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Three new tetracyclic structures, containing the azepine ring, were synthesized: 11,12-dihydro-6*H*-benzofuro[3,2-*c*]2]benzoazepine-6,11-dione, 5,6,11,12-tetrahydroindolo[3,2-*c*]2]benzoazepine-6,11-dione and 11,12-dihydro-6*H*-benzofuro[3,2-*c*]2]benzoazepin-6-one.

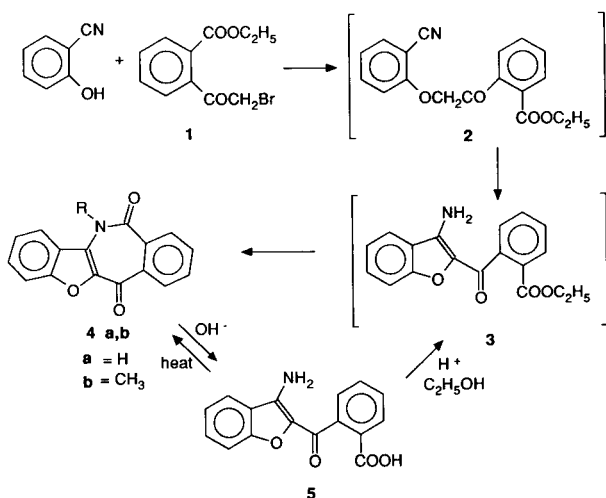
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Great pharmacological interest has been devoted, for a long time, to tricyclic structures with a diazepine or an azepine ring [1]. In order to evaluate the influence on pharmacological activity of the substitution of one of the rings with another, bulkier, aromatic system, we have substituted a benzene ring with a benzofuran or an indole moiety obtaining new compounds with tetracyclic structures. We dealt previously [2] with the synthesis of two new structures containing a diazepine ring, namely 5,6-dihydro-12*H*-benzofuro[3,2-*b*]1,5]benzodiazepin-6-ones and 5,6-dihydro-12*H*-benzofuro[3,2-*b*]pyrido[3,2-*f*]1,5]diazepin-6-one. We now describe the synthesis of three new tetracyclic structure containing the azepine ring, namely 11,12-dihydro-6*H*-benzofuro[3,2-*c*]2]benzoazepine-6,11-dione (**4**), 5,6,11,12-tetrahydroindolo[3,2-*c*]2]benzoazepine-6,11-diones **9**, **10** and 11,12-dihydro-6*H*-benzofuro[3,2-*c*]2]benzoazepin-6-ones **15** and **16**.

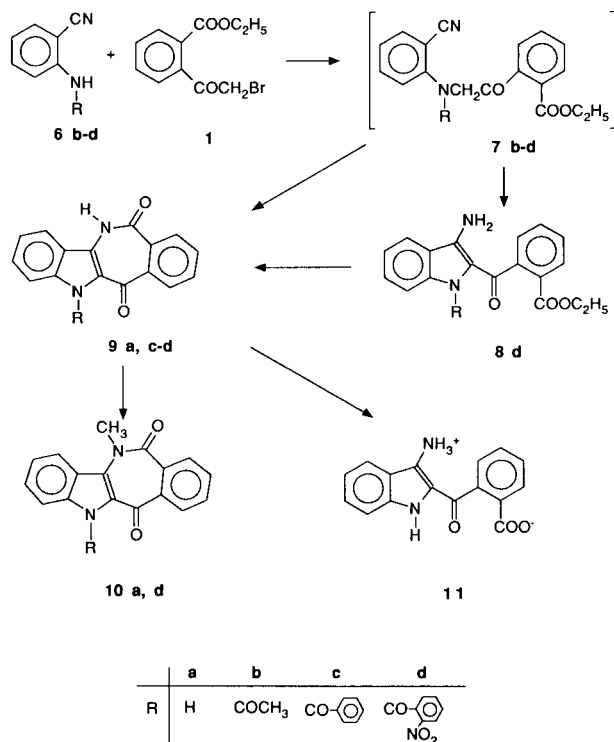
The synthesis of compound **4** is described in Scheme 1. Condensation of 2-hydroxybenzonitrile with 2-ethyloxycarbonylphenacyl bromide (**1**), in alkaline medium and under reflux, gave, presumably, 3-aminobenzofuran (**3**) which directly cyclized to the desired compound **4a**. In some attempts to isolate intermediates **2** and **3**, the reaction was conducted at lower temperatures obtaining only tars from

