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CONDENSED ISOQUINOLINES. 13*. SYNTHESIS OF 1,2,3,4-TETRAHYDRO-SPIRO[ISOQUINOLINE-4,1'-CYCLOPENTANE]-3-IMINES AND CONDENSED SPIROCYCLIC SYSTEMS BASED ON THEM

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1-(2-Bromomethylphenyl)-1-cyclopentanecarbonitrile has been synthesized by the cycloalkylation of (2-methylphenyl)acetonitrile with 1,4-dibromobutane with subsequent bromination of the intermediate product with N-bromosuccinimide. The product serves as a convenient intermediate in the synthesis of derivatives of a series of heterospiro systems. Condensation of it with primary amines leads to the hydrobromides of 1,2,3,4-tetrahydrospiro[isoquinoline-4,1'-cyclopentane]-3-imines, but with vicinal eneamino carbonyl compounds derivatives results in previously undescribed condensed spirocyclic systems, viz. spiro[5H-isoquino[2,3-a]quinazoline-7,1'-cyclopentane] and spiro[4H-thieno[3',2':5,6]-pyrimido[1,2-b]isoquinoline-6,1'-cyclopentane].

Keywords: isoquinolineimines, isoquinoquinazoline, condensed isoquinolines, spirocyclic compounds, thienopyrimidoisoquinoline, cyclopentane.

Spiro[isoquinoline-4,1'-cyclopentanes] are of practical interest due to discovery of biologically active substances amongst them [2,3]. At the same time the available methods for building the spiro[isoquinoline-4,1'-cyclopentane] system are limited by the single examples of synthesizing its derivatives. Consequently it seemed promising to work on the introduction into synthetic practice of intermediates opening a route to a series of derivatives of this system. The possibility of realization just such an approach is studied in the present work, which is a continuation of our investigations [1,4] in the area of spirocyclic condensed isoquinoline compounds.

The cycloalkylation of (2-methylphenyl)acetonitrile (**1**) with 1,4-dibromobutane in anhydrous toluene in the presence of sodium hydride as base leads to the previously undescribed 1-(2-methylphenyl)-1-cyclopentanecarbonitrile (**2**). Bromination of this compound with N-bromosuccinimide leads in high yield to 1-(2-bromomethylphenyl)-1-cyclopentanecarbonitrile (**3**), which lies at the basis of the method proposed by us for constructing the spiro[isoquinoline-4,1'-cyclopentane] system.

We have studied the interaction of bromo nitrile **3** with various primary amines, such as aniline, substituted arylamines, benzylamine, (2-furyl)methylamine, and butylamine. It is evident that at the first stage of the reaction a simple alkylation takes place, but it may be accompanied by an intramolecular interaction of nitrile and amino groups. It was found that, independently of the basicity of the initial amine, heating a mixture

* For Part 12 see [1].

