Send Orders for Reprints to reprints@benthamscience.net

Recent Patents on Anti-Cancer Drug Discovery, **2020**, *15*, **1-21** **1**

MINI-REVIEW ARTICLE

Developments in the Application of 1,2,3-Triazoles in Cancer Treatment

Katerina I. Slavova[1], Lozan T. Todorov[1,*], Nataliya P. Belskaya[2], Mauricio Alcolea Palafox[3] and Irena P. Kostova[1]

[1]*Department of Chemistry, Faculty of Pharmacy, Medical University – Sofia, 2 Dunav Str., Sofia, Bulgaria;* [2]*Ural Federal University, 19 Mira Str., Yekaterinburg 620002, Russian Federation;* [3]*Departamento de Química-Física I, Facultad de Ciencias Químicas, Universidad Complutense, Madrid 28040, Spain*

ARTICLE HISTORY

Received: March 10, 2020
Revised: June 02, 2020
Accepted: June 04, 2020

DOI:
10.2174/1574892815666200717164457

Abstract: ***Background*:** The impact of cancer on modern society cannot be emphasized enough in terms of both economic and human costs. Cancer treatments are known, unfortunately, for their side effects – frequently numerous and severe. Drug resistance is another issue medical professionals have to tackle when dealing with neoplastic illnesses. Cancer rates are rising worldwide due to various factors - low-quality nutrition, air and water pollution, tobacco use, *etc*. For those and many other reasons, drug discovery in the field of oncology is a top priority in modern medical science.

***Objective*:** To present the reader with the latest in cancer drug discovery with regard to 1,2,3-triazole-containing molecules in a clear, concise way so as to make the present review a useful tool for researchers.

***Methods*:** Available information present on the role of 1,2,3-triazoles in cancer treatment was collected. Data was collected from scientific literature, as well as from patents.

***Results*:** A vast number of triazole-containing molecules with antiproliferative properties have been proposed, synthesized and tested for anticancer activity both *in vitro* and *in vivo*. The substances vary greatly when considering molecular structure, proposed mechanisms of action and affected cancer cell types.

***Conclusion*:** Triazole-containing molecules with anticancer activity are being widely synthesized and extensively tested. They vary significantly in terms of both structure and mechanism of action. The methods for their preparation and administration are well established and with proven reproducibility. These facts suggest that triazoles may play an important role in the discovery of novel antiproliferative medications with improved effectiveness and safety profile.

Keywords: Antiproliferative, cancer, cell lines, *in vitro*, *in vivo*, patents, therapy, 1,2,3-triazoles.

1. INTRODUCTION

Oncological diseases are one of the leading health problems modern societies face. According to the World Health Organization, as per WHO's own fact sheet, "Cancer is the second leading cause of death globally, and is responsible for an estimated 9.6 million deaths in 2018. Globally, about 1 in 6 deaths is due to cancer." [1] Treatment of cancer patients, palliative care, as well as other cancer-related costs, both in terms of economics, as well as in terms of social impact, put a strain on the economies of both developed and developing countries. For example, the annual economic impact of cancer in the USA for the year 2010 is estimated to be about 1,16 trillion USD [1]. Therefore, drug discovery in the field of oncology is one of the most important issues modern pharmaceutical science faces. Increasing rates of cancer illness and the generally high toxicities of contemporary medications are the reason investigators continually search for novel compounds with new mechanisms of action, safer profile and improved effectiveness. The main goal is the synthesis of molecules that specifically target tumors, have a short plasma half-life and minimal adverse effects with regard to healthy human cells.

The triazole heterocycle is an important component of a huge variety of modern medications. It is composed of five atoms – two carbon and three nitrogen atoms. The molecule exists in two isomeric forms - 1,2,3-triazoles and 1,2,4-triazoles. Both isomers and their derivatives have been investigated and are well known for their various pharmacological effects – antibacterial [2-7], antifungal [7, 8], anticancer [9-13], anti-tubercular [14-16], anti-inflammatory [17-19], analgesic [19], antiviral [20, 21], anti-nociceptive [22, 23],

* Address correspondence to these authors at the Department of Chemistry, Faculty of Pharmacy, Medical University – Sofia, 2 Dunav Str., Sofia, Bulgaria; E-mail: ltodorov@pharmfac.mu-sofia.bg

1574-8928/20 $65.00+.00

2018; 47(13): 4625-38.
http://dx.doi.org/10.1039/C8DT00449H PMID: 29520401

[154] Maisonial A, Serafin P, Traïkia M, Debiton E, Thery V, Aitken DJ, *et al.* Click chelators for platinum-based anticancer drugs. Eur J Inorg Chem 2008; 2008(2): 298-305.
http://dx.doi.org/10.1002/ejic.200700849

[155] Singh K, Gangrade A, Jana A, Mandal BB, Das N. Design, synthesis, characterization, and antiproliferative activity of organoplatinum compounds bearing a 1, 2, 3-triazole ring. ACS Omega 2019; 4(1): 835-41.
http://dx.doi.org/10.1021/acsomega.8b02849 PMID: 31459480