which the reactant 2-hydroxybenzonitrile was recovered in high yields; this was probably due to the high instability of compound **1** under the alkaline conditions of the reaction that made formation of by-products become predominant when the desired condensation was depressed. Tars were also obtained, at all the tested temperatures, when the somehow more sensitive 2-methyloxycarbonylphenacyl bromide was used instead of the corresponding ethyl ester **1**. Alkaline hydrolysis of compound **4a** gave 2-(2-carboxybenzoyl)-3-aminobenzofuran (**5**) which was cyclized back to **4a** by refluxing in toluene or by treating, even at room temperature, in ethyl alcohol with sulfuric acid in catalytic amount.

Scheme 1



Scheme 2

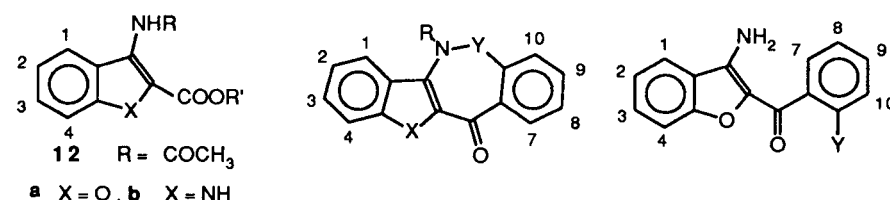


The synthesis of the tetracyclic molecule bearing an indole moiety **10** is depicted in Scheme 2. 2-Aminobenzonitrile did not react with **1**, but did so after it was protected with an acyl group, **6b-d**, in analogy to what was observed with 2-hydroxybenzonitrile. Again, isolation of intermediates **7** and **8** could not be achieved, except for **8d** which was isolated when the reaction was conducted at room temperature; **8d** gave almost quantitatively **9d** when refluxed in DMF. The protecting group seemed to be quite important and the overall yield increased in the series acetyl << benzoyl < 2-nitrobenzoyl. When acetyl derivative **6b** was used, deacetylation took place spontaneously during the reaction, thus preventing isolation of **9b** and leading directly to **9a**. In the case of benzoyl derivative **6c**, after the usual 8 hours of reflux in DMF, a mixture of **9a**

and **9c** was obtained; **9c** was converted to **9a** by additional reflux in DMF. The best results were obtained with the 2-nitrobenzoyl derivative **6d**; compound **9d** was obtained in high yield, the protecting group stabilized it enough to allow chemical modifications like, for instance, alkylation on the nitrogen atom in position 12, **10d**, and the final products could easily be deprotected by aminolysis at room temperature, **9a** and **10a**. Aminolysis with *N,N*-dimethylaminoethylamine gave rise to a by-product, namely *N*-(dimethylaminoethyl)-2-nitrobenzamide, which was soluble in acidic media, simplifying purification procedure.

2-Carboxy-3-acetylaminobenzofuran propyl ester (**12a**) was *N*-benzylated to **13** and condensed to compound **15**; final deacetylation afforded the desired molecule **16** (Scheme 3).

Table 1: ¹H NMR Data of Title Compounds and Related Derivatives

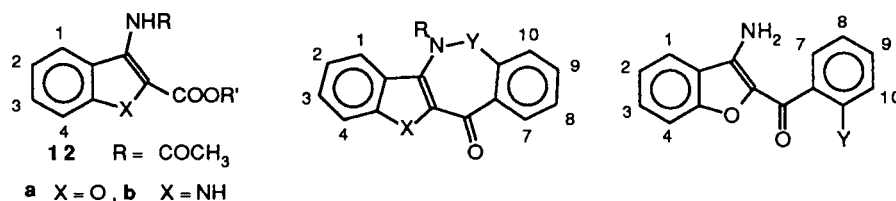


(δ)

