OPINION

Nanoinformatics is a new field of nanomedicine study

Michael Richard

Richard M . Nanoinformatics is a new field of nanomedicine study. J Nanosci Nanomed .2022; 6(3):05-06.

ABSTRACT

Nanotechnologists began studying nanomaterials for medical uses more than a decade ago. This study uncovered a wide range of obstacles as well as numerous opportunities. Some of these concerns are closely related to informatics issues, such as managing and integrating heterogeneous data, developing nomenclatures, taxonomies, and classifi-cations for diverse types nanomaterials, and research on novel nanoparticle modeling and simulation tools. To solve these difficulties, nano-informatics has recently evolved in the United States and Europe. We describe the roots of nano-informatics, the problems it solves, areas of interest, and examples of contemporary research activities and informatics resources in this study.

Key Words: *Biomedical Informatics; Nanomedicine; Nanotoxicology; Ontologies; Electronic Health Records*

INTRODUCTION

Recently, a consensus has emerged about the informatics infrastructure required to collect, curate, and disseminate data am-among all stakeholders in nanotechnology. A more efficient and broad sharing of data, information, and knowledge concerning nanotechnology research and applications should be possible with a more effective nano-informatics infrastructure. We'll start with medical applications of nanotechnology and their connections to nano-informatics in this review. Even though specific illustrated instances may be referred to in the literature under "bio-nanoinformatics" or "nanomedicine informatics," we utilize solely the term "nano-informatics" to avoid term confusion. Finally, we will discuss other areas of nanotechnology application, as well as the current directions and needs for developing a broader nano-informatics infrastructure.

BIOMEDICAL INFORMATICS

The first applications of computers in biomedicine were in hospitals in the 1950s, with pioneering scientific computer programs for simulating the diagnostic process. Computational biologics evolved a little later to address issues of scientific inquiry at the molecular level. Medical informatics grew throughout time to encompass computerized medical records, artificial intelligence systems for medical diagnosis and planning, and laboratory, radiology, and hospital information systems. Database of macromolecular sequences, structures, and functions was built and confirmed with experimental data in computational biology. Later, the Human Genome Project (HGP) generated large bioinformatics datasets, and the project's infrastructure and software tools were critical to the project's on-time completion.

Based on a significant number of research projects, Biomedical Informatics (BMI) has continued to evolve as a science embracing both medical informatics and bioinformatics during the last decade. Over 1000 public databases with omics and illness information are available, which are critical for biomedical translational research. The creation of ontologies like Gene Ontology and a slew of others for data, information, and knowledge transfer among diverse systems, supplied well-defined terminology and semantic content.Despite the broad range of applications of BMI, which includes everything from molecular medicine to public health, Nanomedicine has received little attention. However, using the search term "nanomedicine" in the PubMed database, about 3000 references were found at the time of writing. This number rises every day.

NANOTECHNOLOGY AND NANOINFORMATICS

The numerous obstacles that nanotechnology poses for nanomedicine point to the necessity for a new informatics field. Nanoinformatics is defined as "the application of informatics techniques to analyze and process information about the structure and physicochemical characteristics of nanoparticles and nanomaterials, their interaction with their environments, and their applications for nanomedicine" in this biomedical context. After an initial workshop in Arlington, Virginia in 2007, the phrase was officially acknowledged. This occurred at the same time as analogous operations in Europe, which were supported by the European Commission Nanoparticles, have a size range of 1 nm to 100 nm. Their behavior may be explained by known atomic, molecular, and ionic interactions and forces below 1 nm; above around 100 nm, their properties resemble the material's bulk properties. Due to quantum phenomena, a particle might exhibit new and changeable properties within that range. Bioavailability and movement in and across biological organisms, tissues, cells, organelles, membranes, and interstices may also be increased by particles smaller than 100 nm. Particles in this range have traditionally been referred to as "ultrafine" particles, and they have long been the subject of research into their health – and hazardous – impacts. Nanomaterials comprise bigger materials with nano-sized layer thicknesses or surface features because new quantum effects or enhanced availability may be visible as coating or layer thicknesses, surface changes, and or pores fall within this size range. Finally, because the size range's maximum limit is rather arbitrary, different definitions exist that extend the upper limit to 1000 nm or 1 m.

