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Synthesis and evaluation of biological activity of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones

A. V. Lozynskyi[1], I. M. Yushyn[1], Yu. T. Konechnyi[1], O. M. Roman[1], O. V. Matiykiv[1], O. V. Smaliukh[1], L. M. Mosula[2], S. V. Polovkovych[3], R. B. Lesyk[1]

[1] Danylo Halytsky Lviv National Medical University
69, Pekarska Str., Lviv, Ukraine, 79010

[2] Ivan Horbachevsky Ternopil National Medical University
1, Maidan Voli, Ternopil, Ukraine, 46001

[3] Lviv Polytechnic National University
12, Stepan Bandera Str., Lviv, Ukraine, 79013
dr_r_lesyk@org.lviv.net, roman.lesyk@gmail.com

Aim. To accomplish the synthesis and screening of anticancer and antimicrobial activities of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones 2-10. **Methods.** The *in vitro* anticancer activity of compounds 4, 6, 8-10 has been established by DTP(Developmental Therapeutics Program) of the National Cancer Institute. The antibacterial and antifungal activities of synthesized thiazole-based derivatives were evaluated *in vitro* with the agar diffusion and broth microdilution methods to wards Gram-positive, Gram-negative bacteria and yeasts. For the synthesized compounds, the *in silico* drug-likeness screening using SwissADME online server is reported. **Results.** The novel 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones were synthesized from 1-[2-amino-4-methylthiazol-5-yl]ethanones and various aromatic aldehydes in the Claisen–Schmidt condensation. The synthesized compound 9 was moderately active against the leukemia CCRF-CEM and HL-60(TB), renal cancer UO-31 and breast cancer MCF7 cell lines. The antimicrobial screening led to identification of the active compound 10 against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans*. **Conclusions.** The results obtained herein provide a platform for structure-based optimization of these newly identified thiazole-based compounds for the anticancer and antibacterial drug design.

K e y w o r d s: thiazoles, Claisen-Schmidt condensation, anticancer activity, antimicrobial activity, SwissADME

Introduction

Nitrogen- and sulfur-containing heterocycles underlie a large number of innovative drugs and biologically active compounds. The significant pharmacological potential of the mentioned compounds is related to their high affinity for biotargets and the structural similarity of various metabolites [1]. In the context of searching for potential drug-like molecules, a prominent interest among heterocyclic systems is attracted to the thiazole derivatives, which constitute a large number of antibiotics, sulfonamides, NSAIDs, antiulcer drugs and vitamins [2–4]. Additionally, several lead compounds with insecticidal [5], antitumor [6], anti-inflammatory [7], antioxidant [8], antimicrobial [9], analgesic [10] properties have been identified among the thiazole derivatives, which undergo various stages of clinical and preclinical studies. Besides, substituted thiazole derivatives are well known as COX-2 [11, 12], serine protease urokinase (uPa) inhibitors [13], adenosine A1 receptor [14] and metabotropic glutamate receptor 5 (mGluR5) antagonists [15]. Noteworthy, the thiazole cycle's uniqueness in the construction of new drug-like molecules is based on the wide possibility of their functionalization providing different classes of condensed and non-condensed thiazoles [16–20]. Moreover, the structural modification of this heterocycle allows obtaining compounds with a new pharmacological profile, increased activity or reduced toxicity.

Among the thiazole derivatives, a significant interest is attracted to aminothiazoles as active binucleophiles, which are important reagents in modern heterocyclic chemistry, allowing the reaction with electrophiles to obtain different classes of heterocyclic com-

