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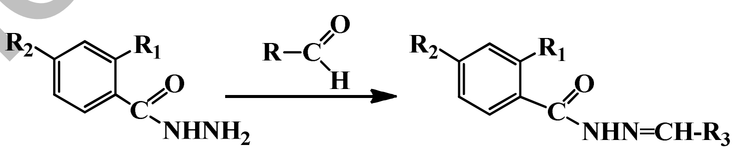
Synthesis, structure and computer bioprognosis new hydrazons based on hydrosides *o*- and *p*-hydroxybenzoic acids

Interaction of hydrazides of *o*- and *p*-hydroxybenzoic acids with substituted aromatic aldehydes yielded the corresponding hydrazone derivatives. Using the computer program PASS, a bioproject of N-arylidene hydrazones was carried out and it was shown that their expected activity combines both the physiological activity of the initial hydrazides of *o*- and *p*-hydroxybenzoic acids and the constituent components of the structural molecule. The structures of the synthesized compounds were studied by ^{1}H NMR and ^{13}C NMR spectroscopy, as well as with the data of the two-dimensional spectra COSY (^{1}H-^{1}H) and HMQC (^{1}H-^{13}C). The values of chemical shifts, multiplicity and integrated intensity of the ^{1}H and ^{13}C signals in one-dimensional NMR spectra are determined. Homogeneous and heteronuclear interactions are established using spectra in the formats COSY (^{1}H-^{1}H) and HMQC (^{1}H-^{13}C), confirming the structure of the compounds under study. X-ray diffraction study of N-(5-bromo-2-hydroxybenzylidene)-4-hydroxybenzohydrazide, whose molecule is bound by a hydrogen bond to an ethanol solvate molecule.

Keywords: *o*- and *p*-hydroxybenzoic acid hydrazide, hydrazone, aromatic aldehydes, NMR spectroscopy.

Advances in the chemistry of hydrazides of carboxylic acids in recent decades are largely due to the widespread use of these compounds as antituberculous drugs in medicine. It should be noted that considerable progress has been made in the chemistry of hydrazides, which led to the creation of such antituberculosis drugs as phtivazide, saluside, and metazide [1, 2]. In recent years, interest in hydrazones has increased again [3, 4], which is associated with a wide range of their biological properties. Hydrazones are used in medical practice and agriculture [5]. It was interesting to obtain on the basis of hydrazides *o*- and *p*-hydroxybenzoic acids carbohydrazones containing pharmacophore groupings. The structure of hydrazides of *o*- and *p*-hydroxybenzoic acids has a great synthetic and biological potential, which makes it possible to develop methods for the synthesis of new biologically active substances [6, 7]. Earlier, we synthesized various derivatives [8] based on *o*- and *p*-hydroxybenzoic acid hydrazides, which showed pronounced antimicrobial activity against Gram-positive strains (*Staphylococcus aureus, Bacillus subtilis*).

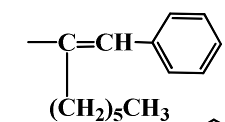
In the present work we synthesized hydrazones **3–20**, the condensation of hydrazides of *o*- and *p*-hydroxybenzoic acids **1, 2** with various aromatic aldehydes by heating equimolar amounts of aldehyde and hydrazides in an ethyl alcohol medium at 60–70 ºC and stirring for several hours.



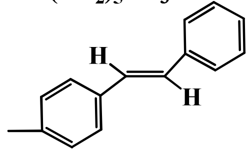
1, 2 **3-20**

R_1 = OH; R_2 = H (1; 3-11); **R_1 = H; R_2 = OH (2; 12-20)**

R_3 = *4*-FC_6H_4 (1, 3; 2, 12);
***2*-HO-*5*-BrC_6H_3 (1, 4; 2, 13);**
***4*-CH_3O-C_6H_4 (1, 5; 2, 14);**
***2*-HO-C_6H_4(1, 6; 2, 15);**
***4*-HO-C_6H_4 (1, 7; 2, 16);**
C_5H_5N (1, 8; 2, 17);
***4*-HO-*5*-C_2H_5O-C_6H_3 (1, 9; 2, 18);**



(1, 10; 2, 19);

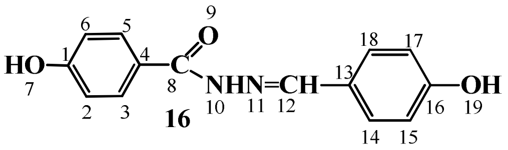


(1, 11; 2, 20);

The reaction products **3–20** are highly crystallizable white substances, soluble in many organic solvents; the yield of compounds is 70–90 %.

In the IR spectra of N-arylidenehydrazones of *o*- and *p*-hydroxybenzoic acids, **3–20** absorption bands of stretching vibrations of the N–H group appear in the region of 3285–3355 cm^{-1}, and C=O of the hydrazone group at 1675–1690 cm$^{–1}$. The group of characteristic bands 1600–1440 cm^{-1} refers to stretching vibrations of the aromatic ring.

In the strong-field NMR part of the ^{1}H-spectrum of compound **16**, signals of residual protons of solvent and water are observed. The protons of methine groups of aromatic systems resonate in a weaker field: δ(H-2, H-6, H-15, H-17) = 6.80 ppm, 4 H; δ(H-14,18) = 7.49 ppm, 2H; δ(H-3,5) = 7.75 ppm, 2H. Signal with a chemical shift of 8.28 ppm. And the integral intensity 1H belongs to the proton H-12. The highest-frequency signals (9.95 and 11.40 ppm) can be attributed to the protons of one amino and two hydroxo groups, respectively.



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NMR ^{13}C spectrum of compound **16** carbon atoms of CH-groups of two benzene nuclei give signals in the weak-field region: δ(C-2,6) = 115.49 ppm; δ(C-15,17) = 116.21 ppm; δ(C-14,18) = 129.21 ppm; δ(C-3,5) = 130.07 ppm. Quaternary atoms of aromatic systems give signals at 124.63 (C-4), 126.03 (C-13), 159.75 (C-16) and 161.04 ppm. (C-1). The signal with a chemical shift of 147.74 ppm. Corresponds to the sp^2-hybridized C-12 atom. High-frequency signal at 163.07 ppm. Refers to the carbonyl atom C-8.

Spin-spin interactions of compound **16** between H-H and H-C atoms via one or more bonds were established by means of two-dimensional spectra of COSY (^{1}H-^{1}H) and HMQC (^{1}H-^{13}C).

Spin-spin interactions of compound **16** between H-H and H-C atoms via one or more bonds and compounds **20** between H-H atoms through three bonds were established by means of the two-dimensional spectra of COSY (^{1}H-^{1}H) and HMQC (^{1}H -^{13}C) (Fig. 1–4).

