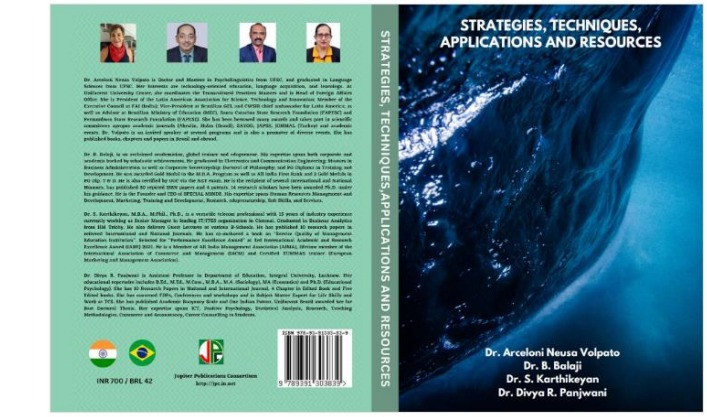

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From Nature to Drug Discovery: The Indole Scaffold as a 'Privileged Structure' for breast Cancer

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Abstract
Breast cancer is still the leading cause of cancer deaths among women worldwide. According to the Global Cancer Observatory (GLOBOCAN) reports, there were more than 19 million cancer cases worldwide for the year 2020[1]. India ranked third after China and the United States of America. According to GLOBOCAN prediction the cancer cases in India would increase to approximately more than 2 million, that is, increase of more than 57 per cent in 2040 from 2020[2]. For treatment of breast cancer new therapies and drugs are continuously being conceived and explored. Recent results from literature search have suggested the benefits of indole based compounds for the prevention of many types of cancer, including breast cancer. Among the most efficacious drugs for treatment of breast cancer are indole based therapeutics such as structurally complex antimitotic vinca alkaloids, and the synthetic receptor tyrosine kinase inhibitor sunitinib. Indole based molecules show their anti-breast cancer activity through various mechanistic pathway (**Fig. 1**). This review will ellaborate an insight into the latest developments in the field of indole based drugs against breast cancers with a special emphasis onindole containing natural products, semi-synthetic and synthetic molecules and their targets and modes of action.

1. Introduction

Indole scaffold and its Biological importance
Indole (**1**) is a privileged naturally occurring heterocyclic nucleus in which pyrrole a five membered N-heterocyclic ring which is fused with a six membered benzene ring it means it is a benzopyrrole compound (**Fig. 2**).
It is an aromatic compound gives electrophilic substitution reactions from molecular orbital approach it was established that pyrrole nucleus of indole is more reactive than benzene nucleus. From studies it was confirmed that 3-position of indole is more susceptible than 2-position. Sincethe hydrogen on nitrogen is acidic, therefore, N-substitution can also be possible under basic condition [3]. Due to its great biological importance in both the biological and pharmacological fields, a number of synthetic routes were developed among them, some notable ones are Fisher, Bischler, Hemetsberger, Nenitzescu, Bartoli indole synthesis, and others [4]
Due to its significant bioavailability and pharmacological applications, indole core is considered the most privileged scaffold in heterocyclic chemistry with a numerous biological applications such as antiviral, antimicrobial, anti-inflammatory, anti-cancer, anti-hypertensive, anti-diabetic, and antioxidant [5-7]. . Among various activities indole based molecules show significant anticancer activity. Indole based scaffolds show anticancer activity through various mechanisticpathways [8] (**Fig. 1**).

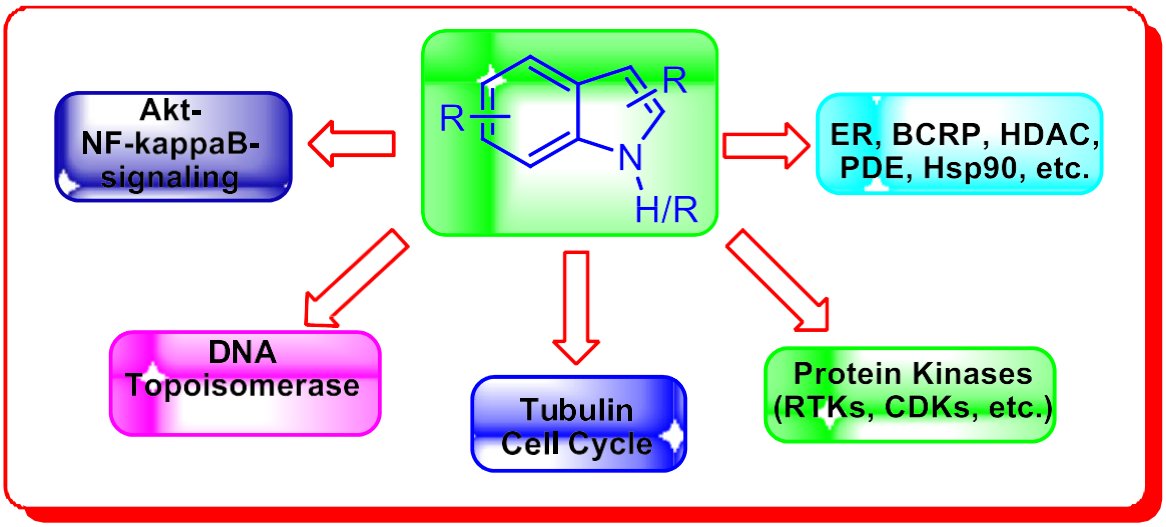

Fig. 1: Different mechanistic pathways followed by indole scaffolds for anti-breast cancer activity

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