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NANOMEDICINE: AN ENABLING TOOL IN THE MODERN PHARMACEUTICAL FIELD

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DESCRIPTION

Nanomedicine is the use of nanotechnology to advance healthcare innovation. It makes advantage of a material's qualities at its nanometric scale, which are frequently different from those of the same substance at a larger size in terms of physics, chemistry, or biology. Additionally, because many biological processes in the human body operate at the nanometric scale, nanoparticles and nanomaterials may be able to pass through natural barriers to reach new delivery sites and interact with DNA and small proteins at various levels in the blood as well as inside organs, tissues, and cells.

The surface properties are increasingly becoming an intrinsic parameter of a particle's or material's possible activities at the nanoscale due to the surface-to-volume ratio. In order to maximise the biocompatibility of the particle and its time spent circulating in the blood as well as to assure a highly selective attachment to the chosen target, coating the particles and functionalizing their surfaces are extremely typical practises.

Nanomedicine has the potential to greatly enhance the diagnosis, treatment, and aftercare of numerous diseases, including cancer but not just, by enabling early identification and prevention. With hundreds of treatments currently undergoing clinical trials in nanomedicine, including those for cardiovascular, neurological, musculoskeletal, and inflammatory illnesses, all major diseases are represented. Nanomedicine is already responsible for about 80 commercially available products, ranging from medical imaging, diagnostics, and biomaterials to nano-delivery and pharmaceuticals.

By providing doctors and patients with the most advanced new medications, therapies, and implantable devices, nanomedicine is recognised as a crucial enabling tool for personalised, targeted, and regenerative medicine. Beyond that, nanomedicine offers significant new tools to address the big challenge of an ageing population and is believed to be essential for better and more economical healthcare, a key element in ensuring that all people have access to and can afford medicines and treatments.

Numerous dangerous and complex diseases, such as cancer, cardiovascular conditions, multiple sclerosis, Alzheimer's and Parkinson's disease, diabetes, and various types of significant inflammatory or infectious diseases are currently being fought by mankind (e.g. HIV). The majority of these illnesses have a severe detrimental effect on not only the patient but also on the entire society and any associated social or insurance systems. It is crucial to combat these ills with effective methods, many of which are provided by applications of nanomedicine.

Nanomedicine has the potential to provide promising treatments for numerous disorders, raising great expectations for better, more effective, and more economical healthcare for millions of people. Nanotechnologies have a significant impact on nearly every aspect of modern medicine, including disease diagnosis, disease monitoring, undergoing surgery and chemotherapy, and regenerative medicine.

The advantages that nanotechnology can provide are already being used in a number of medical fields. Targeted medication delivery systems based on nanotechnology are now available on the market, while others are either in clinical studies or, by far the majority of them, are still being developed. Diagnostics at the nanoscale is another incredibly appealing field of nanomedicine. Finding a disease at its earliest stage is the goal. In an ideal world, a single cell that is acting abnormally would be found, treated, or eliminated. Many patients with serious injuries or organ failure have hope because to new ideas in regenerative medicine. Artificial skin, bone, and cartilage are currently in advanced stages of development and are in some cases already available.

CONCLUSION

The future potential of nanomedicine must be weighed against the risks, as is the case with every ground-breaking technology. Similar to pharmaceuticals and medical equipment, the safety of nanomedicine products is controlled, and they are clinically assessed for their benefit-to-risk ratio for the patients. Before having the full potential to serve patients, nanomedicines must undergo multi-stage clinical trials, extensive characterisation, toxicity evaluation, and rigorous regulation, much like any other medical devices or pharmaceuticals. However, it is crucial to carefully and responsibly analyse all potential negative consequences on both humans and the environment up front. This crucial issue is already being addressed by several European projects. Social acceptance and ethical considerations must also be taken into account.