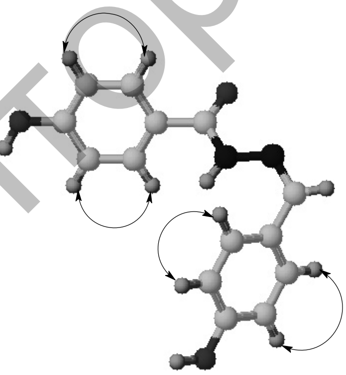

Figure 1. Correlations of COSY (^{1}H-^{1}H) of compound **16**

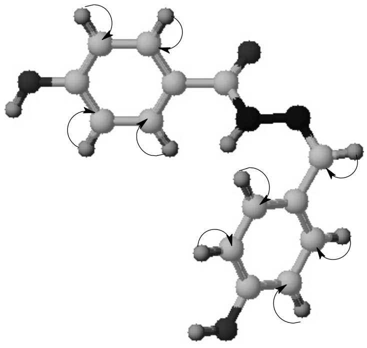

Figure 2. HMQC correlations (^{1}H-^{13}C) of compound **16**

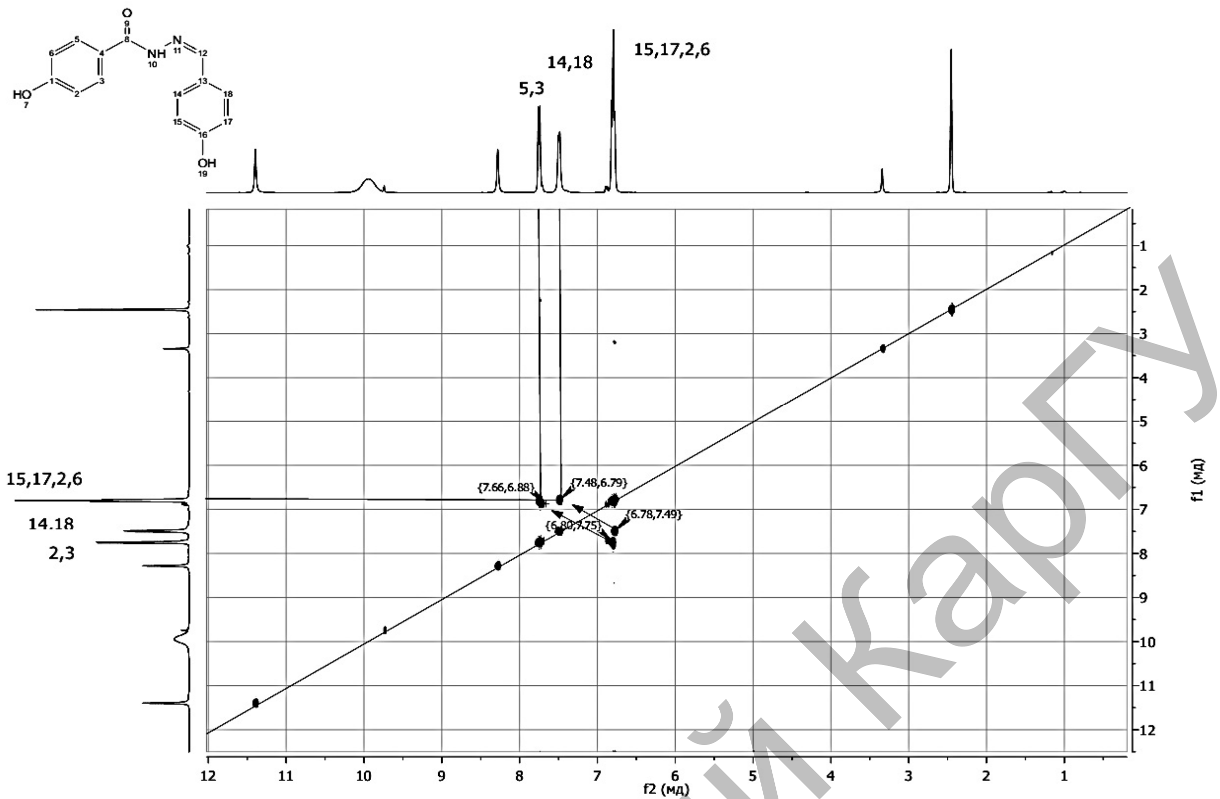

Figure 3. Shooting the COSY (^1H-^1H) spectrum of compound **16**

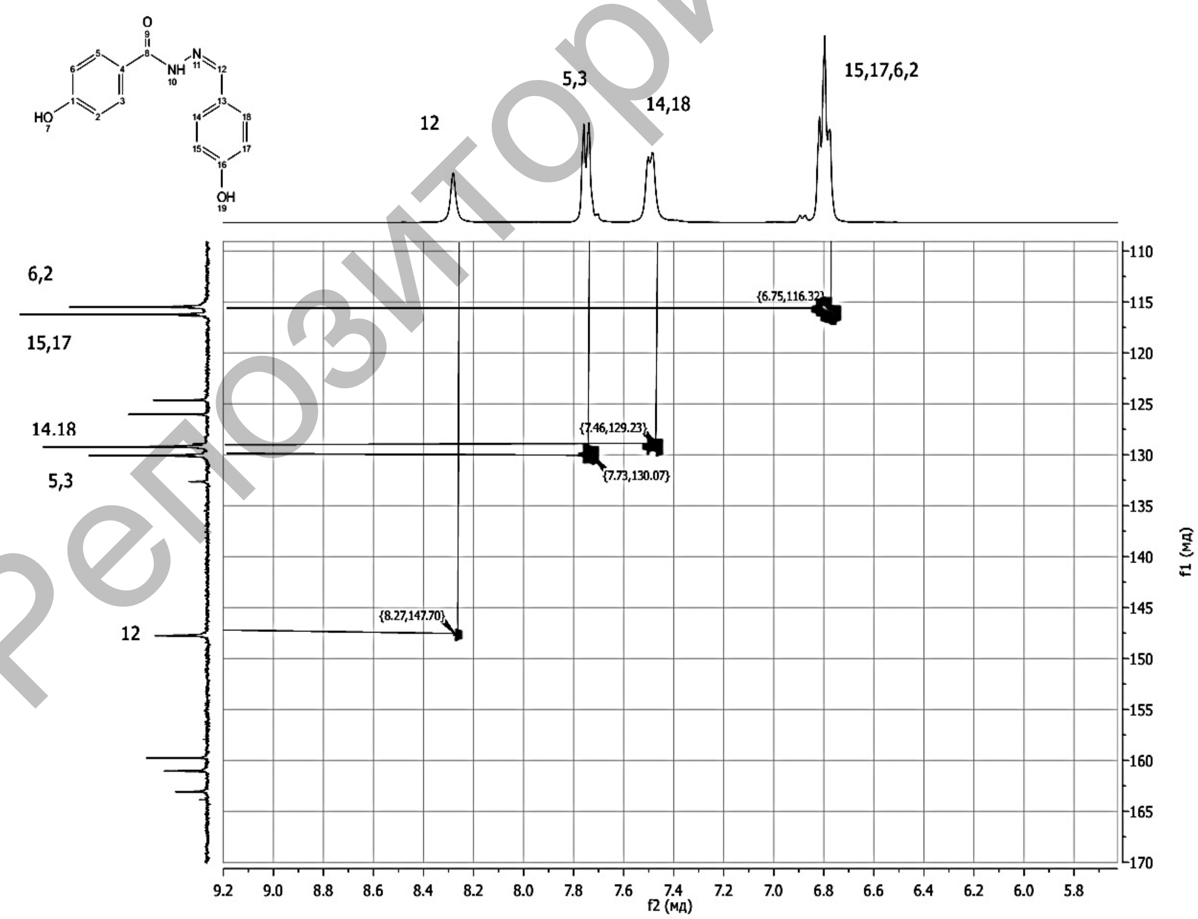

Figure 4. Shooting the HMQC (^1H-^{13}C) spectrum of compound **16**

To prove the spatial structure of the N-arylidene-hydrazone derivatives of *p*-hydroxybenzoic acid, an X-ray diffraction study of the ethanolic solvate of N-(5-bromo-2-hydroxybenzylidene)-4-hydroxybenzohydrazide **(13)** was performed (Fig. 5).