	H-1	H-2	H-3	H-4	H-7	H-8	H-9	H-10	X	NHR	Y	J _{H,H} (Hz)
12a ^[a]	7.79 d	7.32 m	7.51 m	7.66 d	-	-	-	-	-	9.95 s NH 2.18 s CH ₃	-	J _{1,2} =7.7, J _{2,3} =7.3 J _{3,4} =8.2, J _{1,3} =1.3 J _{5,7} =0.9
12b ^[b]	7.57 d	7.04 m	7.26 m	7.41 d	-	-	-	-	9.56 NH	11.7 s NH 2.10 s CH ₃	-	J _{1,2} =8.1 J _{2,3} =7.0 J _{3,4} =8.1
4 a	8.46 d	7.41 m	7.65 m	7.76 m	8.51 m	7.9-8.0 2H(H-8+H-9)	8.62 m	-	-	12.1 NH v br	-	J _{1,2} =8.1
4 b	8.22 d	7.44 m	7.64 m	7.76 d	8.17 m	7.8-7.9 2H(H-8+H-9)	8.36 m	-	-	3.91 CH ₃	-	J _{1,2} =8.5 J _{3,4} =8.3
5	8.05 d	7.23 m	7.46 m	7.35 d	-	7.5-7.7 3H(H-7+H-8+H-9)	7.93 m	-	-	7.2 NH ₂ v br	12.5 COOH	J _{1,2} =7.7 J _{3,4} =8.3
9 a	8.37 d	7.10 m	7.3-7.5 2H(H-3+H-4)	8.58 m	-	7.92 2H(H-8+H-9)	8.67 m	11.8 NH, s	-	11.6 NH, s	-	J _{1,2} =8.1 J _{3,4} =5.9 J _{2,4} =2.1
10 a	7.98 d	7.11 m	7.34 m	7.46 d	8.12 m	7.7-7.9 2H(H-8+H-9)	8.30 m	11.9 NH, s	-	3.85 CH ₃	-	J _{1,2} =8.4 J _{3,4} =8.2
11	8.11 d	7.37 m	7.63 m	8.47 d	8.14 m	7.7-7.9 2H(H-8+H-9)	8.26 m	-	-	3.4 - 4 NH+NH ₃ ⁺ , v br	-	J _{1,2} =7.6 J _{3,4} =8.1
15	8.06 d	7.37 m	7.5-7.7 5H	7.75 d	-	7.5-7.7 5H(H-3+H-7+H-8+H-9+H-10)	-	-	-	2.4 CH ₃ , s br	5.2 CH ₂ , s br	J _{1,2} =7.4 J _{3,4} =8.6
16	7.97 d	7.32 m	7.4-7.7 5H	7.89 d	-	7.4-7.7 5H(H-3+H-4+H-8+H-9+H-10)	-	-	-	8.38 NH, s br	4.4 2H, s br	J _{1,2} =8.1 J _{7,8} =7.0

[a] see ref [2]

[b] see also ref [4]; R' = C₂H₅: 1.3 (CH₃, q), 4.31 (CH₂, t)

Table 2: ^{13}C NMR and Mass Spectral Data of Title Compounds and Related Derivatives ^{13}C NMR (δ) [a]

	C-1 ^d	C-2 ^d	C-3 ^d	C-4 ^d	C-7 ^d	C-8 ^d	C-9 ^d	C-10 ^d	CO ^s	NHR	Y	other C ^s			
12a ^[b]	123.4	124.1	129.6	112.3	-	-	-	-	168.6	23.0 CH ₃ ^q	159.6 CO ^s	-	123.8	127.4	134.6 135.5
12b ^[c]	119.7	121.9	125.3	112.8	-	-	-	-	168.5	22.95 CH ₃ ^q	161.5 CO ^s	-	118.9	120.6	123.1 135.5
4 a	123.2	123.8	130.8	112.5	130.0	133.7	1	33.6	175.2	-	165.8 CO ^s	-	120.6	128.6	135.3 139.3 154.9
4 b	124.9	124.2	129.9 [§]	113.0	128.1	133.7	133.2	134.1	178.3	37.8 CH ₃ ^q	166.1 CO ^s	-	122.0	130.5	131.4 136.1 141.8 154.3
5	122.4 2C	130.1	112.4	128.4	131.9	129.8	129.6	184.8	-	-	168.2 COOH ^s	-	121.6	131.3	134.0 140.8 141.2 154.3
9 a	122.1	119.8	128.1	112.6	129.9	133.3 2C	133.7	177.3	-	-	164.9 CO ^s	-	118.2	123.1	123.9 132.2 135.1 138.0
10 a	123.0	120.5	126.7	113.4	127.7	132.6	133.1	133.8	181.1	38.8 CH ₃ ^q	165.4 CO ^s	-	120.1	124.6	127.8 131.7 136.5 137.0
11	132.7	124.7	131.9	117.0	125.4	133.7	133.0	128.6	171.7	-	157.6 COO ^{-s}	-	112.5	122.3	131.1 135.3 136.8 145.8
15	124.8 br	124.2	129.8	112.8	130.3 ^[d]	129.6 ^[d]	134.0 ^[d]	130.0 ^[d]	179.2	22.5 CH ₃ ^q	169.4 CO ^s	54.1 CH ₂ ^t	123.3	136.2	137.4 144.0 154.3
16	122.3	122.7	130.4	112.5	128.3	129.0 ^[d]	132.8 ^[d]	128.2 ^[d]	177.8	-	-	50.6 CH ₂ ^t	121.3	135.2	135.8 138.6 142.6 155.1

