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Editorial

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Nanotechnology in the Horizon: The Introductory Editorial for Cellular and Molecular Medicine Research

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Nanotechnology is handling any substance on a near-atomic scale to yield new assemblies, constituents, and devices. This technology has gained momentum in the second decade of this century. New technology in molecular biology and quantum physics advancements has been a pillar in underpinning new platforms and discoveries [1].

Genetically engineered osteosarcoma cells were established using the CRISPR-Cas9 technique. CRISPR-Cas9 is the abbreviation for clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9 [2]. CRISPR-Cas9 is adapted from a genome editing system detected in bacteria. The bacteria target snippets of DNA from invading biological structures (e.g., viruses). They use them to produce DNA segments known as CRISPR arrays. If a virus attacks again, the bacteria generate RNA segments from the CRISPR arrays to target the virus' DNA specifically. Then, the bacteria utilize Cas9 to cut the DNA apart, which inactivates the virus. Like the natural system, the CRISPR-Cas9 method is used in the laboratory. A small piece of RNA is created with a short "guide" sequence. This sequence binds to a designed target sequence of DNA in a genome. Moreover, the RNA links to the Cas9 enzyme. The modified RNA identifies the DNA sequence of interest. The Cas9 enzyme cuts the DNA at the specific location. Once the DNA is reduced, the cell's DNA repair machinery is utilized to add or delete pieces of genetic material or make changes to the DNA by replacing an existing segment with a customized DNA sequence. The knockdown of insulin growth factor 1 (*IGF1*) and insulin growth factor binding protein 3 (*IGFBP3*) genes was validated via genome sequencing against wild-type cells and confirmed by flow cytometry for a better understanding of the cellular pathology since the beginning of the ontogenesis [3].

Nanotechnology and molecular biology coupled with quantum physics advances promise scientific advancement in many sectors such as medicine, energy, materials, and manufacturing. Nanomaterials are defined as those objects that have a length scale between 1 and 100 nanometers (one nm equals 10^{-3} µm or 10^{-6} mm, or 10^{-9} m) and can be compared to the size of a cell. Prokaryotic cells are 0.1 - 5.0 µm in diameter, significantly smaller than eukaryotic cells, with diameters ranging from 5 to 100 µm (micrometers). In the nanoscale environment, materials begin to exhibit unique properties that hint at physical, chemical, and, of course, biological behavior. Even though hazards in nanotechnology-related industries are still under investigation, the potential of a breakthrough in medicine, biology, and other sciences is real. For example, low solubility nanoparticles are crucial in penetrating biological structures of several organs and tissues. Nanotechnology encompasses the science of materials, and quantum physics plays an essential role. Quantum materials characterization and synthesis, including quantum wells, wires, and dots will be key in this century's discoveries. Bi-dimensional (2D) materials demonstrating quantum phenomena will be crucial in penetrating the insights of the biological matter. Optoelectronics, photonics, and electromechanical devices at the nanoscale can interact with biological substrates. This interaction will be key in selecting new devices for the market of medicine and pharmacology. Nanotechnologies are also key for tissue engineering. They include nanomaterials for cell and tissue manipulation and engineering, nanocomposite scaffolds, and nanotechnology-based devices to sense and trigger tissue function.

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Conflict of Interest

None to declare.

Author Contributions

The author is the sole contributor of this editorial.

Data Availability

The author declares that data supporting the findings of this study are available within the article.

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