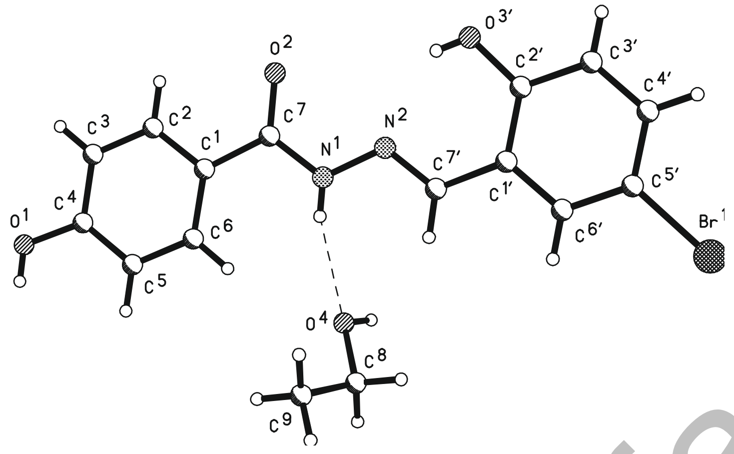

Figure 5. Spatial structure of the ethanol solvate molecule
N-(5-Bromo-2-hydroxybenzylidene)-4-hydroxybenzohydrazide **(13)**

It follows from the obtained data that the bond lengths and valence angles in compounds **13** are close to the usual ones (Tables 1–5) [9]. Molecule **13** is practically flat, but there is a slight reversal of the phenyl cycles relative to each other (the dihedral angle between them is 5.9°).

Table 1

Bond lengths (*d*, Å) in the structure of compound 13

Bond	*d*	Bond	*d*
Br(1)-C(5')	1.894(5)	C(6)-H(6)	0.9300
O(1)-C(4)	1.361(5)	C(1')-C(6')	1.388(6)
O(1)-H(01)	0.76(4)	C(1')-C(2')	1.409(6)
O(2)-C(7)	1.226(4)	C(1')-C(7')	1.451(5)
O(3')-C(2')	1.353(6)	C(2')-C(3')	1.385(6)
O(3')-H(03')	0.68(5)	C(3')-C(4')	1.380(6)
N(1)-C(7)	1.354(5)	C(3')-H(3')	0.9300
N(1)-N(2)	1.366(5)	C(4')-C(5')	1.384(6)
N(1)-H(1)	0.76(4)	C(4')-H(4')	0.9300
N(2)-C(7')	1.274(5)	C(5')-C(6')	1.372(6)
C(1)-C(2)	1.384(6)	C(6')-H(6')	0.9300
C(1)-C(6)	1.392(5)	C(7')-H(7')	0.9300
C(1)-C(7)	1.483(6)	O(4)-C(8)	1.407(6)
C(2)-C(3)	1.383(6)	O(4)-H(04)	0.82(6)
C(2)-H(2)	0.9300	C(8)-C(9)	1.440(8)
C(3)-C(4)	1.389(5)	C(8)-H(8A)	0.9700
C(3)-H(3)	0.9300	C(8)-H(8B)	0.9700
C(4)-C(5)	1.370(6)	C(9)-H(9A)	0.9600
C(5)-C(6)	1.378(6)	C(9)-H(9B)	0.9600
C(5)-H(5)	0.9300	C(9)-H(9C)	0.9600

Table 2

Valent angles (ω, deg.) in the structure of compound 13

Angle	ω	Angle	ω
C(4)-O(1)-H(01)	109(4)	O(3')-C(2')-C(1')	122.9(4)
C(2')-O(3')-H(03')	115(5)	C(3')-C(2')-C(1')	119.7(4)
C(7)-N(1)-N(2)	119.0(4)	C(4')-C(3')-C(2')	120.2(4)
C(7)-N(1)-H(1)	120(3)	C(4')-C(3')-H(3')	119.9
N(2)-N(1)-H(1)	121(3)	C(2')-C(3')-H(3')	119.9
C(7')-N(2)-N(1)	117.7(4)	C(3')-C(4')-C(5')	120.0(4)
C(2)-C(1)-C(6)	118.0(4)	C(3')-C(4')-H(4')	120.0
C(2)-C(1)-C(7)	117.6(4)	C(5')-C(4')-H(4')	120.0
C(6)-C(1)-C(7)	124.4(4)	C(6')-C(5')-C(4')	120.6(4)
C(3)-C(2)-C(1)	121.3(4)	C(6')-C(5')-Br(1)	118.5(4)
C(3)-C(2)-H(2)	119.4	C(4')-C(5')-Br(1)	120.9(4)
C(1)-C(2)-H(2)	119.4	C(5')-C(6')-C(1')	120.3(4)
C(2)-C(3)-C(4)	119.8(4)	C(5')-C(6')-H(6')	119.9
C(2)-C(3)-H(3)	120.1	C(1')-C(6')-H(6')	119.9
C(4)-C(3)-H(3)	120.1	N(2)-C(7')-C(1')	121.3(4)
O(1)-C(4)-C(5)	123.3(4)	N(2)-C(7')-H(7')	119.3
O(1)-C(4)-C(3)	117.2(4)	C(1')-C(7')-H(7')	119.3
C(5)-C(4)-C(3)	119.5(4)	C(8)-O(4)-H(04)	111(4)
C(4)-C(5)-C(6)	120.6(4)	O(4)-C(8)-C(9)	111.6(5)
C(4)-C(5)-H(5)	119.7	O(4)-C(8)-H(8A)	109.3
C(6)-C(5)-H(5)	119.7	C(9)-C(8)-H(8A)	109.3
C(5)-C(6)-C(1)	120.9(4)	O(4)-C(8)-H(8B)	109.3
C(5)-C(6)-H(6)	119.5	C(9)-C(8)-H(8B)	109.3
C(1)-C(6)-H(6)	119.5	H(8A)-C(8)-H(8B)	108.0
O(2)-C(7)-N(1)	121.3(4)	C(8)-C(9)-H(9A)	109.5
O(2)-C(7)-C(1)	121.1(4)	C(8)-C(9)-H(9B)	109.5
N(1)-C(7)-C(1)	117.6(4)	H(9A)-C(9)-H(9B)	109.5
C(6')-C(1')-C(2')	119.3(4)	C(8)-C(9)-H(9C)	109.5
C(6')-C(1')-C(7')	118.7(4)	H(9A)-C(9)-H(9C)	109.5
C(2')-C(1')-C(7')	122.0(4)	H(9B)-C(9)-H(9C)	109.5
O(3')-C(2')-C(3')	117.4(4)		

Table 3

The coordinates of the atoms in the fractions of the cell in the structure of compound 13

Atom	*x*	*y*	*z*	*U*(eq)
1	2	3	4	5
Br(1)	5593(1)	8504(1)	1603(1)	80(1)
O(1)	7718(2)	1056(2)	3868(4)	67(1)
O(2)	4490(2)	3531(2)	914(3)	56(1)
O(3')	3466(3)	5582(2)	39(4)	69(1)
N(1)	5754(3)	4310(2)	1903(4)	51(1)
N(2)	5162(2)	4921(2)	1392(4)	49(1)
C(1)	6028(3)	2970(2)	2255(4)	44(1)
C(2)	5628(3)	2261(2)	1928(4)	53(1)
C(3)	6198(3)	1627(2)	2472(4)	56(1)

Table 3 continuation

1	2	3	4	5
C(4)	7193(3)	1698(2)	3364(4)	50(1)
C(5)	7598(3)	2398(3)	3692(4)	57(1)
C(6)	7027(3)	3028(2)	3147(4)	57(1)
C(7)	5362(3)	3618(2)	1629(4)	47(1)
C(1')	4979(3)	6244(2)	1203(4)	47(1)
C(2')	3970(3)	6227(3)	409(4)	52(1)
C(3')	3459(3)	6891(3)	-19(5)	62(1)
C(4')	3933(3)	7568(3)	333(5)	62(1)
C(5')	4924(4)	7584(2)	1116(5)	55(1)
C(6')	5443(3)	6931(3)	1550(4)	54(1)
C(7')	5551(3)	5565(2)	1680(4)	53(1)
O(4)	7693(3)	4784(2)	2979(4)	75(1)
C(8)	8410(4)	5181(3)	4147(6)	105(2)
C(9)	8659(5)	4818(4)	5308(6)	119(3)

Table 4

The coordinates of the atoms in the fractions of the cell (×10^4) in the structure of compound 13