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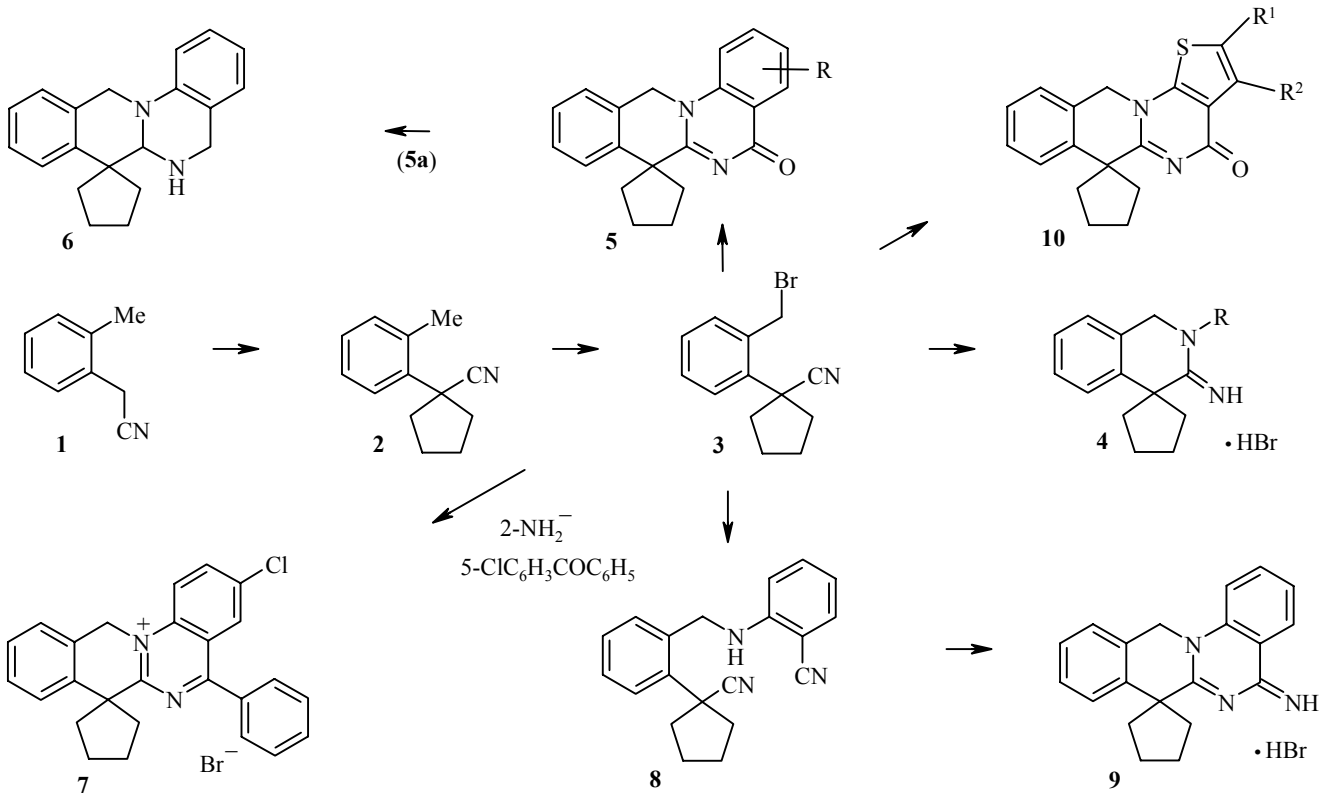

4 a–k R = C_6H_4X; **l** R = CH_2Ph; **m** R = CH_2-(2-furyl); **n** R = $(CH_2)_3Me$; **a** X = H; **b** X = 4-OMe; **c** X=4-CH_3; **d** X=2-Cl; **e** X=3-Cl; **f** X = 4-Br; **g** X = 3-F; **h** X = 4-CO_2Et; **i** X = 4-COMe; **j** X = 4-NO_2; **k** X = 3-NO_2; **5 a** R = H; **b** R = 2-Cl; **c** R = 3-Br; **10 a** $R^1 = R^2 = Me$; **b** R^1 = Et, R^2 = H; **c** $R^1R^2 = (CH_2)_4$; **d** $R^1R^2 = (CH_2)_3$

of equimolar amounts of the starting materials in dioxane leads to 2-R-1,2,3,4-tetrahydrospiro[isoquinoline-4,1'-cyclopentan]-3-imine hydrobromides **4** (Table 1). In their IR spectra bands for the nitrile absorption were absent, which might have been expected for the intermediate alkylation products, but bands were observed for the absorption of N^+–H and $C=N^+$ groups (Table 2).

