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STUDY OF THE ANTIMICROBIAL PROPERTIES OF THIETANE DERIVATIVES

Abstract. *The article provides information on the study of the bactericidal and fungicidal activity of newly synthesized thietane derivatives. These compounds are derived from the reaction of 1,2-epithio-3-chloropropane with ammonium thiocyanate. The antimicrobial activity of the compounds was tested on gram-negative and gram-positive bacteria and yeast by serial dilutions. The experiments were carried out in comparison with 96% ethyl alcohol, carbolic acid, rivanol and nitrofungin, which are used in medicine as antiseptics. Recently synthesized thietanyl derivatives have been shown to have a stronger antimicrobial effect than these drugs.*
Keywords: *sulfur substances, thietanes, thiourea, antimicrobial, bactericidal, fungicide, cal practice as antimicrobial drugs.*

Since ancient times, people have used sulfur and its natural compounds for the preparation of various ointments. Years later, with the development of science, a new class of sulfur-containing compounds was synthesized, and their various

properties were studied. Sulfur-containing compounds have been successfully used in the treatment of colds [1], various diseases of internal organs, especially neurological diseases [2]. However, the antiseptic properties of these compounds have always been superior to other properties [3].

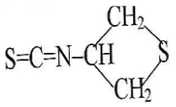
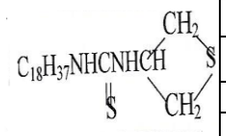
We obtained 3-thiethanyl isothiocyanate by reacting 1,2-epithio-3-chloropropane with ammonium thiocyanate in an aqueous medium. At the next stage, thioureas replacing 3-thiethanyl were obtained by the interaction of 3-thietanyl isothiocyanate with various mono- and binary amines. The reaction with aliphatic amines proceeded with the release of heat in a benzene environment for 10-15 minutes. Unlike aliphatic amines, the reaction with aromatic amines lasts 3-4 days. The resulting compounds are white crystalline substances.

The bactericidal and fungicidal activity of some thietanylthioureas has been tested by serial dilution of several strains of microorganisms. The experiments were carried out in comparison with carbolic acid, rivanol, nitrofungin and 96% ethyl alcohol, widely used antimicrobial drugs in medicine. Gram-positive ("Staphylococcus aureus"), gram-negative (“ Intestinal spores”, “Blue-pus weeds”) bacteria and yeast ("Candida" type) were used as a test culture. A meat-peptone-agar solution (pH 7.2-7.4) and Sabouraud's medium for fungi were used as a nutrient medium for bacteria. The test compounds were diluted with alcohol 1: 100, 1: 400, 1: 800, and 1: 1600.

In the experiments, a solution of microbial strains with a concentration of 500 million microbial bodies per 1 ml was used. 0.1 ml of these solutions was added to the test tubes. The exposure time for the experiments was 10, 20, 40, 60 minutes. The incubation period of bacteria and fungi was 18-24 hours at 370 C. The results of the test experiment are shown in the table (Table 1). As can be seen from the table, the synthesized thioureas have significant advantages over carbolic acid, rivanol, nitrofungin and 96% ethyl alcohol, which are currently widely used in medical practice, in terms of their bactericidal and fungicidal activity. Due to these properties, the newly synthesized thiourea compounds can be used in medical practice as antimicrobial drugs.

Table 1

Investigation of antimicrobial properties of synthesized compounds by serial dilution

Formula	Dilution rate	Name of test-cultures															
		"Staphylococcus aureus"				" Intestinal spores"				" Blue-pus weeds"				Candida fungus			
		Exposure time															
		10	20	40	60	10	20	40	60	10	20	40	60	10	20	40	60
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1:1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:8	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:4	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	1:8	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:4	-	-	-	-	+	+	+	-	+	+	+	+	+	+	+	+
	1:8	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
96% or ethyl alcohols	1:1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1:4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:8	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
1% or carbolic acid	1:1	+	+	+	+	-	-	-	-	-	-	-	-	+	+	+	+
	1:2	+	+	+	+	+	+	-	-	-	-	-	-	+	+	+	+
	1:4	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:8	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Rivanol (1:1000)	1:1	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+
	1:2	+	+	+	-	-	-	-	-	+	+	+	-	+	+	+	+
	1:4	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+
	1:8	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
	1:16	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
1% or Nitrofungin	1:1													-	-	-	-
	1:2													+	+	+	+
	1:4													+	+	+	+
	1:8 1:16													+	+	+	+

(Dilution rates of 1: 100,1: 200, 1: 400, 1: 800, 1: 1600 are simply given as 1:1, 1: 2, 1: 4, 1: 8, 1:16)

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