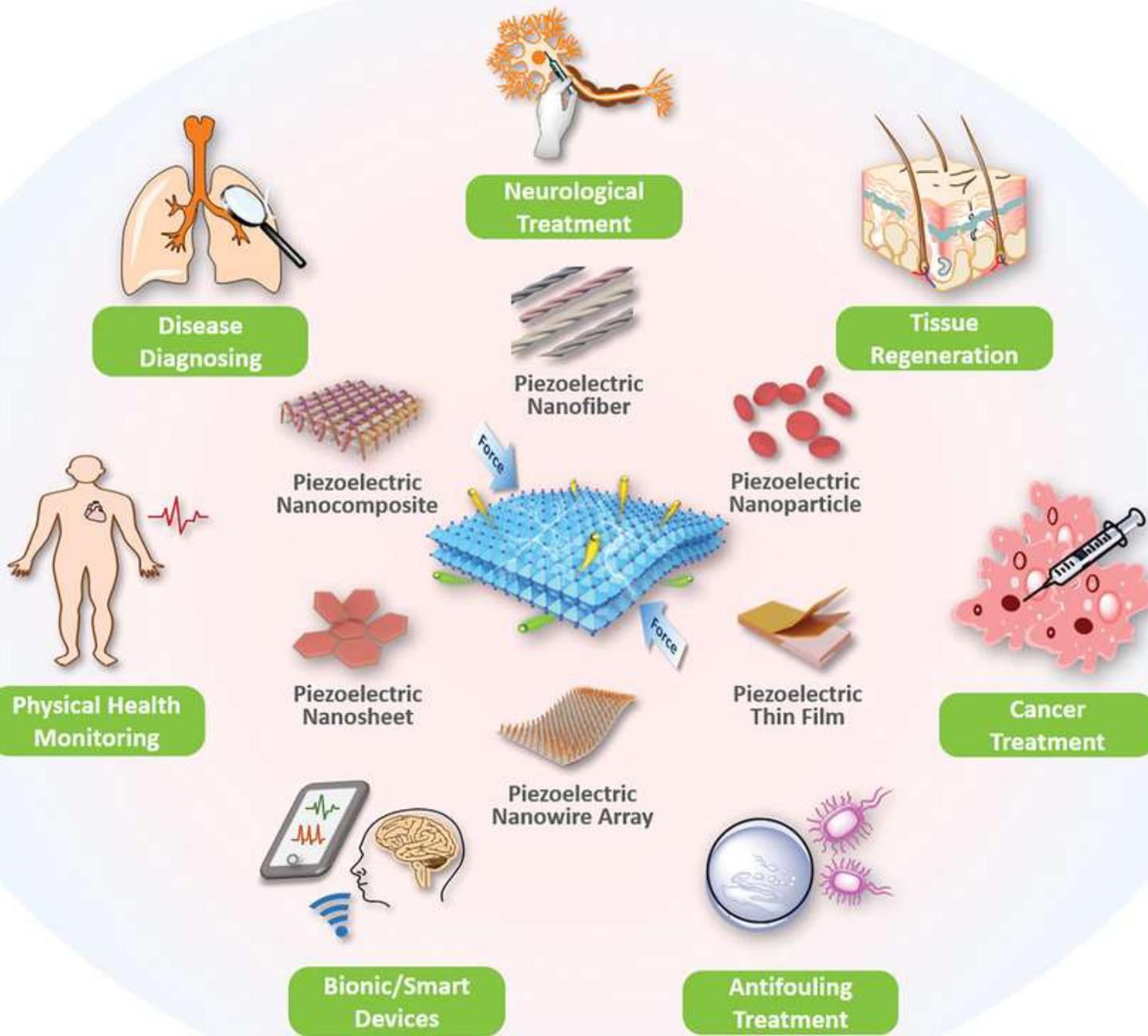
Selected advances
relevant to tissue
engineering