TABLE 1. Characteristics of the Compounds Synthesized

Compound	Empirical formula	Found, % / Calculated, %				mp, °C	Yield, %
		C	H	N	Hal (S)*		
4a	$C_{19}H_{20}N_2 \cdot HBr$	64.00 63.87	6.15 5.92	7.91 7.84	22.64 22.36	223	42
4b	$C_{20}H_{22}N_2O \cdot HBr$	62.17 62.02	6.10 5.99	7.19 7.23	20.86 20.63	217	40
4c	$C_{20}H_{22}N_2 \cdot HBr$	64.80 64.69	6.37 6.24	7.64 7.54	21.82 21.52	179	79
4d	$C_{19}H_{19}ClN_2 \cdot HBr$	58.40 58.26	5.25 5.15	7.40 7.15	29.22 29.45	234	59
4e	$C_{19}H_{19}ClN_2 \cdot HBr$	58.35 58.26	5.25 5.15	7.07 7.15	29.47 29.45	226	57
4f	$C_{19}H_{19}BrN_2 \cdot HBr$	52.49 52.32	4.82 4.62	6.56 6.42	36.97 36.64	246	80
4g	$C_{19}H_{19}FN_2 \cdot HBr$	60.00 60.81	5.42 5.37	7.87 7.46	21.38 21.29	224	62
4h	$C_{22}H_{24}N_2O_2 \cdot HBr$	61.67 61.54	6.00 5.87	6.66 6.52	18.92 18.61	232	83
4i	$C_{21}H_{22}N_2O \cdot HBr$	63.23 63.16	6.00 5.81	7.17 7.02	20.18 20.01	242	61
4j	$C_{19}H_{19}N_3O_2 \cdot HBr$	56.93 56.73	5.12 5.01	10.27 10.45	20.12 19.86	258	58
4k	$C_{19}H_{19}N_3O_2 \cdot HBr$	56.82 56.73	5.13 5.01	10.49 10.45	20.06 19.86	282	56
4l	$C_{20}H_{22}N_2 \cdot HBr$	64.76 64.69	6.29 6.24	7.69 7.54	21.72 21.52	233	93
4m	$C_{18}H_{20}N_2O \cdot HBr$	59.90 59.84	5.88 5.86	7.90 7.75	22.64 22.12	255	82
4n	$C_{17}H_{24}N_2 \cdot HBr$	60.63 60.54	7.62 7.47	8.38 8.31	23.68 23.69	191	55
5a	$C_{20}H_{18}N_2O$	79.60 79.44	6.13 6.00	9.30 9.26		224	88
5b	$C_{20}H_{17}ClN_2O$	71.43 71.32	5.15 5.09	8.52 8.32	10.30 10.53	224	64
5c	$C_{20}H_{17}BrN_2O$	63.10 63.01	4.55 4.49	7.58 7.35	21.08 20.96	254	49
6	$C_{20}H_{20}N_2O$	79.03 78.92	6.76 6.62	9.17 9.20		172	97
7	$C_{26}H_{22}ClN_2^+ \cdot Br^-$	65.39 65.36	4.97 4.64	5.90 5.86	23.67 24.14	163	42
9	$C_{20}H_{19}N_3 \cdot HBr$	62.89 62.84	5.32 5.27	11.21 10.99	21.04 20.90	301	69
10a	$C_{20}H_{20}N_2OS$	71.52 71.40	6.13 5.99	8.16 8.33	(9.56) (9.53)	291	55
10b	$C_{20}H_{20}N_2OS$	71.54 71.40	6.07 5.99	8.23 8.33	(9.66) (9.53)	205	94
10c	$C_{22}H_{22}N_2OS$	73.03 72.90	6.24 6.12	7.87 7.73	(8.90) (8.84)	217	75
10d	$C_{21}H_{20}N_2OS$	72.43 72.38	5.85 5.78	8.17 8.04	(9.30) (9.20)	257	50

***** For compounds **4d,e** the combined data are given for the analysis of Cl and Br, but for **4g** data are given for the analysis of Br.

