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Original Article

Exploring Drug for Cancer Management

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ABSTRACT

Background Repurposing drugs for cancer treatment is a popular area of study right now. Theoretically, the repurposing strategy has various benefits over the acknowledged challenges of creating new molecular entities. It is generally claimed to be quicker, safer, simpler, and less expensive. **Objectives** This paper provides a thorough analysis of the different approaches used in drug repurposing, with a particular emphasis on using pharmaceuticals to treat cancer. We outline the antitumor characteristics of potential medications. We give a summary of the state of drug repurposing for cancer treatment in this paper, along with the obstacles that must be removed in order to fully reap the rewards of this strategy. It refers to the low-cost acceptance of repositioned medications for cancer treatment as conventional treatment for cancer reasons. We also stress how important it is to employ repurposed medications as part of a combination treatment plan.

Keywords: repurposed drugs, therapeutic, strategies, current candidates, potential drug, Apoptosis

INTRODUCTION

A disorder where cells proliferate abnormally and the cell cycle and apoptosis are not properly regulated is linked to cancer.[1] Global health is heavily burdened by cancer, which continues to be one of the major causes of mortality worldwide.1, 2 Numerous causes, including genetic mutations, environmental influences, a lack of physical exercise, a variety of lifestyles, and unstable behaviors relating to diet, smoking, and alcohol consumption, may contribute to the high prevalence of cancer.3, 4, 5, 6, and 7 Chemotherapy, radiation therapy, solid tumour surgery, or a mix of these are being used to treat different stages of different malignancies [2] [3] [4].

Fig.1 Cancer treatment options

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Finding medications with anticancer efficacy and unique modes of action has become more and more dependent on drug repurposing [5]. Drug repositioning, also known as drug repurposing, is the study of novel pharmacological effects of medications created for one illness while creating a therapy for the treatment of another disorder with a different pharmacological activity [6]. Utilizing the repurposed molecules established biological activity and clinical appropriateness is the main goal of development techniques for appropriate anticancer medicines [7]. Preclinical pharmacokinetic and toxicological investigations provide further advantages for repurposing medications. Drug repurposing is a remarkable opportunistic approach in drug discovery [8], whereby off-patent non- cancer medications that are already clinically licensed are investigated for new medical applications [9]. It's similar to bringing out ancient weaponry for a fresh conflict. Searching for "off-target" effects or a recently discovered on-target impact of licensed medications to treat other ailments is part of the concept of "drug repurposing" [10]. In terms of quicker and less expensive drug development processes, this approach has advantages over the traditional approach [11]. It is outside the purview of this review to discuss the benefits and drawbacks of drug repurposing; interested readers are directed to other sources.

Advantages:

1. Faster development and approval.
2. Reduce costs and lower risk of failure.
3. New therapeutic option for resistant or rare cancers.
4. Reduction in time taking.
5. Drug repurposing can provide targeted treatment than traditional drug development.
6. Lower number of patients in trials

Disadvantages:

1. Limited Mechanistic Understanding.
2. Intellectual Property Issues.
3. Funding Limitations.
4. Lack of efficacy in clinical population.
5. Patent already field, might require negotiation.
6. Variable absorption rates

2 Drug Repurposing Strategies:

Three steps make up drug repurposing: identifying the disease's primary targets (generating hypotheses), evaluating the drug's effectiveness using in vitro and in vivo models, and moving on to phase II clinical trials when phase I trials have produced sufficient data[12].21–23 Since developing hypotheses is essential to every drug repurposing project, the initial phase is crucial.24 In the past, knowledge of the disease pathways or coincidental discoveries have been the main drivers of drug repurposing in oncology[13]. Drug repurposing may therefore be more successful if creative ways are developed to connect current medications with recently discovered uses [14]. Computational and experimental techniques can be used to identify a possible repurposed medication. While computational techniques employ target-centric, knowledge-driven, signature- aligned, pathway-focused, and mechanism-specific methodologies, the experimental approach considers tools like induced pluripotent stem cell models and function-first phenotypic screens (also known as reverse chemical biology),25,26.27, 28 These methods are more frequently used in tandem [15] [16]. Notably, compounds that reduce disease symptoms can be found through high- throughput screening with advanced models without requiring prior understanding of drug-target interactions.29, 30 The selection of therapeutic candidates appropriate for drug repurposing in cancer can be done using current computational approaches, such as combining drug effects with clinical disease markers and model systems that anticipate disease modifying effects [17]. From a long number of possible compounds, these technologies may find ligands, parse medication ingredient binding schemas, and highlight intriguing choices.27, 31, and 32 In conclusion, while the concept of drug repurposing has been around for a while, it has only been in recent years that innovative approaches that can be purposefully combined with new indications have been developed due to technology advancements like the ones discussed in this article [18]. Experimental methods cancer organoid models. Tumoroids are a particular kind of cancer organoid, whereas organoids are categorized as "stem cells containing self- organising structures [19] [20]