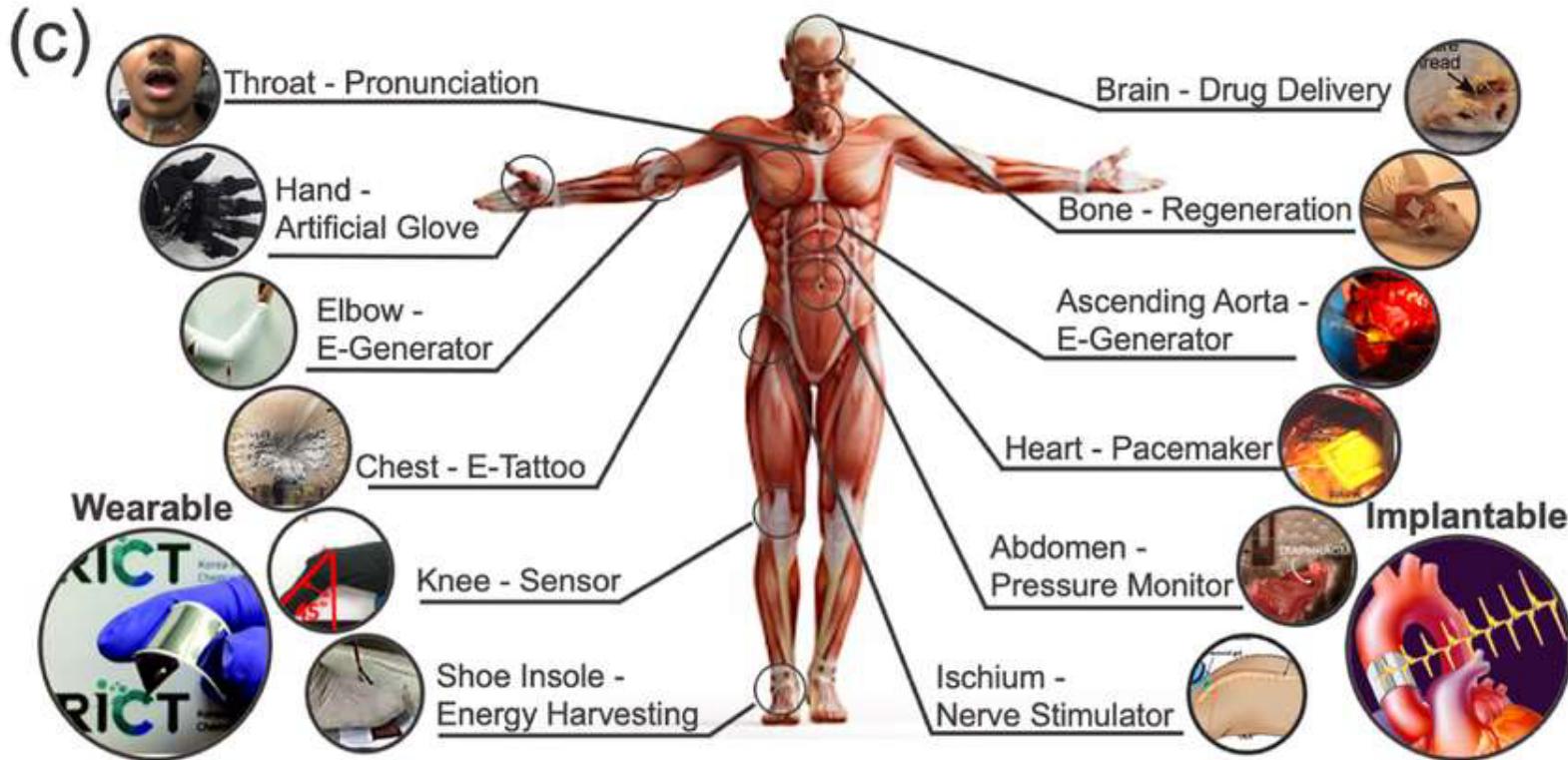
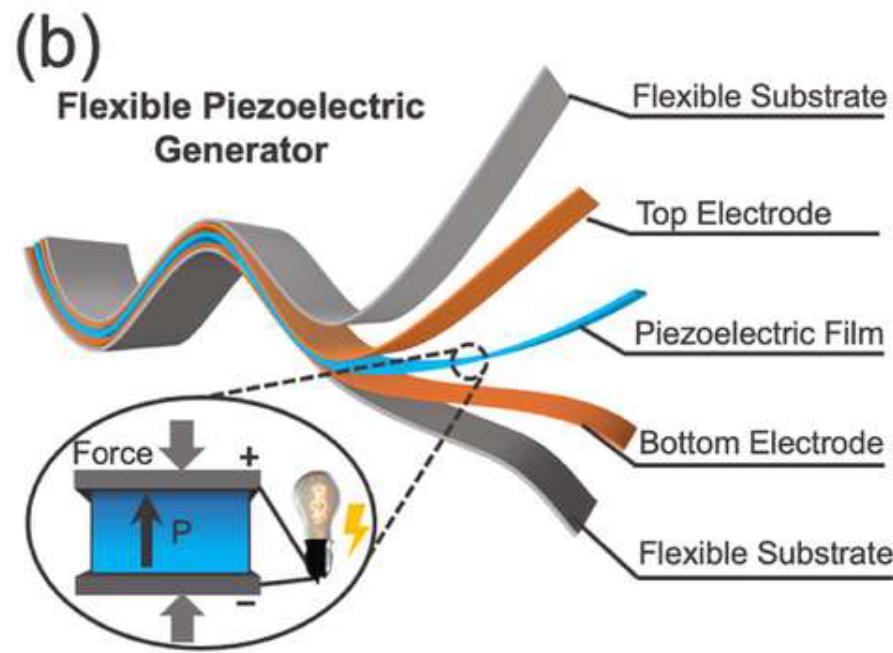