TABLE 2. Spectral Characteristics of the Compounds Synthesized

Compound	IR spectrum, ν, cm^{-1}	^{1}H NMR spectrum, δ, ppm, *J* (Hz)*			
		$-(CH_2)_4-$	NCH_2 (2H, s)	N^+H_2 (1H, s)	Other signals
1	2	3	4	5	6
4a	3020, 3180 (N–H); 1650 (C=N)	1.92-2.50 (8H, m)	5.02	8.95, 8.35	7.35-7.75 (9H, m, H_{Ar})
4b	3120, 3340 (N–H); 1645 (C=N)	1.88-2.00 (4H, m); 2.10-2.55 (4H, m)	4.97	8.90, 8.28	7.36-7.52 (6H, m, H_{Ar}); 7.17 (2H, d, *J* = 8, H_{Ar}); 3.84 (3H, s, OCH_3)
4c	3120, 3320 (N–H); 1645 (C=N)	1.80-2.50 (8H, m)	4.98	8.92, 8.31	7.10-7.80 (8H, m, H_{Ar}); 2.42 (3H, s, CH_3)
4d	3020, 3180 (N–H); 1650 (C=N)	1.80-2.50 (8H, m)	4.97	9.08, 8.77	7.35-7.90 (8H, m, H_{Ar})
4e	3000, 3150 (N–H); 1650 (C=N)	1.80-2.50 (8H, m)	5.02	8.98, 8.57	7.81 (1H, t, *J* = 2.5, C(2")–H); 7.35-7.75 (7H, m, H_{Ar})
4f	3100, 3330 (N–H); 1640 (C=N)	1.75-2.50 (8H, m)	5.00	8.70 (2H)	7.84 (2H, d, *J* = 8, C(3")–H, C(5")–H); 7.52 (2H, d, *J* = 8, C(2")–H, C(6")–H); 7.36-7.45 (4H, m, H_{Ar})
4g	3020, 3180 (N–H); 1650 (C=N)	1.80-2.50 (8H, m)	5.03	9.00, 8.53	7.35-7.85 (8H, m, H_{Ar})
4h	3030, 3200 (N–H); 1640 (C=N); 1700 (C=O)	1.80-2.50 (8H, m)	5.07	9.09, 8.55	8.20 (2H, d, *J* = 8, C(3")–H, C(5")–H); 7.74 (2H, d, *J* = 8, C(2")–H, C(6")–H); 7.35-7.55 (4H, m, H_{Ar}); 4.39 (2H, q, *J* = 7.5, $C\underline{H}_2CH_3$); 1.35 (3H, t, *J* = 7.5, $CH_2C\underline{H}_3$)
4i	3080, 3350 (N–H); 1650 (C=N); 1675 (C=O)	1.70-2.50 (8H, m)	5.04	9.04, 8.52	8.21 (2H, d, *J* = 8, C(3")–H, C(5")–H); 7.72 (2H, d, *J* = 8, C(2")–H, C(6")–H); 7.35-7.55 (4H, m, H_{Ar}); 2.66 (3H, s, CH_3)
4j	3100, 3360 (N–H); 1650 (C=N); 1350, 1515 (NO_2)	1.93-2.50 (m, 8H)	5.10	8.92 (2H)	8.53 (2H, d, *J* = 8, C(3")–H, C(5")–H); 7.94 (2H, d, *J* = 8, C(2"), C(6")–H); 7.40-7.60 (4H, m, H_{Ar})
4k	3020, 3200 (N–H); 1650 (C=N); 1350, 1515 (NO_2)	1.83-2.50 (8H, m)	5.09	9.06 (2H)	8.62 (1H, t, *J* = 2, C(2")–H); 8.44 (1H, dt, J_m = 2, J_o = 8, C(4")–H); 8.08 (1H, dt, J_m = 2, J_o = 8, C(6")–H); 7.93 (1H, t, *J* = 8, C(5")–H); 7.33-7.54 (4H, m, H_{Ar})
4l	3150, 3220 (N–H); 1630 (C=N)	1.87-2.50 (8H, m,)	5.05	9.03 (2H)	7.20-7.50 (9H, m, H_{Ar}); 4.75 (2H, s, $-CH_2-Ph$)
4m	3150, 3260 (N–H); 1650 (C=N)	1.83-2.50 (8H, m)	5.05	9.23, 9.00	7.69 (1H, d, *J* = 2.5, C(5")–H); 7.32-7.43 (4H, m, H_{Ar}); 6.62 (1H, d, *J* = 3, C(3")–H); 6.48 (1H, dd, *J* = 3, *J* = 2, C(4")–H); 4.79 (2H, s, $-CH_2-$(2-furyl))
4n	3060, 3240 (N–H); 1650 (C=N)	1.83-2.50 (8H, m)	4.78	8.75 (2H)	7.36 (4H, s, H_{Ar}); 3.68 (2H, t , *J* = 7.5, $-NC\underline{H}_2(CH_2)_2CH_3$); 1.40 (4H, centre m, $-(C\underline{H}_2)_2CH_3$); 0.91 (3H, t, *J* = 7.5, $(CH_2)_3C\underline{H}_3$)
5a	1590 (C=N); 1625 (C=O)	1.70-2.15 (6H, m); 2.30-2.90 (2H, m)	5.45		7.30-7.60 (4H, m, H_{Ar}); 7.77-8.20 (4H, m, H_{Ar})