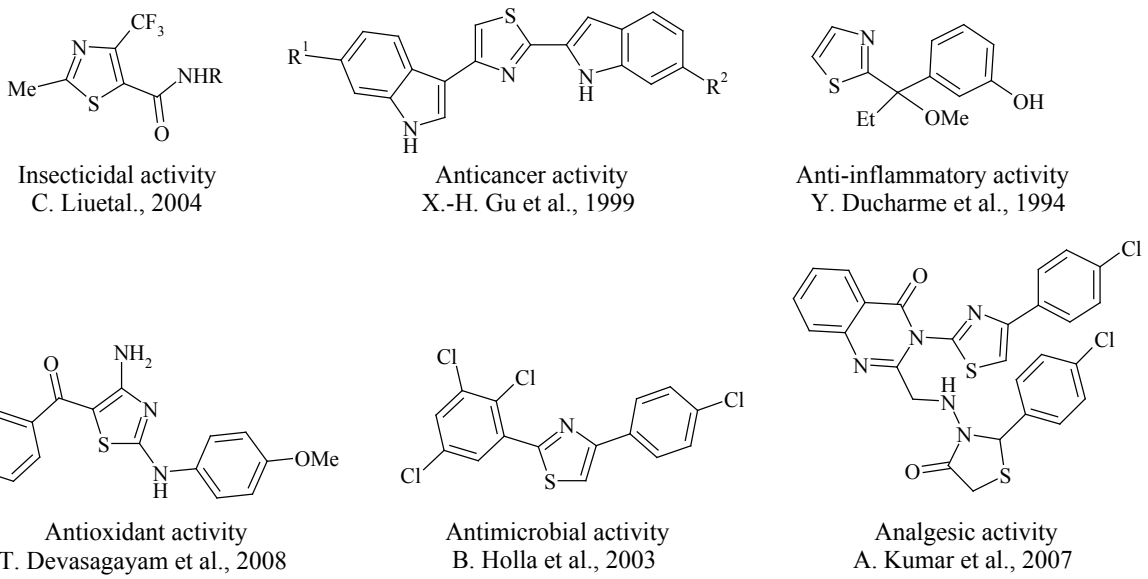

Fig. 1. Structures of thiazoles with biological activity.

pounds [21,22]. The most investigated area of aminothiazole chemistry is the condensation reactions (Claisen–Schmidt condensation, Mannich reaction *etc.*) and various reactions involving heterocyclic ring formations with α,β-unsaturated ketones or α-ketoacids yielding fused azoloazines [23,24]. Thus, the purpose of our work was the design and synthesis of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones, and evaluation of their anticancer and antimicrobial activities.

Materials and Methods

Chemistry

All materials were purchased from Sigma-Aldrich and used without purification. Melting points were measured in open capillary tubes and were uncorrected. The elemental analyses were performed using the Thermo Scientific FlashSmart Elemental Analyzer. The ^{1}H NMR spectra were recorded on Varian Gemini (^{1}H NMR at 400 MHz) instrument in DMSO-d_6. Chemical shifts (δ) are given in ppm units relative to tetramethylsilane as reference (0.00). LC-MS spectra were obtained on a Finnigan MAT INCOS-50. The purity of all obtained compounds was checked by TLC on Silufol-254 plates (Eluent Benzene: EtOAc 1:1). 2-The starting 2-amino-4-methyl-5-acetylthiazole **1** was prepared according to a reported method [25].

*General procedure for synthesis of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones **2–10**.*

A mixture of 2-amino-4-methyl-5-acetylthiazole (10 mmol), appropriate substituted benzaldehyde (20 mmol), and potassium tert-butylate (10 mmol) in ethanol (10 mL) was heated under reflux for 3-5 h, then left overnight at room temperature. The solid product was collected by filtration and recrystallized from acetic acid.

1-(2-Amino-4-methylthiazol-5-yl)-3-p-tolylpropenone (2). Yield 72 %, mp 264-266 ºC. ^{1}H NMR: δ 2.33 (s, 3H, CH_3), 2.65 (s, 3H, CH_3), 7.23 (d, 2H, J = 7.4 Hz, arom.), 7.50 (d, 1H, J = 15.6 Hz, =CH), 7.61 (d, 2H, J = 7.4 Hz, arom.), 7.90 (d, 1H, J = 15.6 Hz, =CH), 9.12 (s, 2H, NH_2). Anal.Calcd for $C_{14}H_{14}N_2OS$: C, 65.09; H, 5.46; N, 10.84. Found: C, 65.11; H, 5.45; N, 10.83. ESI-MS *m/z* 259 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(4-methoxyphenyl)-propenone (3). Yield 88 %, mp 288-290 ºC. ^{1}H NMR: δ 2.10 (s, 3H, CH_3), 3.80 (s, 3H, OCH_3), 6.98 (d, 2H, J = 8.5 Hz, arom.), 7.11 (d, 1H, J = 15.1 Hz, =CH), 7.50 (d, 1H, J = 15.1 Hz, =CH), 7.68 (d, 2H, J = 8.5 Hz, arom.), 7.90 (s, 2H, NH_2). Anal.Calcd for $C_{14}H_{14}N_2O_2S$: C, 61.29; H, 5.14; N, 10.21. Found: C, 61.30; H, 5.12; N, 10.22. ESI-MS *m/z* 275 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(4-fluorophenyl)-propenone (4). Yield 84 %, mp 277-279 ºC. ^{1}H NMR: δ 2.65 (s, 3H, CH_3), 6.93 (d, 2H, J = 8.4 Hz, arom.), 7.21 (d, 1H, J = 16.1 Hz, =CH), 7.52 (d, 1H, J = 15.1 Hz, =CH), 7.69 (d, 2H, J = 8.4 Hz, arom.), 7.93 (s, 2H, NH_2). Anal.Calcd for $C_{13}H_{11}N_2OS$: C, 59.33; H, 4.23; N, 10.68. Found: C, 59.32; H, 4.22; N, 10.7. ESI-MS *m/z* 244 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(3,4-dimethoxyphenyl)-propenone (5). Yield 75 %, mp 255-257 ºC. ^{1}H NMR: δ 2.60 (s, 3H, CH_3), 3.71 (s, 3H, OCH_3), 3.92 (s, 3H, OCH_3), 7.13

