

Arsenic Compounds as Therapeutic Agents

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ABSTRACT: The review looks into therapeutic effect of arsenic compounds from ancient time to contemporary era. Arsenic compounds are therapeutic agents that are multifaceted. Contributions and participation of selected chemists were aligned with the history of the use of arsenic compounds as therapeutic agent.

KEYWORDS: Arsenic compounds, selected chemists, history, therapeutic agents.

1. INTRODUCTION

The therapeutic application of arsenic had been in existence over 2400 years ago [1, 2]. In 15th century, William Withering discovered digitalis, an active promoter of arsenic-based therapies [3]. His argument was, “poisons in small doses are the best medicines and the best medicines in too large doses are poisons” [4]. In 18th century, Thomas Fowler prepared an inorganic compound of arsenic called Fowlers’ solution, which bore his name [5]. Fowler’s solution is a potassium-based solution of arsenic oxide, As_2O_3 [5]. It was used to treat various diseases of asthma, bleeding gastric ulcers, cancer, chorea, chronic rheumatism, eczema, heartburn, hysteria, Hodgkin’s, leukemia, plague, pemphigus, pernicious anemia, rheumatosis, syphilis and trypanosomiasis from the 18th century to early 20th century [5-7]. In the 1880s, pharmacology texts described usage of arsenical plates for breast and skin cancers [8], while for the treatment of bleeding gastric ulcers, chronic rheumatism and heartburn required the use of arsenous acid [9]. Resurgence took place after in the medical use of arsenic due to notable therapeutic effectiveness [10]. In mid 1990s, arsenic trioxide (ATO) was found to induce total remission in elevated proportions of patients with acute promyelocytic leukemia (APL) because of the structural analogy [11, 12]. This led to increased interest in the use of arsenic for treating human ailments such as hematological malignancies and solid tumours [13]. In 1859, Pierre Antoine Be’champ synthesized the first significant organic drug, atoxyl, by the reaction of arsenic acid and aniline [1], but in 1910, nobel laureate and founder of chemotherapy, Paul Ehrlich, with supplementary experimental tests discovered salvarsan, an organic arsenical drug to treat syphilis and trypanosomiasis which led to enhancement of arsenic status as a therapeutic agent [1]. In the 1990s, various organoarsenics were used as treatment for the parasitic infection of the intestine but the drawbacks of depicted carcinogenic effects led to their withdrawal everywhere including Europe and USA [1]. However, in the 20th century, the medical application of arsenic increased [1]. In 2003, arsenic trioxide reemerged again to treat specific malignancies of hematology [1]. The other drawbacks encountered in the use of ATO are anorexia, cardiotoxicity, cough, diarrhea, dyspnea, edema, electrocardiographic abnormalities, emesis, fatigue, fever, headache, hypokalemia, hypomagnesaemia, hypoglycemia, insomnia, hyperleukocytosis, nausea and skin rash [12, 14, 15].

Phase I and II clinical trials of arsenic are in progress to assess the potentials and potencies in different types of cancer [16, 17].

2. CONCLUSION

The therapeutic record from past till present of the use of arsenic compounds; both as inorganic and organic (complexes), showed a promising future for treatment of different ailment. This can be achieved with more of the organic arsenic compounds.

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