[a] superscripts indicate the partial proton decoupling pattern

[b] see ref [2]

[c] see also ref [4]; R' = C₂H₅; 14.17 (CH₃^q), 60.3 (CH₂^t)

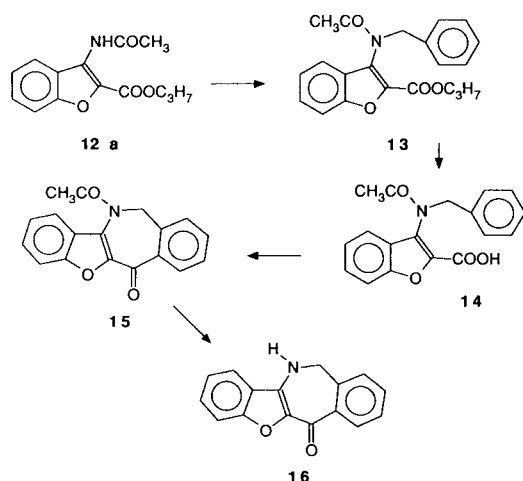
[d] assignment based on similarity with the other products and on their theoretical values

MS (m/z)

	principal fragments [a]						other fragments			
4 a	263(60) M ⁺	262(100) M ⁺ -1	235(5) M ⁺ -CO	206(4) 262-2CO	178(5) 206-CO	151(5) 178-HCN	105(5)	104(7)	76(16)	
9 a	262(89) M ⁺	261(100) M ⁺ -1	234(6) M ⁺ -CO	205(12) 261-2CO	178(3) 205-CN	151(3) 178-HCN	129(7)	105(6)	104(9)	76(14)
16	249(100) M ⁺	248(56) M ⁺ -1	221(20) M ⁺ -CO	220(85) M ⁺ -NHCH ₂	192(7) 220-CO	165(17)	110(5)	89(16)	76(7)	

[a] relative abundance in parenthesis

Scheme 3



Proposed structures for title compounds were confirmed by nmr (Tables 1 and 2), mass (Table 2), ir (Table 3) spectra and elemental analysis (Table 3). Assignment of nmr resonances were accomplished with APT, COSY and HETCOR experiments [3], in addition to normal ^1H and ^{13}C spectra. In order to clearly identify hydrogen and carbon nuclei belonging to the benzofuran moiety, propyl 3-acetyl-2-benzofurancarboxylate (**12a**) [2] and ethyl 3-acetyl-2-indolecarboxylate (**12b**) were synthesized [4] and used as reference compounds (Tables 1 and 2).

The title compounds were used as starting materials for the synthesis of derivatives which showed an interesting anticonvulsant activity.