(d, 1H, *J* = 16.1 Hz, =CH), 7.44 (d, 1H, *J* = 16.1 Hz, =CH), 7.60 (s, 1H, arom.), 7.88 (m, 2H, arom.), 7.90 (s, 2H, NH_2). Anal.Calcd for $C_{15}H_{16}N_2O_3S$: C, 59.15; H, 5.30; N, 9.20. Found: C, 59.16; H, 5.31; N, 9.19. ESI-MS *m/z* 305 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3(2-ethoxyphenyl)-propenone (6). Yield 89 %, mp 225-227 ºC. ^{1}H NMR: δ 1.28 (t, 3H, *J* = 7.1 Hz, CH_3CH_2), 2.52 (s, 3H, CH_3), 4.23 (q, 2H, *J* = 7.1 Hz, CH_3CH_2), 7.28-7.40 (м, 2H, arom.), 7.48-7.56 (m, 2H, arom, =CH), 7.69 (d, 1H, *J* = 15.6 Hz, =CHCO), 7.96 (t, 1H, *J* = 7.4 Hz, arom.), 8.96 (s, 2H, NH_2). Anal.Calcd for $C_{15}H_{16}N_2O_2S$: C, 62.48; H, 5.59; N, 9.71. Found: C, 62.47; H, 5.57; N, 9.72. ESI-MS *m/z* 289 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(3-hydroxy-4-methoxyphenyl)-propenone (7). Yield 77 %, mp 232-234 ºC. ^{1}H NMR: δ 1.90 (s, 3H, CH_3), 3.80 (s, 3H, OCH_3), 5.88 (s, 1H, OH), 6.99 (m, 2H, *J* = 8.1 Hz, arom.), 7.22 (d, 1H, *J* = 15.1 Hz, =CH), 7.54 (d, 1H, *J* = 15.1 Hz, =CH), 7.68 (s, 1H, arom.), 7.90 (s, 2H, NH_2). Anal.Calcd for $C_{14}H_{14}N_2O_3S$: C, 57.92; H, 4.86; N, 9.65. Found: C, 57.91; H, 4.87; N, 9.64. ESI-MS *m/z* 291 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(2,3-dimethoxyphenyl)-propenone (8). Yield 75 %, mp 246-248 ºC. ^{1}H NMR: δ 2.40 (s, 3H, CH_3), 3.80 (s, 3H, OCH_3), 3.83 (s, 3H, OCH_3), 6.94-7.30 (m, 3H, Hz, arom., =CH), 7.67-7.91 (m, 2H, arom., =CH), 8.90 (s, 2H, NH_2). Anal. Calcd for $C_{15}H_{16}N_2O_3S$: C, 59.19; H, 5.30; N, 9.20. Found: C, 59.20; H, 5.32; N, 9.18. ESI-MS *m/z* 305 $(M+H)^+$.

