DIGITAL LITERACY

ICTF 0513

TOPIC : THE TRADIONAL MEDICINE AND MODERN MEDICINE FROM NATURAL PRODUCTS

SECTION NUMBER: 558

	Team Members Name	**Matric Number**
1.	Awang Muhammad Danish bin Awang Hassanal	241288
2.	Iqhwan Farihin bin Mohamad Hazman	242142
3.	Faryadi Hafifie bin Khairi	241714

Lecturer Name: Mohamad Taufiq bin Mohd Safwan Chin

i)Case Study Introduction and Objective

INTRODUCTION

TRADITIONAL MEDICINE is the oldest form of health care in the world and is used in the prevention, and treatment of physical and mental illnesses. Different societies historically developed various useful healing methods to combat a variety of health- and life-threatening diseases. TRADITIONAL MEDICINE is also variously known as complementary and alternative, or ethnic medicine, and it still plays a key role in many countries today.

In contrast, **modern medicine** refers to evidence-based treatments that have been validated through rigorous clinical trials and scientific research. However, many modern pharmaceutical drugs are derived from natural sources. Aspirin, for example, originates from willow bark, and the cancer treatment paclitaxel was first isolated from the bark of the Pacific yew tree. The intersection of traditional wisdom and modern scientific inquiry has led to the discovery of many life-saving drugs and therapies.

Natural products have a wide range of diversity of multi-dimensional chemical structures; in the meantime, the utility of natural products as biological function modifiers has also won considerable attention. Subsequently, they have been successfully employed in the discovery of new drugs and have exerted a far-reaching impact on chemicalbiologythe . From the past century, the high structural diversity of natural products have been realized from the perspective of physical chemistry. Their efficacy is related to the complexity of their well-organized three-dimensional chemical and steric properties, which offer many advantages in terms of efficiency and selectivity of molecular targets. As a successful example of drug development from natural products, artemisinin and its analogs are presently in wide use for the anti-malaria treatment. This shows how research using natural products has made a significant contribution in drug development.

OBJECTIVES

The purpose of this case study is to explore and analyze the use of natural products in traditional medicine and modern medicine, evaluating their historical significance, scientific validation, also integration into healthcare systems and the challenges or opportunities for collaboration between both practices to improve health outcomes.

ii) Literature review:

Natural products have been a cornerstone of drug discovery, owing to their unparalleled diversity in chemical structures and biological activities. These compounds, derived from plants, microorganisms, and animals, offer a high level of structural complexity and unique three-dimensional properties, making them highly efficient and selective in targeting molecular pathways. Notable examples include the anti-malarial drug artemisinin and its derivatives, as well as plant-based anticancer drugs like Vinca alkaloids (from Catharanthus

roseus) and paclitaxel (from Taxus baccata). Between 1940 and 2002, approximately 54% of approved anticancer drugs and 64% of antihypertensive drugs were derived from or inspired by natural products.

Despite advancements in synthetic drug development, including high-throughput screening (HTS) and combinatorial chemistry, natural products remain integral to pharmaceutical innovation. From 2005 to 2007, 13 of the 69 new small-molecule drugs approved worldwide were natural product-based, underscoring their continued significance. However, only a fraction of the estimated 250,000–500,000 plant species have been scientifically studied for their bioactive compounds, leaving significant room for discovery and innovation.

ICT Integration in Natural Product Research

Data Management and Bioinformatics

Centralized databases like **PubChem** and **ChemSpider** store detailed information about natural compounds, including their chemical structures, bioactivities, and pharmacological properties.

ICT tools enable researchers to efficiently mine these databases for potential drug candidates, streamlining the early stages of drug discovery.

High-Throughput Screening (HTS)

ICT-powered HTS platforms allow the rapid testing of thousands of natural compounds for biological activity. Automation and robotics reduce time, cost, and human error, accelerating the identification of promising candidates.

Molecular Modeling and Virtual Screening

ICT tools such as molecular docking and virtual screening predict interactions between natural compounds and biological targets, reducing dependency on extensive laboratory experiments.

Computational modeling helps design derivatives of natural products with optimized efficacy and reduced toxicity.

iii) Analysis

The integration of ICT has significantly transformed natural product research and drug discovery by enhancing efficiency, accuracy, and collaboration across various stages of the process.

Data Accessibility and Centralization

Impact: ICT-powered databases such as PubChem and ChemSpider provide centralized repositories of information, enabling easy access to chemical structures, biological activities,

and pharmacological properties of natural products. This allows researchers to identify promising drug candidates more efficiently.

