

1,2,3-TRIAZINES: REACTIVITY AND APPLICATIONS

Triazines serve as a versatile scaffold for many biologically active compounds and feature in numerous clinically used drugs. Some members of this compound class already operated in medicine while others undergoing clinical trials.

Among all isomers of the triazine nucleus (1,2,4-triazines, and 1,3,5-triazines), 1,2,3-triazines often attract interest in medicinal chemistry due to their wide range of activities, including antitumor, antimicrobial, antiviral, anxiolytic, anti-inflammatory, antimicrobial, antihistaminic, and antiviral effects, as investigated in articles [1-5]. Derivatives of 1,2,3-triazine are more preferable because of their high efficacy and minimal side effects [6].

Among the three isomers, 1,2,3-triazines, also known as vic-triazines or v-triazines, are the least studied owing to the peculiarities of their ring system structure [7]. Over the past decade, several reviews on the chemistry and biological properties of benzene- and hetero-condensed derivatives of 1,2,3-triazines have been published. Hetero-condensed derivatives of 1,2,3-triazine are the subject of attention because of their potent biological properties. Benzene-1,2,3-triazines participate in the regulation of cytokines, inflammation, and apoptosis. The best enzymatic activity is exhibited by benzotriazinone. Benzo[d][1,2,3]triazin-4-yl-(4-methoxy-phenyl)-methyl-amine (Fig. 1) is a powerful antitumor compound.

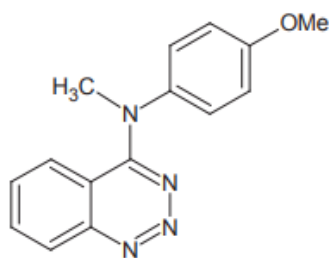


Fig. 1. Benzo[d][1,2,3]triazin-4-yl-(4-methoxy-phenyl)- methyl-amine

Hydrolysis of condensed 1,2,3-triazines (Fig. 2) leads to the cleavage of the heterocyclic ring. The products formed largely depend on the nature of the substituents at the 3- and 4-positions. Hydrolysis in alkaline conditions is caused by N-C bond cleavage, while in acidic conditions, N2-N bond cleavage occurs, with

the intermediate formation of diazo derivatives. The hydrolytic cleavage of condensed derivatives of 1,2,3-triazine is typically a straightforward process, resulting in one or several products with high yields [8].

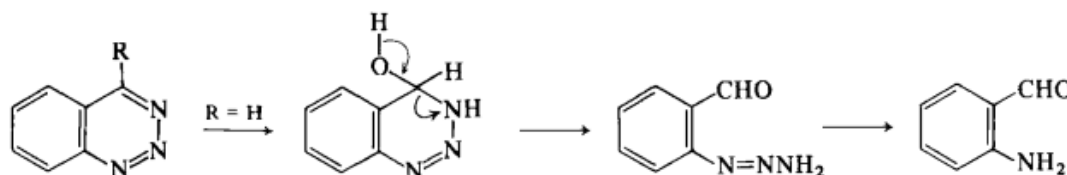


Fig. 2. Hydrolysis reaction of 1,2,3-benzotriazine

Very little is known about the reactivity of the nitrogen atoms in the ring. Oxidation of derivatives of 3-amino-1,2,3-benzotriazin-4(3H)-one has attracted significant research interest. The functional group -N=N=N- is typically unstable to reducing agents, both in 1,3-disubstituted triazenes and in condensed 1,2,3-triazines. A wide range of reducing agents is used in reduction reactions. The hydrolysis of many derivatives of 1,2,3-benzotriazine, as well as hydrolysis and reductive cleavage under certain conditions, can be best rationalized based on the heterocyclic system functioning as a "masked" diazonium compound, used as an azo dye. Reduction of some types of derivatives of 1,2,3-benzotriazine, on the other hand, yields substituted indazoles.

Existing methods for obtaining substituted 1,2,3-triazole compounds are based on constructing the cycle by attaching-alkyne cyclization of an alkyl azide with an alkyne. During alkylation with iodomethane or dimethyl sulfate in the presence of a base, simultaneous alkylation occurs at positions 1 and 2, resulting in the formation of both regioisomers of N-alkyl derivatives (2,3). Obtaining one of the regioisomers is a weak point of many synthetic methods. The mechanism of acylation and alkylation of 1,2,3-triazines involves: acylating or alkylating agent undergoes a nucleophilic attack by the nitrogen atom in the triazine ring, forming a temporary adduct, next step is acid or base catalysis, when possible further reactions [9].

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P. Tishchenko, T. Turyska, O. Osadcha

DIFFERENCE BETWEEN PHYSICAL REHABILITATION AND PHYSICAL THERAPY

Rehabilitation and physical therapy are two branches of healthcare that focus on helping people with injuries or disabilities to regain their physical functions. Even though physical rehabilitation is a bit like physical therapy, and people often mix up these terms, there are some essential differences too. Physical rehabilitation covers more types of jobs, while physical therapy is just one part of physical rehabilitation.

Physical rehabilitation often begins in the hospital after an injury or surgery and can last a long time. It does not stop there though; it may continue in places like nursing facilities, homes with therapy, outpatient clinics, and other places too.

Physical rehabilitation is a term that covers the whole process a person goes through to get back to their best physical shape. Physical therapy is a term that refers specifically to the physical therapy profession. Physical therapists (PTs) play a crucial role in the physical rehabilitation journey. They specialize in movement and work on improving a person's physical abilities through evaluation, setting goals, and using different methods such as strengthening exercises, alignment techniques, balance training, vestibular exercises, and other therapies.