Atom	*x*	*y*	*z*	U(eq)
H(2)	4962	2210	1330	64
H(3)	5917	1155	2241	67
H(5)	8264	2447	4287	68
H(6)	7312	3499	3380	69
H(3')	2793	6882	–544	74
H(4')	3587	8014	45	75
H(6')	6108	6948	2078	64
H(7')	6215	5601	2206	63
H(01)	8240(30)	1150(30)	4440(50)	66(17)
H(03')	3740(40)	5270(30)	330(50)	70(20)
H(1)	6290(30)	4350(20)	2280(40)	40(13)
H(8A)	8184	5684	4085	126
H(8B)	8979	5219	4234	126
H(9A)	9152	5100	6086	179
H(9B)	8890	4322	5377	179
H(9C)	8100	4790	5235	179
H(04)	7590(40)	4970(30)	2330(60)	100(20)

Table 5

Torsion angles (τ, deg.) for compound 13

Angle	τ	Angle	τ
1	2	3	4
C(7)-N(1)-N(2)-C(7')	179.2(4)	C(6')-C(1')-C(2')-O(3')	-179.3(4)
C(6)-C(1)-C(2)-C(3)	-179.7(4)	C(7')-C(1')-C(2')-O(3')	0.3(7)
C(7)-C(1)-C(2)-C(3)	0.3(7)	C(6')-C(1')-C(2')-C(3')	0.3(7)
C(1)-C(2)-C(3)-C(4)	-0.1(7)	C(7')-C(1')-C(2')-C(3')	179.9(4)
C(2)-C(3)-C(4)-O(1)	179.9(4)	O(3')-C(2')-C(3')-C(4')	179.6(5)

Table 5 continuation

1	2	3	4
C(2)-C(3)-C(4)-C(5)	-0.1(7)	C(1')-C(2')-C(3')-C(4')	-0.1(7)
O(1)-C(4)-C(5)-C(6)	-179.9(5)	C(2')-C(3')-C(4')-C(5')	0.0(8)
C(3)-C(4)-C(5)-C(6)	0.2(8)	C(3')-C(4')-C(5')-C(6')	-0.1(8)
C(4)-C(5)-C(6)-C(1)	0.1(8)	C(3')-C(4')-C(5')-Br(1)	179.5(4)
C(2)-C(1)-C(6)-C(5)	-0.3(7)	C(4')-C(5')-C(6')-C(1')	0.3(7)
C(7)-C(1)-C(6)-C(5)	179.8(5)	Br(1)-C(5')-C(6')-C(1')	-179.3(3)
N(2)-N(1)-C(7)-O(2)	1.4(7)	C(2')-C(1')-C(6')-C(5')	-0.4(7)
N(2)-N(1)-C(7)-C(1)	-177.0(4)	C(7')-C(1')-C(6')-C(5')	180.0(4)
C(2)-C(1)-C(7)-O(2)	4.5(6)	N(1)-N(2)-C(7')-C(1')	-178.6(4)
C(6)-C(1)-C(7)-O(2)	-175.5(4)	C(6')-C(1')-C(7')-N(2)	180.0(4)
C(2)-C(1)-C(7)-N(1)	-177.1(4)	C(2')-C(1')-C(7')-N(2)	0.3(7)
C(6)-C(1)-C(7)-N(1)	2.8(7)		

In a crystal, the molecule **13** forms the hydrogen bond N^1 H... O^4 (x, y, z) (distance N... O 2.956(5) Å, H... O 2.22(4) Å, angle N H... O 164(2)°) c Solvate molecule of ethanol. The intermolecular hydrogen bond O^1-H... O^2 (distance O... O 2.243(4) Å, H... O 1.89 5) Å, the angle O H... O 174(5)°) is also observed, owing to which the molecules **13** form Chains along the diagonal [*a, o, c*] parallel to the plane of this diagonal with the *b* axis.

In order to establish the expected type of biological activity of the synthesized derivatives of **3–20** hydrides of *o*- and *p*-hydroxybenzoic acids, we conducted a bioprojection using one of the most effective PASS (Prediction of Activity Spectra for Substances) computer program to date Chemical structure and a universal mathematical algorithm for establishing «structure-activity» dependencies [10]. Types of biological activity of compounds are presented in Table 6.

From the analysis of the bioprognosis data of N-arylidene hydrazones it follows that their expected activity combines both the physiological activity of the initial hydrazides of *o*- and *p*-hydroxybenzoic acids and the constituent components of the structural molecule. With a fairly high degree of probability, the compounds can exhibit antibacterial, antitubercular, antiseptic, inhibitory activities and are of interest for the synthesis and study of their biological properties.

Table 6

The results of a computer bioprojection of the expected type of biological activity of compounds 3–9, 12–18

Comp. No.	Probability	Ranging	Activity type names
1	2	3	4
3	0.807	0.005	HMGCS2 expression enhancer
	0.807	0.012	Beta-adrenergic receptor kinase inhibitor
	0.784	0.003	Antituberculosic
	0.785	0.004	Antimycobacterial
	0.751	0.003	PfA-M1 aminopeptidase inhibitor
4	0.921	0.002	HMGCS2 expression enhancer
	0.898	0.002	Antituberculosic
	0.875	0.003	Antimycobacterial
	0.811	0.002	PfA-M1 aminopeptidase inhibitor
	0.799	0.004	Antiseptic
5	0.826	0.003	Antimycobacterial
	0.823	0.003	Antituberculosic
	0.814	0.004	HMGCS2 expression enhancer
	0.810	0.012	Beta-adrenergic receptor kinase inhibitor
	0.810	0.012	G-protein-coupled receptor kinase inhibitor
	0.731	0.003	PfA-M1 aminopeptidase inhibitor

T a b l e 6 c o n t i n u a t i o n

1	2	3	4
6	0.902	0.002	HMGCS2 expression enhancer
	0.837	0.003	Antituberculosic
	0.830	0.004	Threonine aldolase inhibitor
	0.819	0.004	Antimycobacterial
	0.813	0.002	PfA-M1 aminopeptidase inhibitor
	0.813	0.011	Taurine dehydrogenase inhibitor
7	0.851	0.008	Beta-adrenergic receptor kinase inhibitor
	0.851	0.008	G-protein-coupled receptor kinase inhibitor
	0.846	0.004	HMGCS2 expression enhancer
	0.836	0.003	Antituberculosic
	0.818	0.004	Antimycobacterial
	0.782	0.003	PfA-M1 aminopeptidase inhibitor
8	0.907	0.002	Antituberculosic
	0.875	0.003	Threonine aldolase inhibitor
	0.873	0.003	Antimycobacterial
	0.869	0.005	Taurine dehydrogenase inhibitor
	0.861	0.003	Amine dehydrogenase inhibitor
	0.813	0.004	HMGCS2 expression enhancer
	0.738	0.004	Antiviral (Picornavirus)
9	0.876	0.002	Antituberculosic
	0.863	0.007	Beta-adrenergic receptor kinase inhibitor
	0.863	0.007	G-protein-coupled receptor kinase inhibitor
	0.850	0.004	Antiseptic
	0.843	0.003	Antimycobacterial
	0.743	0.007	HMGCS2 expression enhancer
12	0.822	0.011	Beta-adrenergic receptor kinase inhibitor
	0.811	0.005	HMGCS2 expression enhancer
	0.758	0.004	Antituberculosic
	0.760	0.004	Antimycobacterial
	0.732	0.003	PfA-M1 aminopeptidase inhibitor
13	0.919	0.002	HMGCS2 expression enhancer
	0.893	0.002	Antituberculosic
	0.872	0.003	Antimycobacterial
	0.803	0.002	PfA-M1 aminopeptidase inhibitor
	0.759	0.005	Antiseptic
14	0.824	0.011	Beta-adrenergic receptor kinase inhibitor
	0.824	0.011	G-protein-coupled receptor kinase inhibitor
	0.818	0.004	HMGCS2 expression enhancer
	0.804	0.004	Antimycobacterial
	0.802	0.003	Antituberculosic
	0.710	0.003	PfA-M1 aminopeptidase inhibitor
15	0.895	0.003	HMGCS2 expression enhancer
	0.876	0.003	Threonine aldolase inhibitor
	0.831	0.003	Antituberculosic
	0.831	0.009	Taurine dehydrogenase inhibitor
	0.814	0.004	Antimycobacterial
	0.798	0.002	PfA-M1 aminopeptidase inhibitor
16	0.862	0.003	HMGCS2 expression enhancer
	0.862	0.007	Beta-adrenergic receptor kinase inhibitor
	0.862	0.007	G-protein-coupled receptor kinase inhibitor
	0.815	0.003	Antituberculosic
	0.801	0.004	Antimycobacterial
	0.776	0.003	PfA-M1 aminopeptidase inhibitor

