# Healthcare informatics driven nanotechnology

**Dear Readers,**

Nanoinformatics has potential to accelerate advancement goals of nanomedicine for mass healthcare. Recent introduction of transformative adoption of information science and technology, machine learning and artificial intelligence for techno-community-wide best practices lead focused nanoinformatics. The new approaches to discovery and innovation for broader understanding of the medical science gaps via generating multi-scale simulations has articulated the key concepts behind complex problems related to cross-cutting issues of biomedical systems.

The translational research into the product developments is key model in identifying required technological approaches to solve issue in sustainable frame. However, additional prediction model of the relationships or decision support system via informatics have successfully contributed to these areas effectively and emerged as foci field of healthcare. This issue bring forth role of nanoinformatics in shaping healthcare sector through advanced computational approaches and nanotechnology research for accelerating healthcare field.

*Nanotechnology and information science:* Novel nanostructures have been developed and utilised in various applications in healthcare sector. Various physical and physio-chemical properties of nanomaterials have enabled their applications in diagnosis of diseases, clinical therapies, drug development and delivery, and development of biomarkers. The computational methods employed to model and analyse nanomaterial systems has led to the development of the branch of nanoinformatics. Modelling of novel nanostructures and studying their interactions with biomolecules has become an essential part of nanotechnology research. Information science and technology changed the knowledge sharing, storage, transfer and analytics extensively. Currently nanoinformatics primarily focuses on; data management, data curation and database development of nanomaterials, meta-analysis, data mining, development of QSARs (quantitative structure–activity relationships), nanomaterials - biomolecules interactions, computational simulation of these interactions and assessment of potential environmental and health risks of nanomaterials.

*Data analytics and integrated technological models:* First of all, medical decision support should be towards safety to people and the environment friendly. Health remediation and environmentally friendly healthcare model and life safety related treatment, production, and consultancy are requirement of today era. The combination of computational tools like machine learning, artificial intelligence helps identifying functional properties of nanomaterials through studying their structural properties. Database management for mass healthcare and data analytics for understanding of real-time issues were adopted through integrated models. Emerging computational modelling in healthcare practice and clinical databases to create issue solving mechanism lies in upgraded cloud computing and artificial intelligence integration in trans disciplinary platforms. Informaticians can successfully contribute to healthcare extensively, due to recent advent in technological upgrade and increasing understanding in genomics and proteomics projects day by day. Overall, exchanging innovation data, results, modelling and simulation methods, data accessibility and computational tools for establishing clinical phenotype databases to contribute to improved products and understanding processes of diverse healthcare issues for mass healthcare is urgent need.

*Nanomedicine and computational modelling:* The concept of nanomedicine was introduced to improve the efficiency of medical and healthcare systems using nano-technology tools and techniques; though the development of translatable, environment friendly nanotherapeutics is still difficult and requires initial advanced computational studies to identify nano-biomolecules interaction mechanisms and other biological events triggered by drug release. Computational modelling and simulation techniques can help in identifying the suitable shape, size and surface of nanoparticle for better uptake and transport through the cells and also visualize their interaction and behaviour with cellular compartments. Modelling and molecular dynamics studies of nanomaterial interactions with bio-membranes or biomolecules and calculating their binding energies and other kinetics helps in developing better drugs and drug targeting systems. These models are then transformed into nanomedicines via experimental procedures.

*Nanomaterials based targeted drug delivery system:* Improper delivery of drugs or other therapeutic agents to the exact target sites has been a major issue in disease treatments and efforts are made to develop nanomaterials and it's applied devices for targeted delivery of more efficient and safe therapeutic agents with prolonged drug residence. Computational tools allow designing nanoparticles with optimized properties and predicting the drug delivery mechanism of nanomaterials. Carbon nanotubes have been efficiently used as drug carriers in various studies.

*Nanobiosensors and other health devices:* Biosensors and drug delivery systems are efficient mechanism under current scenario, although nontoxicity causes a major limitation to the applications in healthcare but a lot of research is being undertaken to reduce its effect. Nanomaterial based biosensors are developed for quick efficient diagnosis owing to their more sensitive and specific biomolecule detection properties. Other health devices for regenerative medicine, arrays, biomimetics and tele-interfaces have also been made using nanomaterials.

Nanoinformatics based methods have been found to be faster and better in performance; and there's an increased demand to develop new materials and strategies for their use in applied research. Computational tools help optimize nanomaterials and nano-based methods before performing actual experiments which is more cost and time effective. Nanomaterials have found various applications in health sector and nanoinformatics is helping with nano- data storage and analysis for development of new advanced methodologies.

With kindest regards

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