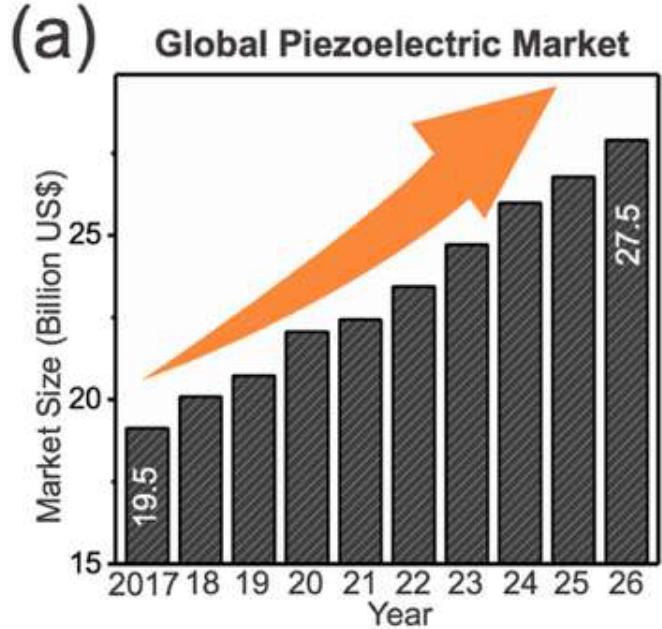


