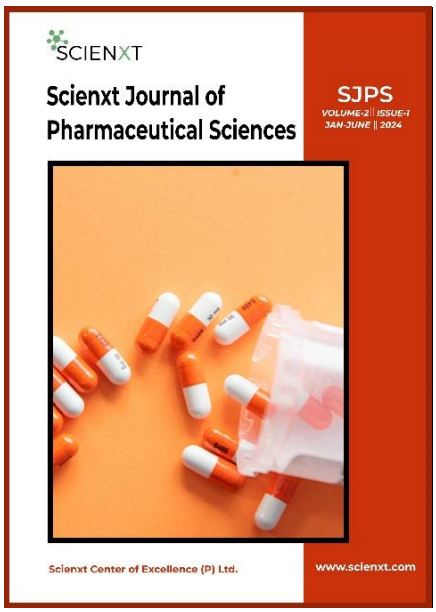

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The vital challenges of drug discovery in pharmaceutical field

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Abstract:

This drug discovery process in pharmacy faces huge numerous challenges, including very high costs, lengthy timelines and a high rate of failure. This paper explores these challenges and proposes new methods for identification using advanced techniques. Through the innovative approaches, such as computational modeling and high throughput screening, Scientists aim to streamline drug discovery and improve success rates. The results and discussions highlight the potential of these methods to revolutionize the field of pharmacy and accelerate the development of novel medicines. But sometimes by Luckily Drug Discovery done in a less time by lower cost. At present Drug Discovery is in a very challenging movement because it takes minimum 10-15 years but very rare scientist of 1% sometimes discovering drug very easily by lower cost. But for Drug Discovery chemical samples with medicinal plant cultivation with NMR, IR spectroscopy all types of instruments required for identifying a new molecule.

1. Introduction:

Drug discovery is a complex and resource intensive process crucial for developing new medicines to address unmet medical needs. However, this process is plagued by challenges such as escalating costs, long development timelines and a low success rate. Traditional methods of drug identification rely heavily on trial and error, often resulting in high attrition rates during preclinical and clinical stages. To overcome these challenges, scientists are increasingly turning to innovative techniques that leverage advances in computational biology, genomics and data analytics. Our review paper explores these emerging methods and their potential to transform drug discovery in the pharmacy field.

2. Methods of identification with new techniques:

2.1. Computational modeling:

Utilizing algorithms and computer simulations to predict the behaviour of molecules and their interactions with biological targets. This approach accelerates the identification of potential drug candidates and reduces the need for exhaustive experimental testing. High-Throughput Screening (HTS) - Employing automated platforms to rapidly test thousands of compounds for their biological activity. HTS enables researchers to evaluate large chemical libraries efficiently, expediting the discovery of lead compounds with therapeutic potential.

2.2. The target based drug design:

Focusing on specific molecular targets implicated in disease pathways, scientists employ rational drug design strategies to develop compounds that selectively modulate these targets. By elucidating the structural and functional properties of target proteins, this approach facilitates the design of more potent and specific drugs.

2.3. AI method:

One very popular AI method for drug discovery is machine learning, particularly deep learning. This also involves training algorithms on large datasets of molecular structures, biological assays and drug responses to predict which molecules are likely to be effective as drugs. Other AI methods include molecular docking simulations, reinforcement learning for optimizing drug properties and generative adversarial networks (GANs) for generating novel molecular structures.

2.4. Robotic technology for drug discovery in japan:

In Japan, the robots are increasingly being used in drug discovery processes to streamline tasks such as high throughput screening, compound synthesis and data analysis. These robots are properly equipped with advanced automation and AI capabilities to accelerate the drug discovery pipeline and improve efficiency in research and development efforts. Additionally, also robots can handle repetitive tasks with precision, by freeing up scientist time for more complex and creative work.

2.5. Drug discovery under water methods:

Drug discovery under the water involves the exploration and identification of novel therapeutic compounds from marine organisms, such as algae, sponges and corals, as well as from microorganisms living in marine environments.

2.6. The following Methodsinclude:

1. **Bio prospecting:** Collecting samples from diverse marine habitats and screening them for bioactive compounds with potential therapeutic properties.
2. **Bioassay guided Fractionation-** For extracting bioactive compounds from marine organisms and fractionating them to proper isolate the active components by using bioassays to assess their biological activity.
3. **Met genomics-**By studying the genetic material directly from the marine environments to identify biosynthetic gene clusters responsible for producing potential drug candidates.
4. **Synthetic Biology-**By engineering marine microorganisms to produce some specific compounds of interest in large quantities, by offering a sustainable method for drug production.
5. **Chemo informatics and Molecular Modeling-**By utilizing computational techniques to predict the pharmacological properties and interactions of marine derived compounds, by accelerating the drug discovery process.
6. **Natural Product Synthesis-** The developing methods for the total synthesis of complex marine derived compounds to obtain sufficient quantities for further evaluation and development as pharmaceuticals.

7. **Ecological Studies**-For understanding the ecological roles of marine organisms and their interactions with their environments to prioritize species and habitats for drug discovery efforts while ensuring sustainable practices.

The methods offer a rich source of novel chemical diversity for drug discovery, with many marine derived compounds showing promising therapeutic potential against various diseases, including cancer, infectious diseases and neurological disorders.