Editorial Office, Journal of Nanoscience and Nanomedicine, United Kingdom

Correspondence: Editorial Office, Journal of Nanoscience and Nanomedicine, United Kingdom; E-mail: Nanomedsci@medicalres.org

Received: 07-May-2022, Manuscript No. PULJNN-22-4969; Editor assigned: 09-May-2022, Pre QC No. PULJNN-22-4969 (PQ); Reviewed: 16-May-2022, QC No. PULJNN-22-4969 (Q); Revised: 18-May-2022, Manuscript No. PULJNN-22-4969 (R); Published: 26-May-2022, DOI: 10.37532/puljnn.2022.6(3).05-06.

NANOINFORMATICS AREAS

In nanomedicine, the need for new data, information, and knowledge repositories, as well as means for information exchange, is fast expanding. A recent method for simplifying data transmission through common terminological references is to develop biomedical ontologies, which are fundamental to the semantic web. Concepts or classes – for example, animals, organisms, organs, cells, molecules, proteins; associated properties; semantic relationships and specific instances – elements, such as a specific cell or protein; and logical formalisms to interrelate the terms, properties, and instance relationships are all described in biomedical ontologies. In the biomedical field, ontologies have proved critical for managing and systematizing information and knowledge. System interoperability and information mapping, as well as search, retrieval, extraction, and multilayer data integration, are all aided by ontologies.

IMAGING

QDs are semiconductor-based luminescent probes that can be used in a variety of biomedical applications. Small size, high photostability, specific adjustable or selectable optical and electronic properties, size-tunable light emission, superior signal brightness, photobleaching resistance, and broad absorption spectra for simultaneous excitation of multiple fluorescence colors and multimodality to facilitate in vivo diagnosis – for example, for various types of cancer – are among their many characteristics. They can be linked to specific molecules within malignant tumors, allowing for earlier identification and treatment, resulting in better patient outcomes.

MODELING

Systems biology research relies heavily on molecular modeling and simulation approaches. They will be crucial in linking nano-level impacts with aggregated, molecular, cellular, tissue, organ, and organismal system-level effects in the nanoworld. The scientific foundation for evaluating and comprehending the basic physical, chemical, and biological aspects of nanoparticles and nanomaterials is provided by quantum mechanics, molecular modeling, and simulation approaches.

TOXICITY TESTS AND CLINICAL TRIALS

Nanomedicine will necessitate new ways of medical care and clinical trials that are focused on proving their usefulness while also taking into account the nanoparticles' possibly harmful side effects. The potential risks of nanomaterials must be assessed by conducting in vitro high-throughput tests and mechanistic studies and comparing the results with known reference data. Several ENMs have been studied in vitro and in vivo to determine the hazards of nanoparticles and their impact on humans.

STANDARDS

To add concepts and links to nano-related information, a large number of standardized nomenclatures, vocabularies, coding standards, and terminologies, such as the Health Level Seven International, Logical Observation Identifiers Names and Codes, Systematized Nomenclature of Medicine, Digital Imaging and Communications in Medicine, and the tenth revision of the International Classification of Diseases, must be extended.

ETHICAL ISSUES

Nanotechnology and nanomedicine raise significant ethical concerns about the organisms and environments they seek to control, such as nanotoxicity. According to a recent review, none of the ethical concerns raised by nanomedicine are new or unique, and they would apply to any new medical technology or medicine under consideration.

CONCLUSION

Nanotechnology and nanomedicine raise significant ethical concerns, including Nanomedicine poses a slew of problems and necessitates a considerable investment in informatics to speed up present research and development. Such informatics requirements are related to the work done by biomedical informaticians in post-genomic research programs, which have changed biomedical research.