Table 6 continuation

1	2	3	4
17	0.922	0.002	Threonine aldolase inhibitor
	0.898	0.004	Taurine dehydrogenase inhibitor
	0.898	0.004	Amine dehydrogenase inhibitor
	0.883	0.002	Antituberculosic
	0.855	0.003	Antimycobacterial
	0.818	0.004	HMGCS2 expression enhancer
	0.758	0.004	Antiviral (Picornavirus)
18	0.872	0.006	Beta-adrenergic receptor kinase inhibitor
	0.872	0.006	G-protein-coupled receptor kinase inhibitor
	0.845	0.003	Antituberculosic
	0.819	0.004	Antimycobacterial
	0.772	0.004	Antiseptic
	0.747	0.007	HMGCS2 expression enhancer

Experimental part

^{1}H and ^{13}C NMR spectra of compounds **3–20** were recorded on a JNN-ECA Jeol 400 spectrometer (frequency 399.78 and 100.53 MHz, respectively) using a DMSO-d_6 solvent. Chemical shifts are measured relative to signals of residual protons or carbon atoms of deuterated dimethylsulfoxide.

X-ray analysis of compound (**13**). The cell parameters and the intensity of 6311 reflections (3293 independent, R_{int}=0.0516) were measured on a diffractometer «Xcalibur Ruby (Oxford Diffraction)» (CuK_α, graphite monochromator, φ, θ scan, 4.03≤76.13) at 293 K. The crystals are monoclinic, a=18.233(4), b=17.857(4), c=13.191(3) Å, β=130.3 (3)^o, V=3275(1) Å3, Z=8 ($C_{14}H_{11}$ N_2O_3Br ⋅ C_2H_5OH), The space group *C2/c*, d_{calc}=1.546 g/cm^3, μ=3.618 mm^{-1}. The processing of the initial array of measured intensities and accounting for the absorption was carried out according to the SAINT and SADABS programs.

The structure of compound **13** is deciphered by a direct method. The positions of non-hydrogen atoms are refined in the anisotropic approximation by the full-matrix least squares. Hydrogen atoms at N^1, O^1, $O^{3'}$ and O^4 are revealed from the difference synthesis and their positions are refined in the isotropic approximation. The remaining hydrogen atoms were placed in geometrically calculated positions and positions were refined in an isotropic approximation with fixed positional and thermal parameters (the «rider» model). The structure is deciphered and refined by the complex of programs «SHELXS-97» and «SHELXL-97» [11, 12]. The calculations used 1750 independent reflections with $I \geq 2\sigma(I)$, the number of parameters to be refined 225. The final divergence factors R_1=0.0501, $_WR_2$=0.0938 (in reflections with $I \geq 2\sigma(I)$), R_1=0.1085, $_WR_2$=0.1190 (For all reflections), *GooF*=0.969. Peaks of residual density: Δρ=0.258 and -0.430 e/Å^3. The CIF file containing the complete information on the structure examined is deposited in CCDC under number 1546889, from which it can be freely obtained on request at the following Internet site: www.ccdc.cam.ac.uk/data_request/cif.

N-(4-Fluoro-benzylidene)-2-hydroxybenzohydrazide (**3**). Yield 1.08 g (83.8 %), mp. 250–251 °C (1.4-dioxane-hexane (1:2)). ^{1}H-NMR (DMSO-d_6), δ, ppm.: 6.23 d (1H, CH^1_{arom}, $^2J_{HH}$ 7.5 Hz), 6.62 t (1H, CH^2_{arom}, J_{HH} 8.4Hz), 6.45 t (1H, CH^3_{arom}, $^2J_{HH}$ 8.5 Hz), 6.77 t (1H, CH^4_{arom}, $^2J_{HH}$7.3 Hz), **7**.74 d (2H, $CH^{15,17}_{arom}$, $^2J_{HH}$ 8.55 Hz), 7.89 d (2H, $CH^{14,18}_{arom}$, $^2J_{HH}$ 8.54 Hz), 8.57 s (1H, N=CH), 10.45 s (1H, OH), 11.85 s (1H, N<u>H</u>-N).

N-(5-Bromo-2-hydroxybenzylidene)-2-hydroxybenzohydrazide **(4).** Yield 1.35 g (80 %), mp. 295 ^{o}C. ^{1}H-NMR (DMSO-d_6), δ, ppm.: 6.90 d (1H, CH^{15}_{arom}, $^2J_{HH}$ 8.76 Hz), 6.95 t (1H, CH^2_{arom}, J_{HH} 7.42 Hz), 7.02 d (1H, CH^1_{arom}, J_{HH} 8.03 Hz), 7.32 d (1H, CH^4_{arom}, J_{HH} 7.58 Hz), 7.42 t (1H, CH^3_{arom}, J_{HH} 8.35 Hz), 7.42 d (1H, CH^{16}_{arom}, J_{HH} 8.73 Hz), 7.76 s (1H, CH_{arom}), 8.57 s (1H, N=CH), 10.32 s (1H, OH^7), 11.42 s (1H, OH), 11.98 s (1H, N<u>H</u>-N).

2-Hydroxy-N-(4-methoxybenzylidene)benzohydrazide (**5**)**.** Yield 1.12 g (83 %), mp. 215–218 ^{o}C (2-propanol). ^{1}H NMR (DMSO-d_6), δ, ppm.: 3.76 s (3H, -O-CH_3), 6.26 d (1H, CH^1_{arom}, J_{HH} 7.5 Hz), 6.48 t (1H, CH^3_{arom}, J_{HH} 8.5 Hz), 6.65 t (1H, CH^2_{arom}, J_{HH} 8.4 Hz), 6.80 d (1H, CH^4_{arom}, J_{HH} 7.1 Hz), 6.84 d (2H, $CH^{15,17}_{arom}$, $^3J_{HH}$ 8.7 Hz), 7.60 d (2H, $CH^{14,18}_{arom}$, $^3J_{HH}$ 8.7 Hz), 8.35 s (1H, N=CH), 10.01 s (1H, OH), 11.49 s (1H, NH). ^{13}C NMR DMSO-d_6), δ, ppm.: 55.81 (-O-CH_3), 114.84 ($CH^{2,6}_{arom}$), 115.51 ($CH^{15,17}_{arom}$), 119.81 (C^4_{arom}), 129.06 ($CH^{14,18}_{arom}$), 130.11 ($CH^{3,5}_{arom}$), 147.36 (N=CH), 161.21 (C^1_{arom}, C^{16}_{arom}), 163.21 (-C=O).