Outcome: The availability of such databases has streamlined the initial stages of drug discovery, reducing time and effort in compound identification and classification.

Automation in High-Throughput Screening (HTS)

Impact: ICT-enabled HTS platforms utilize robotics and automation to test thousands of compounds for biological activity simultaneously.

Outcome: This has drastically increased the speed and accuracy of screening processes, enabling researchers to identify active compounds in days rather than months.

Challenges and ICT-Driven Solutions

Limited Exploration of Natural Diversity

Challenge: Despite their potential, many natural sources, such as marine organisms, remain underexplored due to resource constraints.

Solution: AI-powered predictive models can prioritize high-potential sources for study, optimizing the allocation of resources.

Barriers to ICT Adoption

Challenge: Some researchers, particularly in resource-limited regions, may lack the training or infrastructure to utilize advanced ICT tools.

Solution: Training programs, user-friendly software, and e-learning tools can bridge these gaps, enabling wider adoption of ICT in drug discovery.

iv) Findings & results

Key Findings

1. **Enhanced Efficiency in Drug Discovery**

ICT integration, particularly through high-throughput screening (HTS) and computational modeling, has significantly accelerated the identification of active compounds from natural products. This efficiency reduces the time and resources required in the initial stages of drug development.

2. **Increased Accessibility of Data**

Centralized databases like PubChem and ChemSpider have streamlined access to information about natural compounds, enabling researchers to analyze chemical structures, biological activities, and pharmacological properties comprehensively.

3. AI and Machine Learning Revolutionizing Research

AI tools have enabled the prediction of bioactive properties and interactions of natural compounds with biological targets, leading to the discovery of novel drug candidates from underexplored sources, such as marine biodiversity.

Insights

ICT tools are indispensable for managing the complexity of natural product research, ensuring precision, efficiency, and collaboration.

The use of artificial intelligence and machine learning has not only transformed traditional approaches but has also opened new pathways for exploring underutilized resources.

Despite advancements, challenges such as accessibility and ethical concerns require continuous refinement of ICT applications and infrastructure to maximize the potential of natural product-based drug discovery.

These findings highlight the critical role ICT plays in advancing natural product research and underscore its potential to address global healthcare challenges through innovative drug development.

v) BOOLEAN search used

1. ("Natural Products AND Drug Discovery AND ICT")
2. ("Traditional Medicine AND Modern Medicine AND Drug Development")

vi)Conclusion

In conclusion, the relationship between traditional and modern medicine, particularly in the context of natural products, illustrates the profound potential of integrating ancient wisdom with contemporary scientific advancements. Traditional medicine, with its deep roots in cultural practices and empirical knowledge, has long relied on the healing power of nature, from plant-based remedies to mineral and animal-derived substances. These treatments, though often based on centuries-old knowledge, have provided invaluable insights into the therapeutic potential of natural products.

On the other hand, modern medicine has transformed the way we understand and approach disease, relying on scientific rigor, clinical trials, and evidence-based practices. Many of the drugs and therapies that are now cornerstones of medical care have their origins in nature, and ongoing research continues to uncover new natural products with promising therapeutic properties. The modern pharmaceutical industry frequently turns to natural sources for new drug discoveries, underscoring the continuing relevance of traditional knowledge.

With respect to the structure and characteristic of traditional medicines, they can be divided into three parts: the knowledge and facts in agreement with modern medicine, the

knowledge and practices not recognized in modern medicine that may be valuable in the future practice of modern medicine, and finally, the component of traditional medicine that has been adequately disproven and should be abandoned from future medical practice.

References:

1. Yuan, H., Ma, Q., Ye, L., & Piao, G. (2016a, April 29). ***The traditional medicine and modern medicine from natural products*****. MDPI. https://www.mdpi.com/1420-3049/21/5/559**

2. Dong, J. (2013a, July 30). ***Wiley Online Library | Scientific Research Articles, journals, ...*** **The relationship between traditional Chinese medicine and modern medicine. https://onlinelibrary.wiley.com/doi/abs/10.1155/2013/153148**

3.Shetty, P. (2010). Integrating modern and traditional medicine: Facts and figures. SciDev. Net-Health. https://search.proquest.com/openview/4f399baecf767fa31d0885d58b4ba641/1?pq-origsite=gscholar&cbl=5572316