3-(3-Allyloxyphenyl)-1-(2-amino-4-methylthiazol-5-yl)-propenone (9). Yield 55 %, mp 222-224 ºC. ^{1}H NMR: δ 2.65 (s, 3H, CH_3), 4.63 (br.s, 2H, OCH_2), 5.29 (m, 1H, $=CH_2$), 5.42 (m, 1H, $=CH_2$), 6.07 (m, 1H, CH_2=CH), 7.00 (d, 1H, *J* = 8.2 Hz, arom.), 7.23-7.36 (m, 3H, =CH, arom.), 8.88 (d, 1H, *J* = 15.3 Hz, =CH), 7.90 (s, 1H, arom.), 9.02 (s, 2H, NH_2). Anal.Calcd for $C_{16}H_{16}N_2O_2S$: C, 63.98; H, 5.37; N, 9.33. Found: C, 63.99; H, 5.35; N, 9.34. ESI-MS *m/z* 301 $(M+H)^+$.

1-(2-Amino-4-methylthiazol-5-yl)-3-(4-hydroxy-3,5-dimethoxyphenyl)-propenone (10). Yield 58 %, mp 212-214 ºC. ^{1}H NMR: δ 2.65 (s, 3H, CH_3), 3.77 (s, 3H, OCH_3), 3.82 (s, 3H, OCH_3), 7.27 (d, 1H, *J* = 15.1 Hz, =CH), 7.64 (d, 1H, *J* = 15.1 Hz, =CH), 7.88 (s, 1H, arom.), 7.91 (s, 1H, arom.), 9.02 (s, 2H, NH_2). Anal.Calcd for $C_{15}H_{16}N_2O_4S$: C, 56.24; H, 5.03; N, 8.74. Found: C, 56.25; H, 5.02; N, 8.75. ESI-MS *m/z* 321 $(M+H)^+$.

Cytotoxic activity against malignant human tumor cells

Anticancer *in vitro* assay was performed on the human tumor cell lines panel derived from nine neoplastic diseases, following the Drug Evaluation Branch protocol, National Cancer Institute, Bethesda, MD, USA [26-28]. Tested compounds were added to the culture at a single concentration (10^{-5} M), and the cultures were incubated for 48 h. Endpoint determinations were made with a protein binding dye, Kiton Red 620. Results for each tested compound were reported as the GP% of the treated cells compared with the untreated control cells. GP% was evaluated spectrophotometrically vs controls not treated with test agents.

Antimicrobial activity

The 16 reference and clinical strains of microorganisms were used as test objects, including the methicillin-sensitive strain of *S.aureus* (MSSA), strain "Iv", the methicillin-resistant strain of *S.aureus* (MRSA), strain ICA-5, (isolated from a patient with retroperitoneal abscess), clinical strain "Fedk" of *E. coli* (from a patient with cystitis) and *Bacillus subtilis* (wild isolate), as well as with a strain of the yeast *Candida albicans* ST-1 (from patients with protein stomatitis). Isolates were identified using biochemical microtests "STAPHYtest 16", "ENTEROtest 24" (Lachema, Czech Republic), as well as taking into account the complexes of morphological and cultural properties by the recommendations of the 9th edition of "Bergi bacteria Determinant." The *C. albicans* culture was identified based on 40 biochemical tests using VITEK 2 systems with the VITEK 2 YST identification card (biomerieux, France). Few strains were multidrug resistant (MDR) to antibiotics.

The antimicrobial activity of the synthesized compounds was studied by the agar diffusion method. Test culture suspensions standardized according to the optical turbidity standard ($1*10^7$ CFU/ml) were evenly inoculated on the nutrient agar surface in Petri dishes. The agar wells with a diameter of 4.0 ± 0.1 mm were made, and 20 µl of the tested compound (concentration of 1000 µg/ml) were added. The solvent was a solution of alcohol/DMSO/water 2:1:1. After cultivation for 24–48 hours, the diameter of the growth inhibition zone was measured. A pure solvent was added to the control wells. Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were determined using serial dilution technique [29,30].

Results and Discussion

Chemistry

The starting thiourea has been used as S,N-binucleophile with 2-chloroacetylacetone as the equivalent of dielectrophilic synton $[C2]^{2+}$ in the [2+3]-cyclocondensation reaction providing 2-amino-4-methyl-5-acetylthiazole with good yield. The reaction was performed in glacial acetic acid and anhydrous sodium acetate as catalyst according to the method described previously [25].