2-Hydroxy-N-(2-hydroxybenzylidene)benzohydrazide (**6**). Yield 1.15 g (90 %), mp. 273–275 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.84–6.90 m (4H, $CH^{4,6,15,17}_{arom}$), 7.26 t (1H, CH^{5}_{arom}, $^{3}J_{HH}$ 7.3 Hz), 7.47 d (1H, CH^{3}_{arom}, $^{3}J_{HH}$ 8.7 Hz), 7.67 d (1H, CH^{18}_{arom}, $^{3}J_{HH}$ 7.8 Hz), 7.79 t (1H, CH^{16}_{arom}, $^{3}J_{HH}$ 8.2 Hz), 8.56 s (1H, N=CH), 10.14 s (1H, OH^{19}), 11.40 s (1H, OH^{7}), 11.89 c (1H, NH). ^{13}C NMR DMSO-d_6), δ, ppm.: 115.12 (C^{2}_{arom}), 115.67 (CH^{15}_{arom}), 116.93 (CH^{6}_{arom}), 119.22 (C^{17}_{arom}), 119.81 (CH^{4}_{arom}), 123.72 (C^{13}_{arom}), 128.12 (CH^{18}_{arom}), 130.27 (CH^{16}_{arom}, CH^{3}_{arom}), 131.66 (CH^{5}_{arom}), 148.18 (N=CH), 157.98 (C^{14}_{arom}), (C^{1}_{arom}), 166.48 (-C=O).

2-Hydroxy-N-(4-hydroxybenzylidene)benzohydrazide (**7**). Yield 1.06 g (83 %), mp. 277–278 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.83 d (2H, $CH^{15,17}_{arom}$, $^{2}J_{HH}$ 8.2 Hz), 6.92 dd (2H, $CH^{4,6}_{arom}$, $^{2}J_{HH}$ 16.0, $^{3}J_{HH}$ 7.6 Hz), 7.38 t (1H, CH^{5}_{arom}, $^{2}J_{HH}$ 7.8 Hz), 7.54 d (2H, $CH^{14,18}_{arom}$, $^{2}J_{HH}$ 8.2 Hz), 7.86 d (1H, CH^{3}_{arom}, $^{2}J_{HH}$ 7.8 Hz), 8.33 s (N=CH), 9.92 br.s (1H, OH^{19}), 11.66 s (1H, NH), 11.96 br.s (1H, OH^{7}). ^{13}C NMR DMSO-d_6), δ, ppm.: 116.20 (C^{2}_{arom}), 116.29 ($CH^{15,17}_{arom}$), 117.85 (CH^{6}_{arom}), 119.38 (CH^{4}_{arom}), 125.60 (C^{13}_{arom}), 128.81 (CH^{3}_{arom}), 129.62 ($CH^{14,18}_{arom}$), 134.25 (CH^{5}_{arom}), 149.78 (N=CH), 159.85 (C^{16}_{arom}), 160.21 (C^{1}_{arom}), 165.25 (C=O).

2-Hydroxy-N-(pyridin-4-yl-methylene)benzohydrazide (**8**). Yield 1.09 g (91 %), mp. 238–239 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.95 m (2H, $CH^{4,6}_{arom}$), 7.41 t (1H, CH^{5}_{arom}), 7.63 d (2H, $CH^{14,18}_{arom}$), 7.84 d (1H, CH^{3}_{arom}), 8.42 s (1H, N=CH), 8.62 d (2H, $CH^{15,17}_{arom}$), 11.96 br.s (2H, NH, OH). ^{13}C NMR DMSO-d_6), δ, ppm.: 116.83 (C^{2}_{arom}), 117.77 (CH^{6}_{arom}), 119.61 (C^{4}_{arom}), 121.59 ($CH^{14,18}_{arom}$), 129.46 (CH^{3}_{arom}), 134.47 (CH^{5}_{arom}), 141.89 (C^{13}_{arom}), 146.63 (N=CH), 150.81 ($CH^{15,17}_{arom}$), 159.17 (C^{1}_{arom}), 165.34 (C=O).

N-(3-Ethoxy-4-hydroxybenzylidene)-2-hydroxybenzohydrazide (**9**). Yield 0.9 g (60.6 %), mp. 196–198 °C (C_6H_6). ^{1}H NMR (DMSO-d_6), δ, ppm.: 1.33 t (3H, CH_3, $^{3}J_{HH}$ 6.9 Hz), 4.01–4.06 m (2H, O-CH_2), 6.84 d (1H, CH^{3}_{arom}, $^{3}J_{HH}$ 8.2 Hz), 6.94 dd (2H, $CH^{18,20}_{arom}$, $^{3}J_{HH}$ 7.6, 13.5 Hz), 7.07 d (1H, CH^{4}_{arom}, $^{3}J_{HH}$ 8.2 Hz), 7.28 c (1H, CH^{6}_{arom}), 7.34–7.41 m (1H, CH^{19}_{arom}), 7.88 dd (1H, CH^{21}_{arom}, $^{3}J_{HH}$ 7.8, 13.7 Hz), 8.30 s (1H, N=CH).

N-(2-Benzylidenoctylidene)-2-hydroxybenzohydrazide (**10**). Yield 1.20 g (69 %), mp. 157–158 °C (1.4-dioxane). ^{1}H NMR (DMSO-d_6), δ, ppm.: 0.80 t (3H, $\underline{CH_3}$-$(CH_2)_3$-CH_2-CH_2–, $^{2}J_{HH}$ 6.4 Hz), 1.21–1.32 m (6H, CH_3-$(\underline{CH_2})_3$-CH_2-CH_2–), 1.48–1.55 m (2H, CH_3-$(CH_2)_3$-$\underline{CH_2}$-CH_2–), 2.56 t (2H, CH_3-$(CH_2)_3$-CH_2-$\underline{CH_2}$–), 6.80 s (1H, C=CH-), 6.89–6.93 m (2H, CH^{4}_{arom}, CH^{6}_{arom}), 7.26–7.32 m (2H, CH^{3}_{arom}, CH^{5}_{arom}), 7.38 d (2H, $CH^{17,19}_{arom}$, $^{3}J_{HH}$ 4.3 Hz), 7.40 d (2H, $CH^{16,20}_{arom}$, $^{3}J_{HH}$ 4.3 Hz), 7.41 s (1H, N=CH), 7.83 d (1H, CH^{18}_{arom}, $^{3}J_{HH}$ 7.3 Hz). ^{13}C NMR DMSO-d_6), δ, ppm.: 14.47 ($\underline{C}H_3$-$(CH_2)_3$-CH_2-CH_2–), 22.61 (CH_3-$\underline{C}H_2$- CH_2-CH_2-CH_2-CH_2–), 26.24 (CH_3-CH_2-CH_2- CH_2-$\underline{C}H_2$-CH_2–), 28.52 (CH_3-CH_2-CH_2- $\underline{C}H_2$-CH_2-CH_2–), 29.46 (CH_3-CH_2-$\underline{C}H_2$-CH_2-CH_2-CH_2–), 31.46 (CH_3-CH_2-CH_2-CH_2-CH_2-$\underline{C}H_2$–), 116.39 (C^{2}_{arom}), 117.79 (CH^{4}_{arom}), 119.41 (CH^{6}_{arom}), 128.41 (CH^{18}_{arom}), 128.96 (CH^{3}_{arom}), 129.15 ($CH^{17,19}_{arom}$), 129.43 ($CH^{16,20}_{arom}$), 134.28 (CH^{5}_{arom}, C^{15}_{arom}), 136.61 ($\underline{C}$=CH-), 137.87 (C=$\underline{C}$H-), 139.62 (N=CH), 159.65 (C^{1}_{arom}), 165.15 (C=O).