Table 3

	IR cm^{-1}		m.p.[a] $^{\circ}\text{C}$	Reaction		C	Analytical data					Formula
	CO	NH		Yield %	Time hours		found %	calcd. %				
							H	N	C	H	N	
4a	1651 br	3200 v. br.	340-5 pyridine	36	8	72.81	3.50	5.67	73.00	3.45	5.32	$\text{C}_{16}\text{H}_9\text{NO}_3$
4b	1650 br		227-9 DMF	73	16	73.28	4.07	5.04	73.64	4.00	5.05	$\text{C}_{17}\text{H}_{11}\text{NO}_3$
5	1708 1682	3440 3332	>240 ethanol	85	2	68.62	3.98	4.81	68.33	3.94	4.98	$\text{C}_{16}\text{H}_{11}\text{NO}_4$
8d	1723 1661 1631	3443 3312	201-3 ethanol	36	36	65.98	4.42	9.51	65.64	4.19	9.19	$\text{C}_{25}\text{H}_{19}\text{N}_3\text{O}_6$
9a	1646 1620	3264 v.br.	>360 DMF	21[a] 62[b]	8 10	73.39	3.86	10.54	73.27	3.84	10.68	$\text{C}_{16}\text{H}_{10}\text{N}_2\text{O}_2$
9c	1691 1640 br	3200 v. br.	>200 dec ethanol	18[c]	6	75.35	3.77	7.82	75.40	3.85	7.65	$\text{C}_{23}\text{H}_{14}\text{N}_2\text{O}_3$
9d	1694 1640 br	3200 v. br.	>320 dec DMSO	82	8	67.02	3.25	9.95	67.15	3.19	10.21	$\text{C}_{23}\text{H}_{13}\text{N}_3\text{O}_5$
10a	1630 br	3280	254-6 DMF	96	3	74.15	4.31	10.40	73.90	4.37	10.13	$\text{C}_{17}\text{H}_{12}\text{N}_2\text{O}_2$
10d	1703 1640	-	236-9 ethanol	73	24	68.08	3.48	10.06	67.76	3.55	9.87	$\text{C}_{24}\text{H}_{15}\text{N}_3\text{O}_5$
11	1681 1636	3390 3296 v. br.	>240 dioxane	75	4	68.49	4.55	9.80	68.57	4.32	9.99	$\text{C}_{16}\text{H}_{12}\text{N}_2\text{O}_3$
13	1730 1662	-	100-2 cyclohexane	72	6	71.64	5.76	3.89	71.77	6.02	3.98	$\text{C}_{21}\text{H}_{21}\text{NO}_4$
14	1730 1628	-	182-4 toluene	79	12	69.59	4.69	4.18	69.90	4.89	4.53	$\text{C}_{18}\text{H}_{15}\text{NO}_4$
15	1715 1620	-	228-30 acetic acid	16	42	74.10	4.51	4.45	74.22	4.50	4.81	$\text{C}_{18}\text{H}_{13}\text{NO}_3$
16	1621	3272	230 dec ethanol	87	24	77.31	4.54	5.54	77.10	4.45	5.62	$\text{C}_{16}\text{H}_{11}\text{NO}_2$

[a] based on **6b**

[b] based on **6c**, without isolation of protected intermediate **9c**

[c] most of the product was directly converted to **9a**

EXPERIMENTAL

All melting points are uncorrected. The ir spectra were recorded with a Perkin-Elmer Model 1710 spectrophotometer and mass spectra with a Hewlett-Packard 5988 spectrometer. Elemental analyses for C, H and N were performed by Analytical Department of Menarini S.r.l., Florence, Italy. All nmr spectra were recorded on Varian Gemini-200 spectrometer using, unless otherwise stated, deuteriodimethylsulfoxide as solvent. APT, COSY and HETCOR experiments [3], in addition to ^1H and ^{13}C nmr spectra, were performed utilizing standard Varian software (version 6.2).

Ethyl 2-Bromoacetylbenzoate **1**.

2-Acetylbenzoic acid sodium salt (0.1 mole) was suspended in 200 ml of absolute ethanol, treated with ethyl iodide (0.12 mole) and refluxed for 16 hours. The solid was removed by filtration, the solvent evaporated and the crude ethyl 2-acetylbenzoate [5] was purified by distillation under reduced pressure, yield 75%, bp 97-99° (0.3 mm/Hg). Ethyl 2-acetylbenzoate (0.5 mole) was dissolved in 500 ml of diethyl ether and treated, under vigorous stirring, at room temperature, dropwise, with bromine (0.55 mole). When the addition was over, the ethereal solution washed three times with water (100 ml each) and dried over sodium sulfate. The solvent was evaporated and the oily residue was crystallized by ligroin. The solid was collected and air dried, yield 68%, mp 60-62°; ir (nujol): 1708 cm^{-1} ; ^1H nmr (deuteriochloroform): δ 1.34 (t, 3 H, J = 7.2 Hz), 4.31 (s, 2 H), 4.34 (q, 2 H, J = 7.2 Hz), 7.35 (dd, 1 H, J = 8.2, 1.8 Hz), 7.54 (m, 2 H), 7.97 (dd, 1 H, J = 7.7, 1.5 Hz).