TABLE 2 (continued)

1	2	3	4	5	6
5b	1585 (C=N); 1635 (C=O)	1.70-2.15 (6H, m); 2.40-2.75 (2H, m)	5.44		8.10 (1H, d, J_p = 8, C(4")–H); 8.08 (1H, d, J_m = 2.5, C(1")–H); 7.54 (1H, dd, J_p = 8, J_m = 2.5, C(3")–H); 7.30-7.50 (4H, m, H_{Ar})
5c	1580 (C=N); 1630 (C=O)	1.75-2.20 (6H, m); 2.40-2.75 (2H, m)	5.44		8.19 (1H, d, J_m = 2, C(4")–H); 7.90-8.03 (2H, m, C(1")–H, C(2")–H); 7.23-7.55 (4H, m, H_{Ar})
6	3080 (N–H); 1650 (C=O)	1.35-2.25 (8H, m)	4.89*[2], 4.40	8.12	7.70 (1H, dd, J_o = 8, J_m = 2.5, C(4")–H); 7.34 (1H, centre m, J_o = 8, J_m = 2.5, C(2")–H); 7.17-7.25 (4H, m, H_{Ar}); 6.90 (1H, d, J_o = 8, C(1")–H); 6.70 (1H, t, J_o = 8, C(3")–H); 4.99 (1H, d, J = 3, C(6a)–H)
7	1575 (C=N)	1.90-2.03 (4H, m); 2.12-2.79 (4H, m)	6.32		8.95 (1H, d, J = 8, C(1")–H); 8.68 (1H, dd, J_o = 8, J_m =2.5, C(2")–H); 8.44 (1H, d, J = 2.5, C(4")–H); 7.46-8.11 (9H, m, H_{Ar})
9	3020, 3220 (N–H); 1650 (C=N)	1.75-2.21 (6H, m); 2.50-2.80 (2H, m)	5.76	9.92, 9.75	8.61 (1H, d, J = 8, C(4")–H); 8.41 (1H, d, J = 8, C(1")–H); 8.21 (1H, t, J = 8, C(2")–H); 7.85 (1H, t, J = 8, C(3")–H); 7.33-7.65 (4H, m, H_{Ar})
10a	1575 (C=N); 1625 (C=O)	1.80-2.10 (6H, m); 2.45-2.60 (2H, m)	5.26		7.30-7.55 (4H, m, H_{Ar}); 2.38 (6H, s, $2CH_3$)
10b	1570 (C=N); 1620 (C=O)	1.70-2.15 (6H, m); 2.50-2.70 (2H, m)	5.30		7.30-7.60 (4H, m, H_{Ar}); 7.05 (1H, s, C(3")–H); 2.88 (2H, q, J = 7.5, $-C\underline{H}_2CH_3$); 1.29 (3H, t, J = 7.5, $CH_2C\underline{H}_3$)
10c	1570 (C=N); 1620 (C=O)	2.02 (4H, centre, m); 2.63 (4H, centre, m)	5.63		7.50-7.65 (4H, m, H_{Ar}); 2.85-3.25 (4H, m, C(11")–H_2, C(8")–H_2); 2.25 (4H, centre m, C(9")–H_2, C(10")–H_2)
10d	1570 (C=N); 1620 (C=O)	2.20-2.40 (4H, m); 2.50-2.80 (4H, m)	5.64		7.45-7.65 (4H, m, H_{Ar}); 3.10-3.30 (4H, m, C(8")–H_2, C(10")–H_2); 2.62 (2H, centre m, C(9")–H_2)