2.7. Drug discovery from other planets, including mars:

This is a fascinating concept that scientists have started exploring. The Mars, Jupiter and other celestial bodies may contain unique compounds, minerals and microorganisms that may be have medicinal properties or serve as inspiration for new drugs. However, this is very largely speculative at the moment, as no direct clue of such discoveries has been made. Nevertheless as space exploration advances, there is potential for exciting discoveries that could revolutionize medicine.

2.8. Drug discovery from fossils:

This is not a common practice. As Fossils are primarily used in paleontology to study ancient life forms and environments. However, some of the compounds found in fossils, such as certain organic molecules or resins, that could potentially have medicinal properties and be studied for drug discovery purposes. Nonetheless, this also approach would be highly speculative and unconventional compared to traditional drug discovery methods.

New Molecule Patent Benefit-By obtaining a patent for a new molecule can offer several benefits, including-

Exclusive Rights-The patent grants the inventor exclusive rights to make, use, and sell the molecule for a certain period, typically 20 years from the filing date.

Commercialization Opportunities- Patents can attract investors and partners interested in developing or commercializing the molecule, by eading to potential licensing agreements or partnerships.

Market Advantage-A patented molecule can provide a competitive edge in the market, as competitors cannot legally replicate or sell the same molecule without permission.

Revenue Generation-Patented molecules can generate revenue through sales, licensing fees or royalties from sublicensing agreements in outside of India. But presently selling of patented

Molecule is more challenging in India, as some molecule price is very high so, if any new molecule is very expensive this time selling of patent is more challenging. But if molecule is low cost and potency very high then marketing properly, if not marketing then patent not sell.

Incentive for Innovation-Patents incentivize further research and development by protecting the intellectual property rights of inventors, encouraging innovation in the pharmaceutical and chemical industries.

3. Results and discussion:

The adoption of these advanced techniques has properly yielded promising results in drug discovery. The computational modelling has enabled the design of novel molecules with improved pharmacokinetic properties and target selectivity. HTS platforms have expedited the identification of lead compounds, by leading to a more efficient drug development process. The Target based drug design approaches have led to the discovery of therapeutics with enhanced efficacy and reduced off target effects. However, more challenges remain, including the need for robust validation of computational predictions and the integration of diverse data sources for more comprehensive target identification. Overall, the main integration of new techniques holds great potential to revolutionize drug discovery in the pharmacy field, paving the way for the development of safer and more effective medicines. Drug discovery of antibiotics involves several stages, that including target identification, screening for potential compounds, lead optimization, preclinical testing and clinical trials. Scientists often target bacterial components essential for survival, such as cell wall synthesis or protein synthesis machinery. Screening methods involve testing thousands of compounds for antibacterial activity, followed by refining and optimizing the most promising candidates. Preclinical testing assesses safety and efficacy in animal models before progressing to human clinical trials, where the drug's safety and efficacy are further evaluated. This process is crucial for developing new antibiotics to combat antibiotic-resistant bacteria and emerging infectious diseases. As we know NMR spectroscopy plays a very crucial role in drug discovery by providing valuable insights into the structure, its dynamics and the proper interactions of molecules. It's mainly used to elucidate the structure of small organic molecules, determine their stereochemistry and analyze their binding interactions with target proteins. Our information aids in the design, optimization and characterization of drug candidates, ultimately helping in the development of safer and more effective medications. As for example Esomeprazole is a proton pump inhibitor (PPI) used to treat acid related disorders like gastroesophageal reflux disease (GERD).Its

discovery involved modification of omeprazole, an earlier PPI. Drug discovery is typically involves medicinal chemistry, where scientists modify existing molecules to improve properties like potency and safety. In the case of esomeprazole, scientists modified the structure of omeprazole to enhance its pharmacokinetic properties, by resulting in a more potent and longer lasting drug. Clinical trials then validated its efficacy and safety for therapeutic use. At present patent selling is not easy matter in total 100% only 2-3%patented molecule selling by chance. So, Selling of Patented molecule is a very risky method. In 100% only 4-5% scientist can discovering a new molecule. The time also take 10-15 years but sometimes very rarely 2-3months.Sometimes many scientist trying and trying for discovering drug till 11-12 years but suddenly any unknown scientist rarely discovers any molecule within short period.

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This review article is guided and written skills done by Guide cum Research-Teacher-in-Charge Mr.Shibanjan Paul Roy a Freelancer Scientist Qualification-M.Pharm(Pharmacology) Address-Race Course Para, Jalpaiguri has 9individual research publications with 1individual review article with 3individual inventorship patents-2published and 1grant with he guided in more than 14researches,has 3groupwise publication (2researches and 1review) has 5awards as Asian Best Scientist Award2023 by World Research Council. In this research Shibanjan Paul Roy guides Mr.Kamal Deka M.Pharm (Pharmaceutics)-Former Principal of Crescent Institute of Pharmacy now Assistant Professor of Royal School of Pharmacy under Assam Royal Global University and Ph.D pursuing from 2021 has more than 11research publications with 1patent and 3book chapters,Mr.Pratyush Kumar Mishra Former Assistant Professor of Vinayaka Missions Sikkim University,Tadong from 20.01.2012 to 30.07.2017 and Mr.Shyam Prakash Rai a Former Principal of ITI College,Young Scientist and now Sr.Lecturer of HGEA College of Pharmacy has more than 10research publications with 2individual research publications.Mr.Pratyush Kumar Mishra,Mr.Kamal Deka and Mr.Shyam Prakash Rai performed for the evaluation and idea under Guide-Mr.Shibanjan Paul Roy's guidance and observation.

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