Send Orders for Reprints to reprints@benthamscience.net

Current Drug Discovery Technologies, XXXX, *XX*, XX-XX

REVIEW ARTICLE

Potential Role of Benzoic Acid and its Synthetic Derivatives to Alleviate Cancer: An Up-to-Date Review

Arvind Kumar[1,*], Yoonus Kunju Thajuddin Koya Kamal[2], Arun K Mishra[3], Mhaveer Singh[4], Harpreet Singh[1], Niranjan Kaushik[5] and Amrita Mishra[6]

[1]Drug Design Laboratory, School of Pharmaceutical Sciences, IFTM University, Moradabad, 244002, Uttar Pradesh, India; [2]Department of Pharmacognosy, College of Pharmacy, King Khalid University, Abha 611441, Saudi Arabia; [3]Sahu Onkar Saran School of Pharmacy, IFTM University, Moradabad, 244002, Uttar Pradesh, India; [4]Central Facility of Instrumentation, Pharmacy Academy, IFTM University, Moradabad, 244002, Uttar Pradesh, India; [5]Department of Pharmacy, School of Medical and Allied Sciences, Galgotias University, Greater Noida, Gautam Budh Nagar, 201306, Uttar Pradesh, India; [6]School of Pharmaceutical Sciences, Delhi Pharmaceutical Sciences & Research University, New Delhi 110017, India.

ARTICLE HISTORY

Received: March 22, 2024
Revised: July 11, 2024
Accepted: July 23, 2024

DOI:
10.2174/0115701638311865240904054111

Abstract: Unregulated cell division is one of the main causes of cancer. These cancerous cells negatively impact nearby healthy cells. Cancer can occur anywhere in the body. Normal cell division occurs when cells grow, reproduce, and divide as the body needs. As a normal cascade of cell growth and division, when the cells get damaged, they undergo death, and normal cells develop. However, sometimes, this process is not followed, and abnormal or damaged cells start to grow and multiply several times more than normal. This particular process may form the basis of cancer. There is a research gap in terms of identifying personalized synthetic anticancer therapy, which may be based on individual patient characteristics with an aim to optimize treatment efficacy and minimize adverse effects.

While searching for new bioactive compounds, it has been observed that organic molecules with benzoic acid (BA) moiety possess significant anticancer potential. Several works of literature reported the use of BA from natural or synthetic sources to synthesize bioactive chemicals. It has been observed that several natural products also contain BA moiety, and the presence of this moiety is considered responsible for several important biological activities. Therefore, in order to chemically synthesize a wide variety of potent biologically active compounds, benzoic acid as a basic moiety in the form of a scaffold can be employed. Other synthetic compounds with BA scaffolds include furosemide, tetracaine, and bumetanide. The current article aims to focus on past and present work done on BA derivatives and to emphasize the molecular pathways involved in cancer treatment. The future prospects for research in this area are encouraging as researchers are striving to advance synthetic BA derivatives. This could possibly contribute to more efficient treatments and better results for cancer patients.

Keywords: Cancer, benzoic acid, anti-cancer activity, scaffold, cell division, cascade.

1. INTRODUCTION

Normal cells of the human body undergo a predictable pattern for cell growth, division, and programmed cell death, whereas abnormal cells do not undergo cell division in a programmed way. Cancer is known as a pathological disease that originates as lumps or masses of tissue called tumors and is characterized by an array of detrimental symptoms. Asymptomatic uncontrolled proliferation of cells is a symptom of more than 100 long-term illnesses, including cancer, that affect multiple parts of the body [1].

*Address correspondence to this author at the Drug Design Laboratory, School of Pharmaceutical Sciences, IFTM University, Moradabad, 244002, Uttar Pradesh, India; E-mail: akarvindsr01@gmail.com

Cancer has adversely affected human civilization for a long time. It is currently considered one of the major reasons for death. Out of all fatalities worldwide due to cancer, more than 70% of fatalities are recorded in developing and underdeveloped countries. There is a continuous increase in the number of fatalities arising due to cancer diagnosed or undiagnosed, in which approximately 12 million mortalities are expected by 2030 [2-4]. Although chemotherapy is one of the prominent ways to treat cancer, the usage of chemotherapeutic agents has certain shortcomings, *e.g.*, nonselectiveness towards tumor tissue, severe side effects, and the development of multiple drug resistance by cancer cells. Thus, a new chemical entity with the least adverse effect and high selectivity toward cancer cells is highly demanded for cancer treatment [5].