In order to obtain potentially biologically active thiazole-based compounds, we accomplished the synthesis of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones **2-10** under Claisen-Schmidt reaction (crossed-aldol condensation) in absolute ethanol medium and the presence of a base as a catalyst. As the starting material for the synthesis of target compounds we used 1-(2-amino-4-methylthiazol-5-yl)-

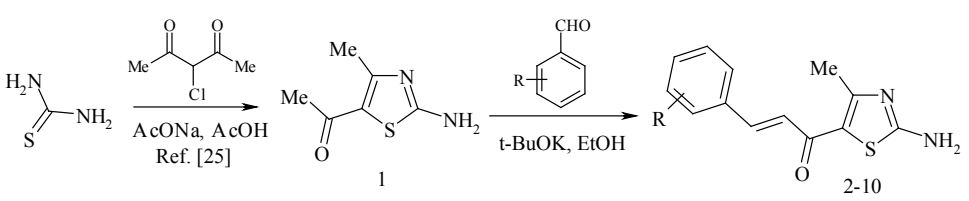

Fig. 2. Synthesis of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones **2-10**.

ethanone **1** as an effective reagent in reactions with aromatic aldehydes. It was found that the use of potassium *tert*-butylate as a catalyst in the ethanol medium provides better yields and purity of the obtained products in comparison with an ethanolic solution of potassium hydroxide.

The structure and purity of the obtained aminothiazole derivatives **2-10** were confirmed by ^{1}H NMR and LC-MS spectral data. The obtained 2-amino-4-methyl-5-acetylthiazole is characterized by the signal of the methyl group in position C-4 of the thiazole ring as a three-proton singlet at 2.23-2.66 ppm. The enone fragment of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones is manifested as two doublets at 7.50-7.70 ppm with spin-spin coupling constants of 15.0-15.6 Hz, which indicates *trans*-configuration of these protons.

In vitro evaluation of the anticancer activity

The synthesized compounds contain the enone fragment in the structure, which makes them potentially Michael acceptors, the object of intensive study in modern medicinal chemistry [31]. Moreover, Michael acceptors are now considered a "new old tool" for creating new drug-like molecules, especially anticancer agents (Michael acceptors are one of the most effective activators of Nrf2, effective covalent inhibitors of several cancer biotargets [32]), and became the reason for the synthesis of target 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones. However, in some reports, it was found that the conjugation of a double bond with the carbonyl group in mentioned compounds gives the properties of "promiscuous inhibitors" and causes probable lack of selectivity in the interaction with potential biotargets [33].

The synthesized 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones **4, 6, 8-10** were submitted and evaluated at a 10^{-5} M single concentration towards a panel of approximately sixty cancer cell lines. The human tumor cell lines were derived from nine different cancer types: leukemia, melanoma, lung, colon, CNS, ovarian, renal, prostate, and breast cancers. Primary anticancer assays were performed according to the US NCI protocol

Table 1. **Anticancer screening data in concentration 10^{-5} M.**

Compound	Mean growth, %	Range of growth, %	Most sensitive cell line growth, % (*cancer line*/type)
4	89.31	54.94 to 115.93	63.70 (CCRF-CEM/ Leukemia) 72.61 (MOLT-4/Leukemia) 67.06 (RPMI-8226/ Leukemia) 71.38 (A549/ATCC/NSCLC) 58.78 (HOP-92/NSCLC) 54.94 (PC-3/Prostate Cancer)
6	98.76	73.23 to 148.67	73.75 (RPMI-8226/ Leukemia) 73.23 (HCT-15/Colon Cancer)
8	100.84	71.29 to 121.70	71.29 (CCRF-CEM/ Leukemia)
9	97.55	48.19 to 146.13	48.19 (CCRF-CEM/ Leukemia) 66.58 (HL-60(TB)/ Leukemia) 66.97 (UO-31/Renal Cancer) 74.99 (MCF7/Breast Cancer)
10	99.16	63.29 to 121.36	63.29 (CCRF-CEM/ Leukemia) 58.81 (HOP-92/ NSCLC) 71.77 (PC-3/ Prostate Cancer)

described elsewhere [26-28]. The preliminary screening results are reported as the percent cell line growth (GP%) and presented in Table 1. The range of growth % shows the lowest and the highest growth % found among different cancer cell lines.

The preliminary screening results of synthesized compounds did not show any significant activity in almost all cancer cell lines with an average cell growth 48.19-148.67 %. However, *in vitro* cytostatic effect was observed for compound **9** with the range of growth 48.19 to 146.13 %. Thus, compound **9** demonstrated moderate cytotoxic effect on leukemia CCRF-CEM and HL-60(TB) (GP = 48.19 and 66.58 %, respectively), renal cancer UO-31 (GP = 66.97 %), and breast cancer MCF7 (GP = 74.99 %).