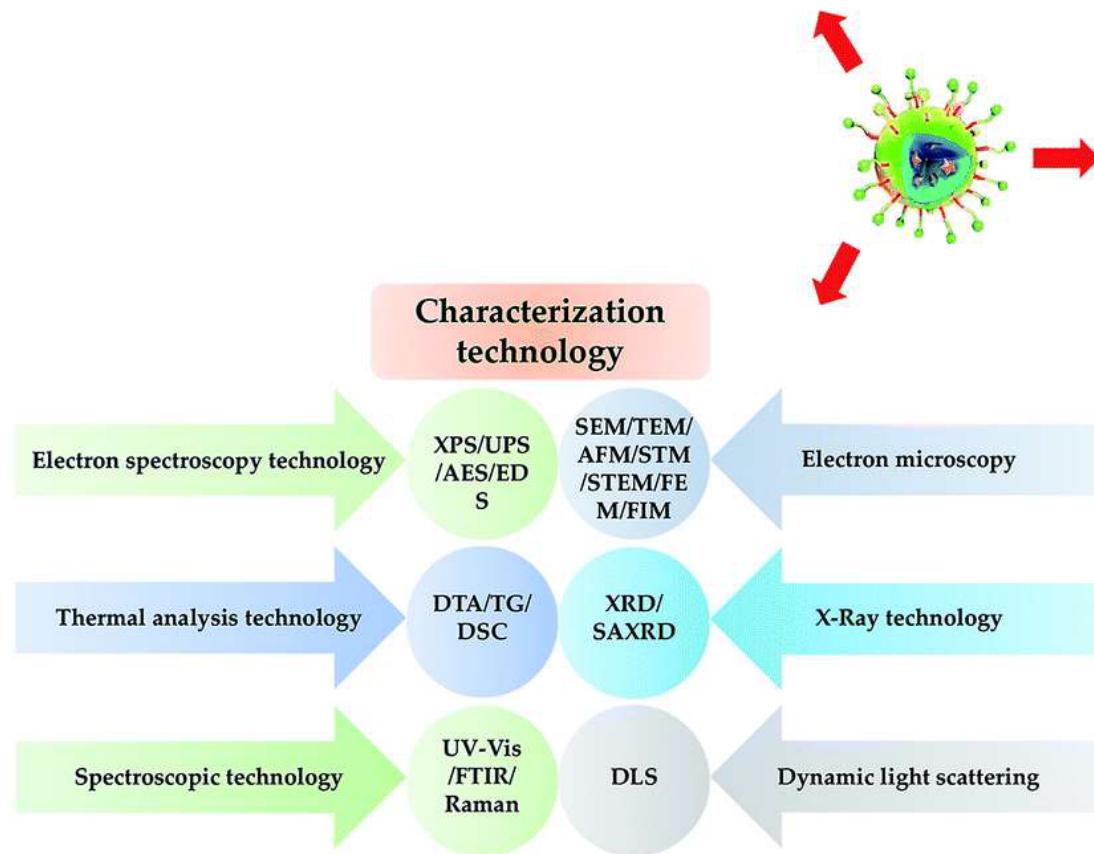
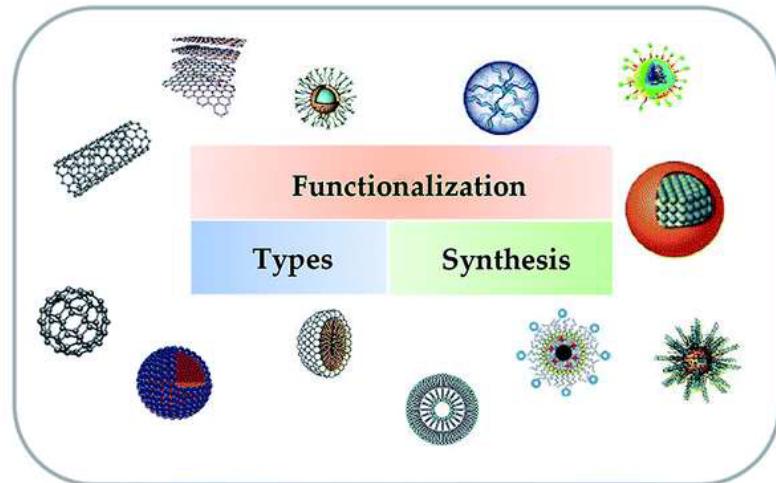
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Nano-biotechnology