* Compounds **4-7**, **9**, and **10a,b** in DMSO-d_6, **10c,d** in deuterotrifluoroacetic acid.
*[2] 1H, d, J = 17 Hz.

The interaction of bromo nitrile **3** with arylamines having a functional group in the *ortho* position capable to amination is completed by the formation of derivatives of a new heterocyclic system, spiro(isoquino[2,3-*a*]quinazoline-7,1'-cyclohexane). In the case of methyl anthranilate the reaction product is 7,12-dihydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentan)-5-one (**5a**). Similarly on using 4-chloro- and 5-bromoanthranilic acids the corresponding 2-chloro- and 3-bromo-7,12-dihydrospiro(5H-isoquino[2,3-*a*]-quinazoline-7,1'-cyclopentan)-5-ones were obtained (**5b,c**). In all cases the reaction was accompanied by deprotonation but the products were free bases. Their structures confirmed by spectral characteristics were in good agreement with the data obtained previously in [1,5] for their structural analogs. In the IR spectra bands were observed for the absorption of C=O and C=N groups in the absence of bands corresponding to the vibrations of ester, carboxyl, nitrile, salts of amino or imino groups, which would be expected for the intermediate interaction products. The C(6a)=N(6) double bond of the isoquinoquinoxaline fragment in compound **5a** is readily subjected to reduction by sodium borohydride with the formation of

6,6a,7,12-tetrahydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentan)-5-one (**6**). In the IR spectrum of this compound an absorption band was observed for the N–H group, but the band for the C=O group undergoes the regular high-frequency shift of 25 cm^{-1} as compared with the spectrum of the starting material. In the ^1H NMR spectrum of compound **6** the protons of the methylene group at C(12) and the fragment H–C(6a)–N(6)–H are displayed as AB and AX spin systems respectively. In the presence of D_2O the doublet for the N(6) proton disappears and the doublet for the proton at C(6a) is converted into a singlet.

The interaction of bromo nitrile **3** with 2-amino-5-chlorobenzophenone is completed with the formation of 3-chloro-5-phenyl-7,12-dihydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentan)-13-ium bromide (**7**). In the reaction with anthranilic acid nitrile 2-[2-(1-cyanocyclopentyl)benzylamino]benzonitrile (**8**) is formed unexpectedly as the free base. Its structure was confirmed by the IR spectrum in which a band was observed for a secondary N–H group and two bands for conjugated and unconjugated nitrile groups.The presence in the ^1H NMR spectrum of an A_2X spin system of signals with J_{vic} = 6 Hz corresponding to a CH_2–NH structural fragment, converted into an A_2 spin system in the presence of D_2O, is also in good agreement with the structure proposed. On heating an alcoholic solution of amino dinitrile **8** in the presence of conc. HBr it readily cyclizes into 7,12-dihydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentane)-5-imine hydrobromide (**9**). The absence of nitrile group absorption at 2200-2250 cm^{-1} and the presence of strong absorption bands for N^+–H and $C=N^+$ groups indicates the formation of the tetracyclic structure.