2-Hydroxy-N-(4-((E-)-styryl)benzylidene)benzohydrazide (**11**). Yield 1.55 g (91 %), mp. 278–279 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.94 br.t (1H, CH^{4}_{arom}), 6.95 br.d (1H, CH=C$\underline{H}$-Ph, $^{2}J_{HH}$ 7.3 Hz), 7.27 d (2H, $CH^{23,25}_{arom}$, $^{2}J_{HH}$ 11.0 Hz), 7.36 d (2H, $CH^{15,17}_{arom}$), 7.37 d (1H, CH^{6}_{arom}), 7.40 d (1H, C$\underline{H}$=CH-Ph), 7.58 d (2H, $CH^{22,26}_{arom}$, $^{2}J_{HH}$ 6.9 Hz), 7.67 t (1H, CH^{5}_{arom}), 7.69 d (2H, $CH^{14,18}_{arom}$), 7.88 d (1H, CH^{3}_{arom}, $^{2}J_{HH}$ 6.4 Hz), 8.42 s (N=C$\underline{H}$-Ph), 11,81 s (NH). ^{13}C NMR DMSO-d_6), δ, ppm.: 116.48 (C^{2}_{arom}), 117.83 (CH^{6}_{arom}), 119.48 (CH^{4}_{arom}), 127.19 ($CH^{15,17}_{arom}$), 127.44 ($CH^{22,26}_{arom}$), 128.18 ($CH^{14,18}_{arom}$), 128.29 ($\underline{C}$H=CH-Ph), 129.09 (CH^{3}_{arom}), 129.28 ($CH^{23,25}_{arom}$), 130.25 (CH=$\underline{C}$H-Ph), 133.81 (C^{13}_{arom}), 134.34 (CH^{5}_{arom}), 137.39 (C^{21}_{arom}), 139.52 (C^{16}_{arom}), 148.87 (N=$\underline{C}$H-Ph), 159.60 (C^{1}_{arom}), 165.28 (C=O).

N-(4-Fluoro-benzylidene)-4-hydroxybenzohydrazide (**12**). Yield 0.87 g (67.5 %), mp. 183–185 °C (2-propanol). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.81 d (2H, $CH^{2,6}_{arom}$, $^{2}J_{HH}$ 8.7 Hz), 7.78 t (2H, $CH^{3,5}_{arom}$, J_{HH} 8.7 Hz), 7.74 d (2H, $CH^{15,17}_{arom}$, $^{2}J_{HH}$ 8.55 Hz), 7.89 d (2H, $CH^{14,18}_{arom}$, $^{2}J_{HH}$ 8.54 Hz), 8.58 s (1H, N=CH), 10.50 s (1H, OH), 11.83 s (1H, N$\underline{H}$-N).

N-(5-Bromo-2-hydroxybenzylidene)-4-hydroxybenzohydrazide (**13**). Yield 0.85 g (51.1 %), mp. 293–295 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.88 d (2H, $CH^{2,6}_{arom}$, $^{2}J_{HH}$ 8.69 Hz), 6.90 d (1H, CH^{15}_{arom}, J_{HH} 8.76 Hz), 7.42 d (1H, CH^{16}_{arom}, J_{HH} 8.73 Hz), 7.76 s (1H, CH^{18}_{arom}), 7.83 d (2H, $CH^{3,5}_{arom}$, $^{2}J_{HH}$ 8.54 Hz), 8.57 s (1H, N=CH), 10.15 s (1H, OH^{7}), 11.42 s (1H, OH), 11.98 s (1H, N$\underline{H}$-N).

4-Hydroxy-N-(4-methoxybenzylidene)benzohydrazide (**14**). Yield 1.21 g (90 %), mp. 220 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 3.76 s (3H, -O-CH_3), 6.83 d (2H, $CH^{15,17}_{arom}$, $^{3}J_{HH}$ 8.7 Hz), 6.97 d (2H, $CH^{2,6}_{arom}$, $^{3}J_{HH}$ 8.7 Hz), 7.61 d (2H, $CH^{14,18}_{arom}$, $^{3}J_{HH}$ 8.7 Hz), 7.77 d (2H, $CH^{3,5}_{arom}$, $^{3}J_{HH}$ 7.8 Hz), 8.34 s (1H, N=CH), 10.03 s (1H, OH), 11.46 s (1H, NH). ^{13}C NMR (DMSO-d_6), δ, ppm.: 55.80 (-O-CH_3), 114.85

($CH^{2,6}_{arom}$), 115.51 ($CH^{15,17}_{arom}$), 124.61 (C^{4}_{arom}), 127.64 (C^{13}_{arom}), 129.05 ($CH^{14,18}_{arom}$), 130.11 ($CH^{3,5}_{arom}$), 147.34 (N=CH), 161.21 (C^{1}_{arom}, C^{16}_{arom}), 163.19 (-C=O).

4-Hydroxy-N-(2-hydroxybenzylidene)benzohydrazide (**15**). Yield 0.85 g (67 %), mp. 260 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.85 d (2H, $CH^{2,6}_{arom,}$ J_{HH} 8.7 Hz), 6.90 d (2H, $CH^{15,17}_{arom}$, J_{HH} 8.76 Hz), 7.74 d (2H, $CH^{3,5}_{arom}$, J_{HH} 7.8 Hz), 7.54 д (2H, $CH^{14,18}_{arom}$, $^2J_{HH}$ 8.2 Hz), 8.28 s (1H, N=CH), 9.98 br.s (2H, $OH^{7,19}$), 11.40 s (1H, NH).

4-Hydroxy-N-(4-hydroxybenzylidene)benzohydrazide (**16**). Yield 0.94 g (73,8 %), mp. 265 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.80 m (4H, $CH^{2,6,15,17}_{arom}$), 7.50 d (2H, $CH^{14,18}_{arom}$), 7.74 d (2H, $CH^{5,3}_{arom}$), 8.28 s (1H, N=CH), 9.95 br.s (2H, $OH^{7,19}$), 11.40 s (1H, NH). ^{13}H NMR (DMSO-d_6), δ, ppm.: 115.49 ($CH^{2,6}_{arom}$), 116.21 ($CH^{15,17}_{arom}$), 124.63 (C^{4}_{arom}), 126.03 (C^{13}_{arom}), 129.21 ($CH^{14,18}_{arom}$), 130.07 ($CH^{5,3}_{arom}$), 147.74 (N=CH), 159.75 (C^{16}_{arom}), 161.04 (C^{1}_{arom}), 163.07 (C=O).

4-Hydroxy-N-(pyridin-4-ylmethylene)benzohydrazide (**17**). Yield 1.07 g (89 %), mp. 261–263 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.84 d (2H, $CH^{2,6}_{arom}$), 7.60 d (2H, $CH^{14,18}_{arom}$), 7.79 d (2H, $CH^{3,5}_{arom}$), 8.37 s (N=CH), 8.60 d (2H, $CH^{15,17}_{arom}$), 10.12 br.s (1H, NH), 11.83 s (1H, OH). ^{13}H NMR (DMSO-d_6), δ, ppm.: 115.62 ($CH^{2,6}_{arom}$), 121.41 ($CH^{14,18}_{arom}$), 124.07 (C^{4}_{arom}), 130.48 ($CH^{3,5}_{arom}$), 142.26 (C^{13}_{arom}), 144.83 (N=CH), 150.75 ($CH^{15,17}_{arom}$), 161.45 (C^{1}_{arom}).

N-(3-Ethoxy-4-hydroxybenzylidene)-4-hydroxybenzohydrazide (**18**). Yield 1.37 g (91.9 %), mp. 240–242 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 1.02 t (3H, -CH-C$\underline{H}_3$, $^3J_{HH}$ 6.9 Hz), 1.31 t (3H, -O-CH_2-C$\underline{H}_3$, $^3J_{HH}$ 6.9 Hz), 3.33–3.43 m (1H, -C$\underline{H}$-CH_3), 3.93–4.04 m (2H, -O-C$\underline{H}_2$-CH_3), 6.80 d (2H, $CH^{18,20}_{arom}$, $^3J_{HH}$ 8.2 Hz), 6.82 d (1H, CH^{3}_{arom}, $^3J_{HH}$ 3.7 Hz), 7.03 d (1H, CH^{4}_{arom}, $^3J_{HH}$ 7.8 Hz), 7.24 s (1H, CH^{6}_{arom}), 7.77 d (2H, $CH^{17,21}_{arom}$, $^3J_{HH}$ 8.7 Hz), 8.27 с (1H, N=CH). ^{13}H NMR (DMSO-d_6), δ, ppm.: 15.24 (-O-CH_2-$\underline{C}H_3$), 19.06 (-CH-$\underline{C}H_3$), 56.58 (-$\underline{C}$H-CH_3), 64.43 (-O-$\underline{C}H_2$-CH_3), 110.87 (CH^{6}_{arom}), 115.49 ($CH^{18,20}_{arom}$, 116.07 (CH^{4}_{arom}), 122.42 (CH^{3}_{arom}), 124.64 (C^{5}_{arom}), 126.47 (C^{16}_{arom}), 130.07 ($CH^{17,21}_{arom}$), 147.70 (N=CH), 149.60 (C^{2}_{arom}), 161.06 (C^{1}_{arom}), 163.15 (C^{19}_{arom}).