Antimicrobial activity

Compounds **7** and **10** were selected for screening the antimicrobial activity. The research objects were chosen to specify the effect of molecular fragments of target compounds on the pharmacological effect. Moreover, an essential aspect of the study was the experimental establishment of the dependence of the antimicrobial activity of the synthesized compounds on the structural environment of the thiazole moiety. In particular, the nature of the aryl substituent of the thiazole nucleus, the establishment of the role of the «Michael acceptors» properties in the realization of a particular pharmacological effect.

Thus, according to the screening results, compounds **7** and **10** showed the moderate antimicrobial activity of different levels with

Table 2. **Antimicrobial activity of compounds 7 and 10 (diameters of growth inhibition zones, mm±SD)**

	Microorganism (strain number)																
	Gram-positive cocci						Gram-negative bacteria (Enterobacteria)			Gram-negative bacteria (non-fermenting rods)						Fungi	
Compound	*S.aureus* (ATCC 25923 (F-49))	*S.aureus**(6)	MRSA* (5)	*S.aureus** (2)	*S.aureus** (20/1)	*S. saprophyticus*	*E. coli* (ATCC 25922)	*E. coli**	*Klebsiella pneumoniae** (1/6)	Acinetobacter	*Pseudomonas aeruginosae* (ATCC 27853 (F-51))	*Pseudomonas aeruginosa** (23/26)	*Pseudomonas aeruginosa** (8/2)	*Pseudomonas aeruginosa**(5)	*Pseudomonas aeruginosa**(23/28)	*Candida albicans* (ATCC 885-653)	*Candida albicans**
7	00	14 ±0.4	00	00	00	00	00	00	00	00	00	00	14 ±0.4	12 ±0.5	11 ±0.3	18 ±0.4	16 ±0.4
10	00	12 ±0.3	12 ±0.5	16 ±0.5	00	10 ±0.4	00	00	00	11 ±0.6	00	00	14 ±0.5	00	12 ±0.3	22 ±0.5	20 ±0.5
Control well (solvent)	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Note: *MDR strain

the growth inhibition rates in the range of 10.0-20.0 mm. Thus, compound **10** showed a pronounced effect on the pathogens of *S.aureus* (diameter of growth inhibition zones 16 mm), *P.aeruginosa* (diameter of growth inhibition zones 14 mm), and fungi of the genus *Candida* (diameter of growth inhibition zones 20 mm). Detailed results of antimicrobial activity are presented in tables 2 and 3.

Table 3. **Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of synthesized compounds**

№	Microorganism	μg / ml			
		MIC		MBC	
		7	**10**	**7**	**10**
1	*S.aureus** (4)	-	250	-	500
2	*Klebsiella pneumoniae** (1/6)	250	-	500	-
3	*Pseudomonas aeruginosa** (23/26)	-	125	-	250

Note: *MDR strain

ADME prediction

ADME prediction of all the synthesized molecules was determined using the SwisAdme online server of the Swiss Institute of Bioinformatics [34]. All the molecules showed acceptable physicochemical parameters with low Lipinski violation of potential drug candidates (Table 4).

Conclusion

New thiazole-based derivatives **2-10** have been synthesized with high yields via Claisen-Schmidt reaction using 1-(2-amino-4-methylthiazol-5-yl)-ethanone and aromatic aldehydes as starting compounds. The synthesized compound **9** displayed moderate antitumor activity against the leukemia, renal, and breast cancers cell lines. The preliminary results on antimicrobial activity allowed us to identify the active compound **10**, which has shown the best activity against *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Candida albicans*. The drug-likeness of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones was calcu-

Table 4. **Drug-likeness parameters of 1-[2-amino-4-methylthiazol-5-yl]-3-arylpropenones (2-10) according to Lipinski rules.**

Compound	Molecular weight	Num. rotatable bonds	Num. H-bond acceptors	Num. H-bond donors	LogP	Bioavai-lability Score
2	258.34	3	2	1	3.11	0.55
3	274.34	4	3	1	2.68	0.55
4	262.30	3	3	1	3.00	0.55
5	304.36	5	4	1	2.60	0.55
6	288.36	5	3	1	3.00	0.55
7	290.34	4	4	1	2.32	0.55
8	304.36	5	4	1	2.66	0.55
9	300.38	6	3	1	3.23	0.55
10	320.36	5	5	2	2.26	0.55

lated through SwissADME online server. The synthesized derivatives fulfilled all the conditions specified by Lipinski without any violation and could be considered as the lead compounds for the anticancer and antibacterial drug design.