Like methyl anthranilate its heterocyclic analogs the ethyl esters of 4,5-dimethyl- and 2-amino-5-ethyl-3-thiophenecarboxylic acids react with bromonitrile **3** to form 2,3-dimethyl- and 2-ethyl-6,11-dihydrospiro(4H-thieno[3',2':5,6]pyrimido[1,2-*b*]isoquinoline-6,1'-cyclopentan)-4-ones (**10a,b**) respectively. The analogous condensation of ethyl 2-amino-4,5,6,7-tetrahydrobenzo[*b*]thiophene-3-carboxylate leads to 5,8,9,10,11,14-hexahydrospiro(7H-benzo[4',5']thieno[3',2':5,6]pyrimido[1,2-*b*]isoquinoline-5,1'-cyclopentan)-7-one (**10c**), and of ethyl 2-amino-5,6-dihydro-4H-cyclopenta[*b*]thiophene-3-carboxylate to 2,3,6,11-tetrahydrospiro(cyclopentane-1,6'-1H,4H-cyclopenta[4',5']thieno[3',2':5,6]pyrimido[1,2-*b*]isoquinolin)-4-one (**10d**). The spectral characteristics of products **10a-d** (see Table 2) and their structural analogs **5a-c** are close, which confirms the structures of compounds **10a-d**.

The newly available intermediate **3** proposed in the present study therefore makes possible the synthesis of 1,2,3,4-tetrahydrospiro[isoquinoline-4,1'-cyclopentane]-3-imine hydrobromides with ready variation of the substituent at the nitrogen atom of the isoquinoline ring. These compounds are interesting as spirocyclic analogs of 1,2,3,4-tetrahydroisoquinoline-3-imines, which display antimicrobial activity [6]. In addition the obtained compounds **5-7**, **9**, and **10** are derivatives of spiroheterocyclic systems on which there is no information in the literature at the present time.

EXPERIMENTAL

The IR spectra were recorded on a Pye Unicam SP3-300 instrument in KBr tablets. The ^1H NMR spectra were obtained on a Bruker WP 100 SY (100 MHz) instrument in deuterotrifluoroacetic acid for compounds **10c,d** and in DMSO-d_6 for compounds **3-9** and **10a,b**, internal standard was TMS. Compound **4j** was recrystallized from water, **4l,m** from ethanol–dioxane, 1:3, **4n** from dioxane, **5a-c**, **6**, and **9** from ethanol, compound **10b** from DMF, and the remainder from 2-propanol.

1-(2-Bromomethylphenyl)-1-cyclopentanecarbonitrile (3). Anhydrous toluene (50 ml) and an 80% emulsion of sodium hydride (10 g, 0.33 mol) in nujol were placed in an apparatus protected from moisture. A mixture of nitrile **1** (18.5 ml, 0.15 mol) and 1,4-dibromobutane (17.9 ml, 0.15 mol) was slowly added dropwise to the reaction mixture while cooling with ice and stirring. Stirring was continued until the end of hydrogen evolution (3-4 h) and then for 1 h further, after which the excess of sodium hydride was decomposed by adding 2-propanol (10 ml). Water (100 ml) was added to the mixture, the organic layer was separated, and the aqueous was extracted with toluene. The combined organic extracts were dried over Na_2SO_4, evaporated under reduced

pressure, and the residue was distilled in vacuum on an oil pump, collecting the fraction of bp 115-130°C (0.5 mm Hg). Compound **2** (12.5 g, 45%) was obtained as a colorless oily substance. IR spectrum (thin film), ν, cm^{-1}: 2230 (C≡N); 2860, 2940 (C–H). ^{1}H NMR spectrum ($CDCl_3$), δ, ppm: 1.70-2.20 (8H, m, $(CH_2)_4$); 2.59 (3H, s, CH_3); 7.21 (4H, s, H_{Ar}).