APPLICATION:

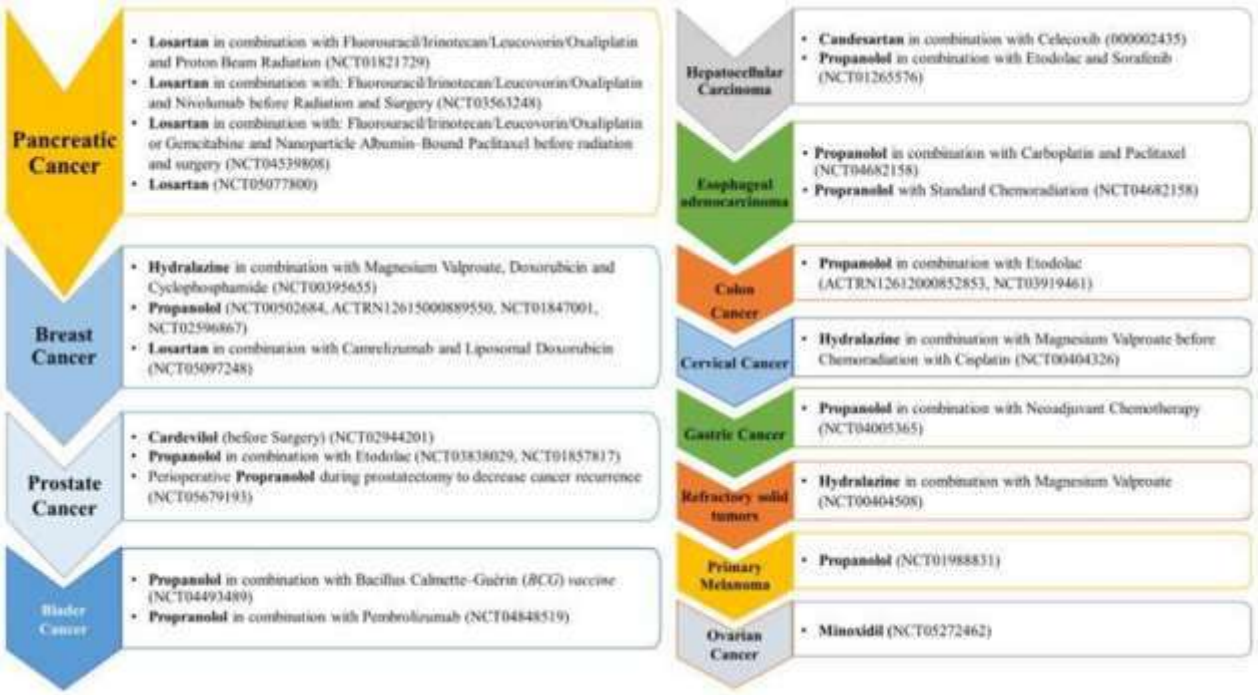

Fig.2 Applications

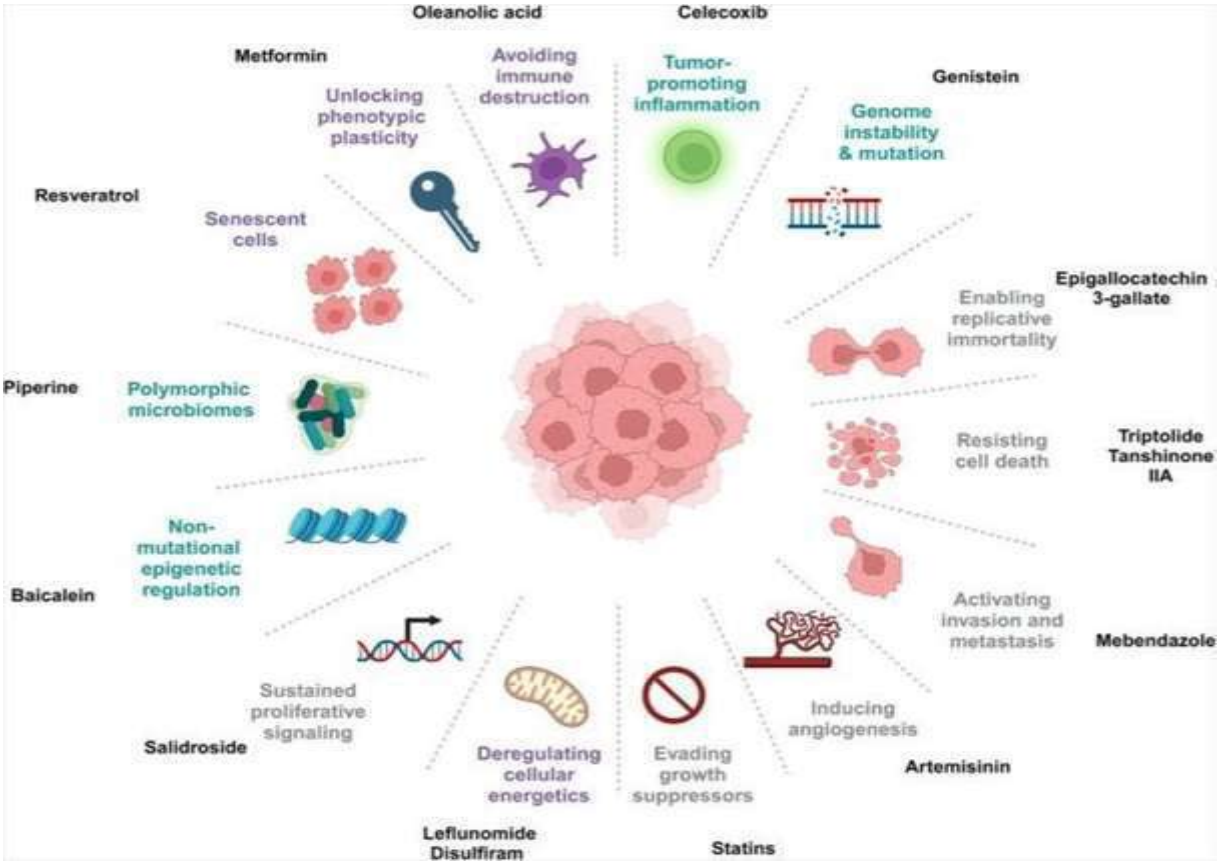

Fig.3. Examples of repurposing drugs for anticancer:

4. Methods for identifying potential drugs for repurposing:

The repurposing process is still unsystematised, especially in the therapeutic cancer field. After their molecular mechanism of action was established, serendipity led to the use of the three currently repositioned cancer medications (ATRA, arsenic trioxide, and thalidomide) as anticancer therapy [21], [22], [23]. Finding repurposing therapeutic

possibilities has also been aided by new discoveries into the molecular pathophysiology of cancer [24] [25].

5. Current cancer treatment medication candidates that are being repurposed:

Although some members of the oncological field may believe that drug repurposing for cancer treatment is an uncommon explicit developmental method [, data from PubMed indicates that the number of articles on drug repurposing has increased exponentially since 2004 [26] [27] [28]. Many non-profit and even for-profit organisations have turned to drug research and development as a result of the realisation that the existing commercial-driven model of drug research and development unsustainable [29] [30].