11,12-Dihydro-6*H*-benzofuro[3,2-*c*]2]benzoazepine-6,11-dione **4a**.

2-Hydroxybenzoxonitrile (0.05 mole) was dissolved in DMF (200 ml) and treated with 80% sodium hydride (0.05 mole) at room temperature, with stirring. When evolution of gas was over, ethyl 2-bromoacetylbenzoate (0.05 mole) was added and the solution was refluxed for 8 hours. The solid material was filtered off and the brown-red solution poured in water (500 ml). The solid product was collected by filtration, dried and purified by recrystallization.

11,12-Dihydro-12-methyl-6*H*-benzofuro[3,2-*c*]2]benzoazepine-6,11-dione **4b**.

Compound **4a** (0.013 mole) was dissolved in dry DMF (50 ml), treated with sodium hydride (0.013 mole) and, after one hour, with ethyl iodide (0.025 mole). The solution was kept at room temperature for one day, poured into water and the solid collected and recrystallized.

2-(2-Carboxybenzoyl)-3-aminobenzofuran **5**.

Compound **4a** (0.002 mole) was refluxed in 10% sodium hydroxide/ethanol (1:1) solution for four hours. Ethanol was distilled off under reduced pressure, concentrated hydrochloric acid was added up to pH 5 and the solid material was collected and filtered. The benzofuran **5** could be cyclized back to **4a** by refluxing for three hours in toluene or keeping it, at 80° for two hours or at room temperature for two days, in ethanol with catalytic amount of sulfuric acid.

2-(2-Ethoxycarbonyl)-3-aminobenzofuran **8d**.

2-(2-Nitrobenzoyl)aminobenzonitrile **6d** [6] (0.029 mole) was dissolved in DMF (100 ml) and treated with 80% sodium hydride

(0.03 mole) at room temperature. After half an hour, **1** (0.029 mole), dissolved in DMF (20 ml), was added dropwise and the solution was kept at room temperature with stirring for 36 hours. The solution was poured into crushed ice (approximately 400 g) and the precipitate was collected and dried.

5-(2-Nitrobenzoyl)-5,6,11,12-tetrahydroindolo[3,2-*c*]2]benzoazepine-6,11-dione **9d**.

2-(2-Nitrobenzoyl)aminobenzonitrile **6d** [6] (0.03 mole) was dissolved in DMF (100 ml) and treated with 80% sodium hydride (0.03 mole) at room temperature. After 30 minutes, **1** (0.03 mole), dissolved in DMF (20 ml), was added and the solution was refluxed for eight hours. After cooling, the solution was poured into water, the brown precipitate was collected by filtration and washed with hot ethanol until a yellow solid was obtained; ^1H nmr: (δ) 6.97 (dd, 1 H, J = 7.7, 1.3 Hz), 7.5 (m, 1 H), 7.6-7.9 (m, 6 H), 7.94 (m, 1 H), 8.18 (d, 1 H, J = 8.1 Hz), 8.35 (dd, 1 H, J = 7.98, 1.3 Hz), 8.51 (d, 1 H, J = 8.0), 11.9 (br s, 1 H, NH).

5,6,11,12-Tetrahydroindolo[3,2-*c*]2]benzoazepine-6,11-dione **9a**.A - From **6b**.

2-Acetylaminobenzonitrile **6b** (0.01 mole) was treated in DMF (100 ml) with 80% sodium hydride (0.01 mole) and, after 30 minutes, with **1** (0.01 mole). The solution was refluxed for eight hours, cooled to room temperature and poured into water. The precipitate was collected by filtration, washed with hot ethanol and recrystallized from DMF.

B - From **6c**.