N-Bromosuccinimide (16 g, 0.09 mol) and the dinitrile of azodiisobutyric acid (100 ml) was added to a solution of compound **2** (12.5 g, 0.07 mol) in CCl_4 (100 ml). The mixture was refluxed with stirring for 14 h, cooled, and filtered. The filtrate was evaporated at reduced pressure, and the residue triturated with hexane. The solid substance was filtered off and washed with hexane. Colorless crystalline product **3** (12.9 g, 70%) was obtained; mp 64°C (2-propanol). IR spectrum, ν, cm^{-1}: 2230 (C≡N); 2860, 2940 (C–H). ^{1}H NMR spectrum ($CDCl_3$), δ, ppm: 1.9-2.8 [8H, m, $(CH_2)_4$]; 4.85 (2H, s, CH_2–Br); 7.30-7.55 (4H, m, H_{Ar}). Found:, %: Br 30.40; N 5.38. $C_{13}H_{14}BrN$. Calculated, %: Br 30.25; N 5.34.

Hydrobromides of 2-R-1,2,3,4-Tetrahydrospiro[isoquinoline-4,1'-cyclopentane]-3-imines (4a-n). A mixture of bromo nitrile **3** (0.79 g, 3 mmol) and arylamine (3 mmol) in dioxane (10 ml) was refluxed for 8 h. After cooling the precipitated crystalline substance was filtered off, washed with dioxane, and recrystallized.

Condensed Spiro[isoquinoline-4,1'-cyclopentanes] 5, 7, and 10. A mixture of bromo nitrile **3** (0.79 g, 3 mmol) and enaminocarbonyl compound (3.5 mmol) in dioxane (10 ml) was refluxed for 12 h. The solid precipitated from the cooled reaction mixture was filtered off, washed on the filter with dioxane, and recrystallized.

6,6a,7,12-tetrahydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentan)-5-one (6). A mixture of compound **5a** (0.20 g, 0.66 mmol) and $NaBH_4$ (0.15 g, 3.96 mmol) in dioxane (5 ml) was refluxed for 2.5 h, cooled, and diluted with two volumes of water. The precipitated solid was filtered off, washed with water, and recrystallized.

2-[2-(1-Cyanocyclopentyl)benzylamino]benzonitrile (8). A mixture of bromo nitrile **3** (0.79 g, 3 mmol) and anthranilonitrile (0.41 g, 3.5 mmol) in dioxane (10 ml) was refluxed for 6 h. The solid precipitated on cooling the reaction mixture was filtered off, washed on the filter with dioxane, and recrystallized from 2-propanol. A colorless crystalline product (0.42 g, 47%) was obtained, mp 167°C. IR spectrum, ν, cm^{-1}: 2200, 2220 (C≡N), 3380 (N–H). ^{1}H NMR spectrum, (DMSO-d_6), δ, ppm, *J* (Hz): 1.70-2.15 (6H, m) and 2.50-2.75 (2H, m) ($(CH_2)_4$); 4.69 (2H, d, J_{vic} = 6, NCH_2); 7.25-7.60 (6H, m, H_{Ar}); 6.84 (1H, t, J_{vic} = 6, NH); 6.66 (1H, t, J_o = 8, C(5)–H); 6.47 (1H, d, J_o = 8. C(3)–H). Found, %: C 79.82; H 6.42; N 13.91. $C_{20}H_{19}N_3$. Calculated, %: C 79.70; H 6.42; N 13.94.

Hydrobromide of 7,12-Dihydrospiro(5H-isoquino[2,3-*a*]quinazoline-7,1'-cyclopentan)-5-imine (9). A mixture of dinitrile **8** (0.6 g, 2 mmol), conc. HBr (2 ml), and ethanol (8 ml) was refluxed for 0.5 h. The solid precipitated on cooling was filtered off, washed with water, and with ethanol.

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