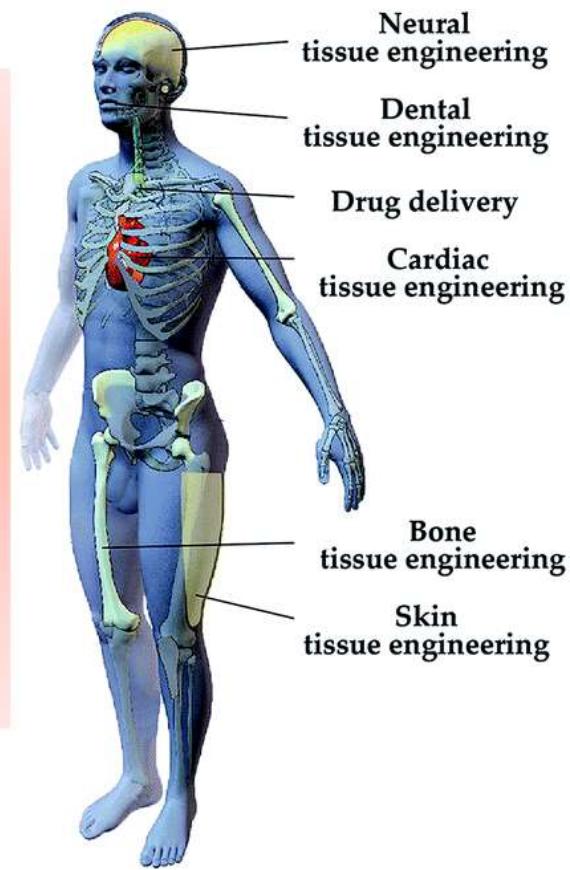




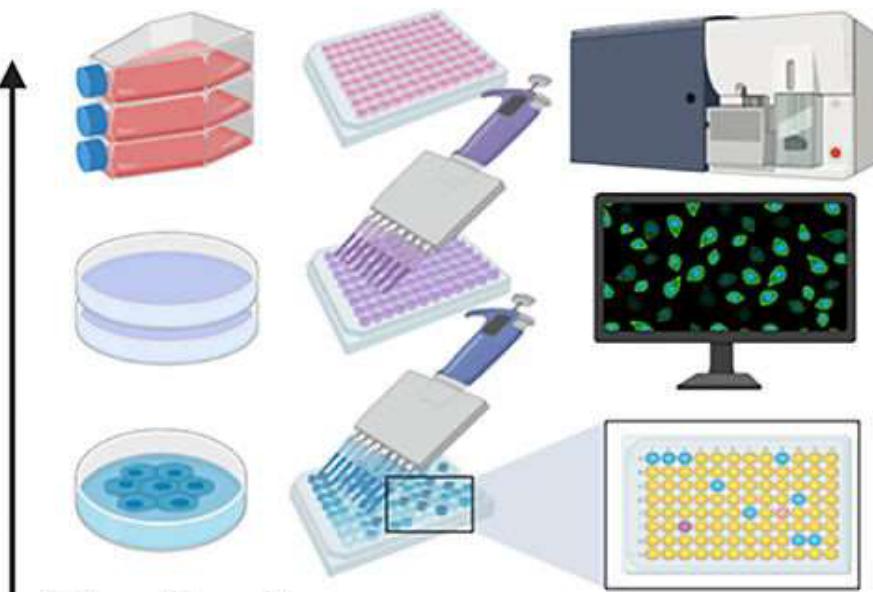




Applications in tissue engineering

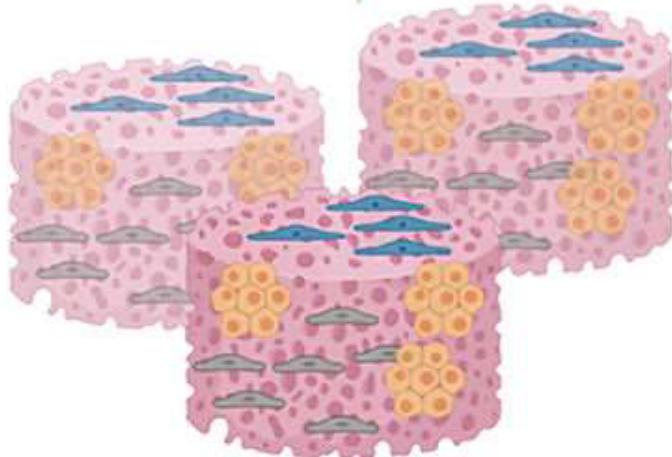
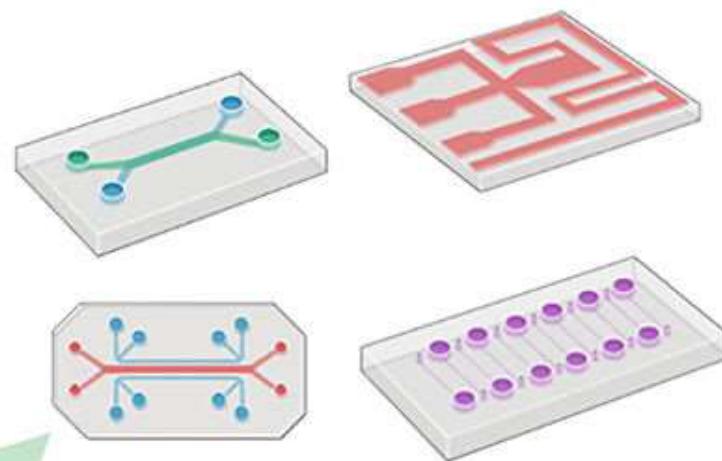


Experimental controllability and reproducibility

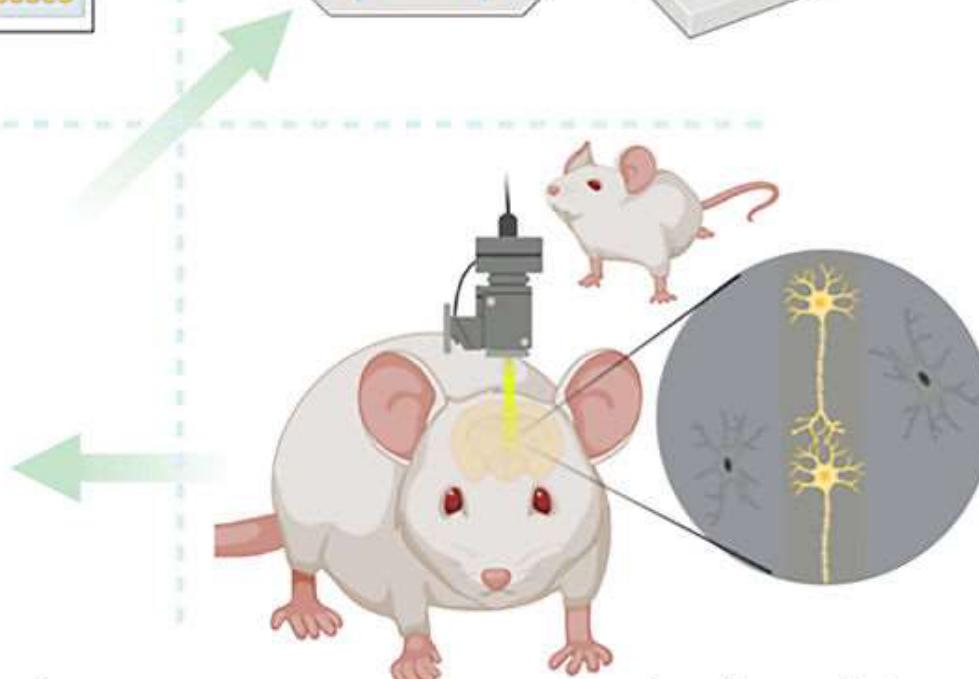


2D cell culture

Microfluidic Organ-on-a-Chip



3D cell culture



Animal models

Physiological relevance and complexity

Physicochemical properties

Size, shape and composition

Surface/volume ratio

Aggregation Stability

Surface chemistry and corona

Surface charge

Neglected properties

