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An Improved Procedure for the Synthesis of *p*-(Dichlorosulfamoyl)benzoic Acid (Halazone)

Short Communication

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Oxidation of Dichloramine-*T* with $KMnO_4$ in mild alkaline medium affords N,N-dichlorosulfamoylbenzoic acid (Halazone) in high yield with 18–20% chlorine content.

(Keywords: Halazone; Synthesis; Disinfectant action)

Eine verbesserte Vorschrift für die Synthese von p-(Dichlorsulfamoyl)benzoesäure (Halazon) (Kurze Mitteilung)

Die Oxidation von Dichloramin-*T* mit $KMnO_4$ ergab unter mild alkalischen Bedingungen N,N-Dichlorsulfamoylbenzoesäure (Halazon) in hohen Ausbeuten mit einem Chlorgehalt von 18—20%.

It has been revealed that Halazone (**2**) is similar to hypochlorite in its mode of action, perhaps due to its hydrolysis in solution to form HOCl which has strong cyst-penetrating power. Dilution of Halazone at approximately 1 : 300.000 has been satisfactory to kill *S. typhosa, E. coli,* and *Vibrio comma* in about 30 minutes[1]. The disinfectant action of Halazone, Globaline and a Lachema preparation containing 0.5 mg tablet for individual treatment of contaminated drinking water has also been studied using virus *Coxsackie B 1* as a model. The efficiency of these agents to inactivate pathogenic viruses was as follows:

$$\text{Halazone} = \text{Globaline} \gg \text{Lachema}^{2a}$$

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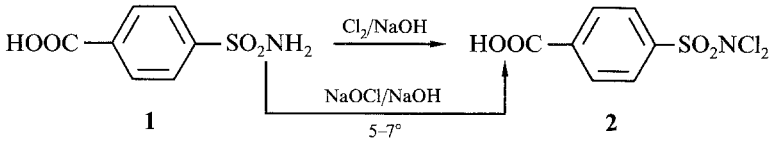
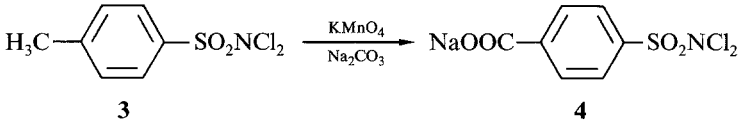
Since Halazone is slightly soluble in water, its solubility may be increased by the use of NaCl or Na_2 and in blends with one or more of these salts, it is tableted (4 mg) for drinking water disinfection[3].

Chlorination of *p*-sulfonamidbenzoic acid in alkaline media in two ways has been a major route to prepare Halazone for many years. It has been reported that when **1** is chlorinated (Cl_2) in dilute NaOH solution, it gives **2** in 93% yield, and upon treating with NaOCl at 5–7 °C in NaOH solution yields 78% of **2**[2b]. On the other hand, when one mol of **1** is treated with 2 mols of NaOCl (10% excess), on the addition of HCl or *Ac*OH, **2** is precipitated as the main product[2c]. According to these procedures, the amount of chlorine which is liberated from the target molecule **2** varies between 5.24–21.2% (theory 26.3%).



In this paper we wish to report a simple, fast and efficient synthesis of Halazone (**2**) in a different way containing more chlorine. By oxidation of easily available Dichloramine-*T* (**3**) with $KMnO_4$ in mild alkaline medium, we have been able to obtain as high as 95% Halazone containing 18–20% chlorine. In this procedure, the sodium salt of Halazone (**4**) is formed in the first step which, after hydrolysis with dilute *Ac*OH, gives a white crystalline compound with a chlorine odor, melting at 196 °C with decomposition.



Experimental

In a 250 ml flask, $KMnO_4$ (2.9 g) was placed and dissolved in water (150 ml). Dichloramine-*T* (2.5 g) and Na_2CO_3 (5 g) were mixed and added to the flask and stirred for 5 min. The reaction mixture was refluxed on a steam bath until the dark violet color disappeared (2 h). The mixture was then cooled at 25° and filtered. A dark brown precipitate was separated (MnO_2). The filtrate was yellowish with a chlorine odor which was concentrated and later neutralized with *Ac*OH (50%). While neutralizing the solution, a vigorous reaction occured and a white substance precipitated which was filtered and dried. Yield 95%, m.p. 195–196 °C. This compound was identified as N,N-dichlorosulfamoylbenzoic acid by direct comparison (ir, mass, m.m.p.) with an authentic sample. The amount of chlorine was determined on the basis of the USP procedure[4].

Acknowledgement

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