6.Challenges:

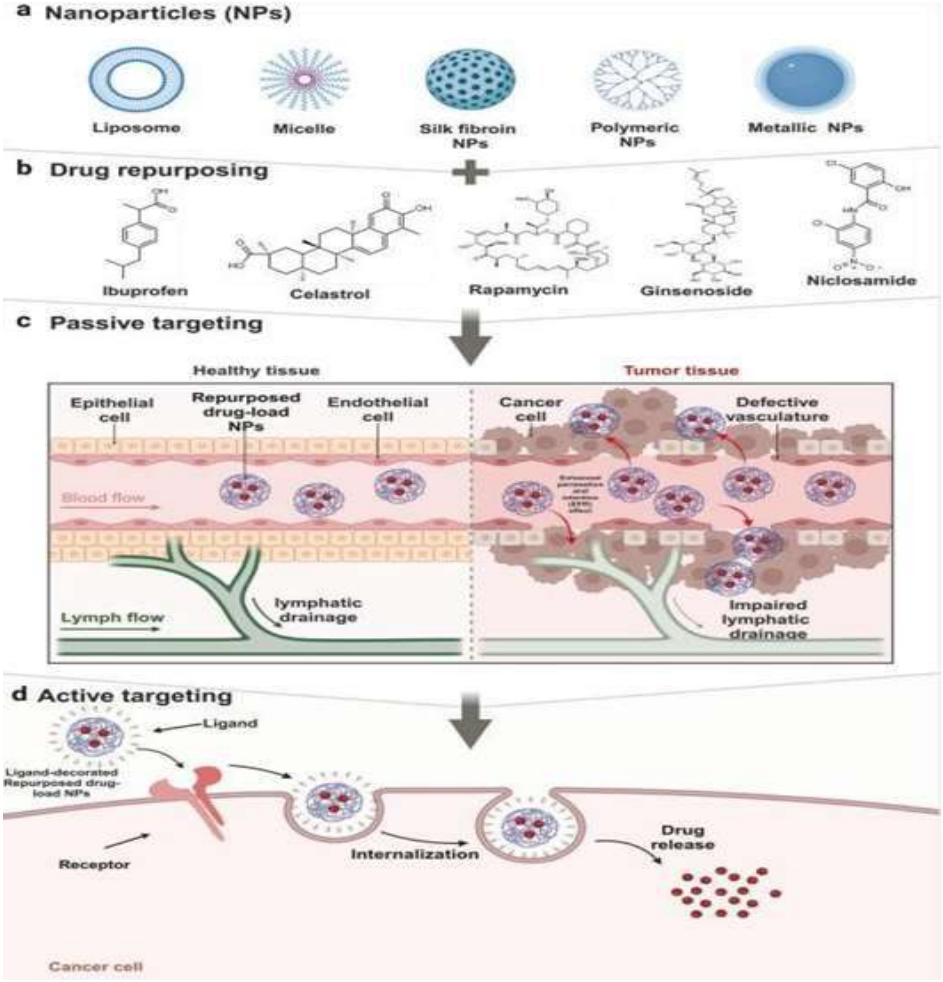

Fig.4 Challenges

7.Potential therapeutic targets for cancer hallmarks by drug repurposing:

The essential traits that propel the onset and spread of cancer are known as its hallmarks [31] [32] [33]. This idea was first put up by Hanahan and Weinberg in 2000, but it has now been broadened to include 14 other cancer markers.67, 68 developing Successful methods for cancer prevention, diagnosis, and therapy require understanding of these characteristics [34] [35].

CONCLUSION:

In this review, we presented a wide array of chemical classes of drugs with sedatives, NSAIDs, antidia betic, anticonvulsant, antihyperlipidemic, antimalarial, antifungal, antihelmintic, antiviral and a drug for osteoporosis, all of which exhibit anticancer activities. Details of reevaluated existing several drugs used for their anticancer activities are summarized in Table 2,3. Mechanisms of actions of these drugs directly impact either cell proliferation or other cell-signaling mechanisms, including taking

advantage of off-target effects that these drugs were not originally used for. These drugs inhibit proliferation of cancer cells and induce apoptosis in pre-clinical studies, for patients with advanced disease or chemotherapy resistance who lack alternative treatment options, combination therapy is a promising and valuable treatment option. Combining repurposed therapeutic drugs with approved anticancer drugs can achieve synergy and improve therapeutic effectiveness and safety. In addition, as with other drug strategies for cancer treatment, new drug delivery technologies are necessary for treating cancer cells. This article provides a summary of the most frequently employed approaches to drug repurposing for cancer management.

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