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Синтез та оцінка біологічної активності 1-[2-аміно-4-метилтіазол-5-іл]-3-арилпропенонів

А. В. Лозинський, І. М. Юшин, Ю. Т. Конечний, О. М. Роман, О. В. Матійків, О. В. Смалюх, Л. М. Мосула, С. В. Половкович, Р. Б. Лесик

Мета. Здійснити синтез і провести скринінг протимікробної і протипухлинної активності похідних 3-ариліден-1-(2-аміно-4-метилтіазол-5-іл)-етанону. **Методи.** Протиракова активність *in vitro* для сполук 4, 6, 8-10 була оцінена в межах програми DTP Національного інституту раку. Вивчення антибактеріальної та протигрибкової активності похідних на основі тіазолу проведено *in vitro* методом дифузії в агар і мікрометодом серійних розведень щодо грампозитивних, грамнегативних бактерій і дріжджів. Для синтезованих сполук проведений *in silico* скринінг лікоподібності з використанням онлайн-серверу SwissADME. **Результати.** Нові 1-[2-аміно-4-метілтіазол-5-іл]-3-арілпропенони були синтезовані виходячи з 1-[2-аміно-4-метілтіазол-5-іл]-етанону і ряду ароматичних альдегідів в умовах конденсації Кляйзена-Шмідта. Синтезована сполука 9 проявила помірну активність щодо ліній клітин лейкемії CCRF-CEM, HL-60 (ТВ), раку нирок лінії UO-31 і раку молочної залози лінії MCF7. Скринінг антимікробної активності дозволив ідентифікувати сполуку 10 з активністю відносно *Staphylococcus aureus*, *Pseudomonas aeruginosa* і *Candida albicans*. **Висновки.** Отримані в процесі досліджень результати можуть стати платформою для подальшої структурної оптимізації ідентифікованих сполук на основі тіазолу у розробці сучасних протипухлинних та антибактеріальних лікарських засобів.

Ключові слова: тіазоли, конденсація Кляйзена-Шмідта, протиракова активність, антимікробна активність, SwissADME

Синтез и оценка биологической активности 1-[2-амино-4-метилтиазол-5-ил]-3-арилпропенонов

А. В. Лозинский, И. М. Юшын, Ю. Т. Конечный, А. М. Роман, О. В. Матийкив, О. В. Смалюх, Л. М. Мосула, С. В. Половкович, Р. Б. Лесык

Цель. Осуществить синтез и провести скрининг противомикробной и противоопухолевой активности производных 3-арилиден-1-(2-амино-4-метилтиазол-5-ил)-етанона. **Методы.** Противораковая активность *in vitro* соединений 4, 6, 8-10 была оценена в рамках программы DTP Национального института рака. Изучение антибактериальной и противогрибковой активности синтезированных производных на основе тиазола проведено *in vitro* методом диффузии в агар и микрометодом серийных разведений относительно грамположительных, грамотрицательных бактерий и дрожжей. Для синтезированных соединений произведен *in silico* скрининг сходства с лекарственными средствами с использованием онлайн-сервера SwissADME. **Результаты.** Новые 1-[2-амино-4-метилтиазол-5-ил]-3-арилпропеноны были синтезированы исходя из 1-[2-амино-4-метилтиазол-5-ил]-этанонов и различных ароматических альдегидов в условиях конденсации Кляйзена-Шмидта. Синтезированное соединение 9 было умеренно активным в отношении клеточных линий лейкемии CCRF-CEM и HL-60 (ТВ), рака почки линии UO-31 и рака груди линии MCF7. Скрининг антимикробной активности позволил идентифицировать соединение 10 с активностью в отношении *Staphylococcus aureus*, *Pseudomonas aeruginosa* и *Candida albicans*. **Выводы.** Полученные в процессе исследований результаты могут стать платформой для дальнейшей структурной оптимизации идентифицированных соединений на основе тиазола в разработке современных противоопухолевых и антибактериальных лекарственных средств.

Ключевые слова: тиазолы, конденсация Кляйзена-Шмидта, противоопухолевая активность, противовоспалительная активность, SwissADME

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