Chapter 1
Nano Robots Promising Advancements and Challenges in Healthcare:
Nanobots in Healthcare

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ABSTRACT

Nanorobotsis a boon in medicine, offering extraordinarycare and control at the tissue level. This review examines the current state of research on nanorobots, highlighting their potential to revolutionize diagnostics, drug delivery, and surgical procedures. Recent developments in nanofabrication, biocompatibility, and targeted functionality have enabled the creation of nanorobots capable of performing complex tasks within the human body. Key applications include targeted cancer therapy, minimally invasive surgery, and real-time monitoring of physiological conditions. Despite significant progress, challenges such as scalability, safety, and regulatory approval remain. This article explores these challenges and discusses future prospects for integrating nanorobots into mainstream medical practice. By providing

DOI: 10.4018/979-8-3693-6150-4.ch001

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a comprehensive overview of current research and anticipated advancements, this review aims to underscore the transformative potential of nanorobots in medicine, paving the way for more effective and personalized healthcare solutions.

1. INTRODUCTION

In the current scenario, drug use is spreading to healthy and non-healthy cells, which will have side effects on the healthy cells. This leads to individuals contracting additional illnesses after recovering from a previous one. We combine nanotechnology and quantum computing technologies to form nanorobots. Nanorobots are made up of nanocomponents. It is different from macrorobots, but both have some similar architecture and control techniques. The health care industry is heavily relying on the futuristic emerging nanotechnology, which combines quantum computing and health care analytics. The health care industry is working to develop successful nanometer machines identified as nanorobots or nanobots. From 2022 to 24, the health care industry will invest more than ten billion dollars in the implementation of nanotechnology. The nanobots are able to travel in the blood stream with the help of nanomaterials that can cross the cell membrane and detect the targeted tissues. The different nanobots perform peculiar jobs inside our bodies and organs (Biswajit Mukherjee and et al. 2023).

1.1. History

The research commenced in 1990, during which researchers developed various concepts regarding its model and architecture. Isaac Asimov published his book 'Fantastic Voyage' in 1966, detailing the tale of the world's tiniest submarine, a 'minuscale sub' consisting of 244 atoms, as it navigates through our bloodstream. The book describes the architecture of nanorobots, and it became popular after 2002. Michael Crichton introduced swarm-like, intelligent nanorobots in 2002. Following their introduction, nanorobots gained significant popularity among researchers. Several movies, serials and stories focus on nanorobotic concepts. In the transition period from 1990 to 2000, more improvements emerged in the fields of nanotechnology and robotics. In 2000, researchers combined both technologies to explore more innovations in the field of nanorobotics. Prior to 1998, researchers referred to nanorobots as 'Molecular machines', 'nanomachines', or 'cell repair machines' (Wowk, 1988) (Dew Dney A.K,1998). The nanorobots have many tiny parts, including the ability to move (actuation), sense, control, or play (manipulation), move forward with the help of force (propulsion), send signals to a computer, process information, be smart enough to find the exact target, and behave like the swarm shown in Fig.

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