N-(2-Benzylidenoctylidene)-4-hydroxybenzohydrazide (**19**). Yield 0.52 g (30 %), mp. 255–257 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 0.80 t (3H, -CH_2-$(CH_2)_4$-C$\underline{H}_3$), 1.21–1.54 m (8H, -CH_2-(C$\underline{H}_2$)$_4$-CH_3), 2.57 t (2H, -C$\underline{H}_2$-$(CH_2)_4$-CH_3), 6.80 t (2H, $CH^{17,19}_{arom}$), 6.89 s (1H, C=CH), 7.31 d (2H, $CH^{3,5}_{arom}$), 7.39 d (2H, $CH^{2,6}_{arom}$), 7.40 d (2H, $CH^{16,20}_{arom}$), 7.84 t (1H, CH^{18}_{arom}), 8.12 s (1H, N=CH), 11.64 s (1H, NH), 11,87 s (1H, OH). ^{13}H NMR (DMSO-d_6), δ, ppm.: 14.45 (-CH_2-$(CH_2)_4$-$\underline{C}H_3$), 22.60 (-CH_2-CH_2-CH_2-CH_2-$\underline{C}H_2$-CH_3), 26.25 (-CH_2-$\underline{C}H_2$-CH_2-CH_2-CH_2-CH_3), 28.52 (-CH_2-CH_2-$\underline{C}H_2$-CH_2-CH_2-CH_3), 29.44 (-CH_2-CH_2-CH_2-$\underline{C}H_2$-CH_2-CH_3), 31.46 (-$\underline{C}H_2$-CH_2-CH_2-CH_2-CH_2-CH_3), 116.37 ($CH^{2,6}_{arom}$), 117.81(C^{4}_{arom}), 119.40 (C=$\underline{C}$H), 128.39 (CH^{18}_{arom}), 128.95 ($CH^{17,19}_{arom}$), 129.13 ($CH^{16,20}_{arom}$), 134.27 ($CH^{5,3}_{arom}$), 137.85 (C^{15}_{arom}), 139.64 ($\underline{C}$=CH), 153.97 (N=CH), 159.70 (OH-C^{1}_{arom}), 165.19 (C=O).

4-Hydroxy-N-(4-((E-)-styryl)benzylidene)benzohydrazide (**20**). Yield 1.36 g (80 %), mp. 274–275 °C (C_2H_5OH). ^{1}H NMR (DMSO-d_6), δ, ppm.: 6.83 d (2H, $CH^{2,6}_{\ arom}$, $^3J_{HH}$ 9.2 Hz), 7.22–7.29 m (4H, CH^{19}, CH^{24}_{arom}, $CH^{15,17}_{arom}$), 7.34 t (2H, $CH^{23,25}_{arom}$, $^3J_{HH}$ 7.6 Hz), 7.58 d (2H, $CH^{22,26}_{arom}$, $^3J_{HH}$ 7.9 Hz), 7.63–7.68 m (3H, $CH^{14,18}_{arom}$, CH^{20}), 7.78 d (2H, $CH^{3,5}_{arom}$, $^3J_{HH}$ 8.5 Hz), 8.38 s (1H, N=CH), 10.11 s (1H, NH), 11.64 s (1H, OH). ^{13}H NMR (DMSO-d_6), δ, ppm.: 115.56 ($CH^{2,6}_{arom}$), 124.39 (C^{4}_{arom}), 127.41 ($CH^{15,17}_{arom}$), 127.87 ($CH^{22,26}_{arom}$), 128.31 (CH^{24}_{arom}), 128.42 (CH^{19}), 129.28 ($CH^{14,18}_{arom}$), 129.96 (CH^{20}), 130.22 ($CH^{23,25}_{arom}$), 134.22 ($CH^{3,5}_{arom}$, C^{13}_{arom}), 137.39 (C^{21}_{arom}), 139.06 (C^{16}_{arom}), 146.94 (N=CH), 161.23 (C^{1}_{arom}), 163.24 (C=O).

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о- және *п*-гидроксибензой қышқылдары негізіндегі жаңа гидразондардың синтезі, құрылымы мен компьютерлік биоболжам

о- және *п*-гидроксибензой қышқыл гидразидтерінің орынбасылған ароматикалық альдегидтермен әрекеттесуі нәтижесінде тиісті гидразон туындылары алынды. PASS компьютерлік бағдарламаны қолдана отырып, N-арилиденгидразондарға биоболжам жүргізіліп, олардың болжамды белсенділігінің бастапқы *о-* және *п*-гидроксибензой қышқыл гидразидтерінің физиологиялық белсенділікпен және құрылымдық молекуланың құрамындағы компоненттерімен біріктірілгені анықталды. Синтезделген қосылыстар ЯМР ^{1}H- және ^{13}C-спектроскопия әдістермен, сондай-ақ екі өлшемді спектрлермен COSY (^{1}H-^{1}H) и HMQC (^{1}H-^{13}C) зерттелінді. ^{1}H пен ^{13}C ЯМР кешенді спектрлеріндегі сигналдардың өлшем құндылықтары мен қарқындылығы, химиялық ауысымның еселілігі белгіленді. COSY (^{1}H-^{1}H) мен HMQC (^{1}H-^{13}C) пішінді спектрлердің көмегімен зерттелінген қосылыстардың құрылымын дәлелдейтін гомо- және гетероядролық өзара байланыстары бекітілді. N-(5-бром-2-гидроксибензилиден)-4-гидроксибензогидразидінің рентгенқұрылымдық зерттеуі жүргізіліп, оның сутектік байланыс молекуласының этанолды сольваттың молекуласымен байланысты екендігі белгілі болды.

Кілт сөздер: *о-* және *п*-гидроксибензой қышқыл гидразиді, гидразон, ароматикалық альдегидтер, ЯМР спектроскопия.

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Синтез, строение и компьютерный биопрогноз новых гидразонов на основе гидразидов *о-* и *п*-гидроксибензойных кислот

Взаимодействием гидразидов *о-* и *п*-гидроксибензойных кислот с замещенными ароматическими альдегидами получены соответствующие производные гидразонов. С использованием компьютерной программы PASS проведен биопрогноз N-арилиденгидразонов и показано, что их предполагаемая активность комбинирует как физиологическую активность исходного гидразидов *о-* и *п*-гидроксибензойных кислот, так и составляющих компонентов структурной молекулы. Исследованы строения синтезированных соединений методами ЯМР ^{1}H- и ^{13}C-спектроскопии, а также данными двумерных спектров COSY (^{1}H-^{1}H) и HMQC (^{1}H-^{13}C). Определены значения химических сдвигов, мультиплетность и интегральная интенсивность сигналов ^{1}H и ^{13}C в одномерных спектрах ЯМР. С помощью спектров в форматах COSY (^{1}H-^{1}H) и HMQC (^{1}H-^{13}C) установлены гомо- и гетероядерные взаимодействия, подтверждающие структуру исследуемых соединений. Проведено рентгеноструктурное исследование N-(5-бром-2-гидроксибензилиден)-4-гидроксибензогидразида, молекула которого связана водородной связью с молекулой этанольного сольвата.

Ключевые слова: гидразид *о-* и *п*-гидроксибензойных кислот, гидразон, ароматические альдегиды, ЯМР-спектроскопия.

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