2-Benzoylaminobenzonitrile **6c** (0.01 mole) was treated with sodium hydride and **1** as described in procedure A. After six hours of reaction, the solid precipitate was collected by filtration and washed with hot ethanol, resulting in **9a**, yield 30%. The filtrate was poured into water and the precipitate collected and recrystallized from ethanol. The product was **9c**, yield 18%; ^1H nmr: (δ) 7.3-7.9 (m, 9 H), 8.4-8.6 (m, 2 H), 11.9 (br s, 1 H); ^{13}C nmr: (δ) 113.2, 122.6, 123.5, 128.1, 128.8, 130.2, 132.8, 133.1, 133.2, 133.3, 133.5 (C $^{\alpha}$), 117.2, 120.2, 122.1, 128.3, 135.5, 136.9, 138.7, 135.6, 166.1, 169.1 (C $^{\beta}$).

Compound **9c** was converted almost quantitatively in **9a** by heating for one hour in DMF. When the reaction was conducted for ten hours at reflux temperature in DMF, **9a** was obtained in 62% yield without isolation of intermediate **9c**.

C - From **9d**.

Compound **9d** (0.012 mole) was suspended in DMF (200 ml) and treated with *N,N*-diethylaminoethylamine at room temperature for two hours. The light red solution was poured into water, concentrated hydrochloric acid was added until pH 2 was reached and the precipitate was collected. A quantitative yield was obtained. The aqueous solution was worked up to obtain a waxy solid which was *N,N*-dimethylaminoethyl-2-nitrobenzamide, yield 65%, ^1H nmr: (δ) 2.15 (s, 6 H, 2 CH $_3$), 2.44 (t, 2 H, CH $_2$, J = 6.2 Hz), 3.37 (m, 2 H, CH $_2$), 7.04 (b s, 1 H, NH), 7.37-7.58 (m, 3 H), 7.88 (d, 1 H, J = 8.1); ^{13}C nmr: (δ) 37.5, 57.6 (C $^{\alpha}$), 45.2 (C $^{\beta}$), 124.8, 129.3, 130.8, 134.1 (C $^{\gamma}$), 133.5, 147.2, 167.3 (C $^{\delta}$); ir: (cm^{-1}) 3297 (NH), 1636 (CO).

5-(2-Nitrobenzoyl)-12-methyl-5,6,11,12-tetrahydroindolo[3,2-*c*]2]benzoazepine-6,11-dione **10d**.

Compound **9d** (0.011 mole) was dissolved in DMF, treated with 80% sodium hydride, (0.011 mole) and, after one hour, with methyl iodide (0.04 mole). After two days the solution was poured into water and the precipitate was collected by filtration and washed with hot ethanol; ^1H nmr: (δ) 4.1 (s, 3 H, CH_3), 7.1-8.6 (m, 12 H).

12-Methyl-5,6,11,12-tetrahydroindolo[3,2-c][2]benzazepine-6,11-dione **10a**.

Compound **10d** (0.013 mole) was dissolved in DMF (200 ml) and treated with *N,N*-diethylaminoethylamine (0.039 mole). After four hours at room temperature, the solution was poured into 2% hydrochloric acid solution (400 ml) and the precipitate was collected by filtration. Almost quantitative yield was obtained.

2-(2-Carboxybenzoyl)-3-aminoindole (**11**).

Compound **9a** (0.0045 mole), or alternatively compounds **9c** or **9d**, was hydrolyzed in sodium hydroxide 10%-ethanol (1:1) (200 ml) for five hours at 70°. Ethanol was removed by distillation under reduced pressure, the water solution was made acid (pH 2) with hydrochloric acid, and the dark red precipitate was collected and recrystallized, yellow crystals from dioxane.

2-Ethoxycarbonyl-3-acetylaminoindole (**12b**) [4].

A modification of the Unangst method [7] was used. Thus **6d** (3.9 mmoles) in DMF was treated with 80% sodium hydride (4 mmoles) and, one hour later, with ethyl bromoacetate (5 mmoles). The solution was heated at reflux temperature for five hours, poured into water and the solid material collected and washed with water, brownish-yellow material, crude yield 69%; ir: (cm^{-1}) 3334, 2965 (NH_2), 1669, 1621 (CO); ^1H nmr: (δ) 0.91 (t, 3 H, $J = 7.0$ Hz), 3.74 (q, 2 H, $J = 7.0$ Hz), 6.4-7.2 (v br s, NH_2), 7.2-8.2 (m, 8 H); ^{13}C nmr: (δ) 14.0 (C^α), 59.4 (C^β), 115.8, 121.5, 124.1, 124.5, 130.4, 130.7, 132.0, 133.9 (C^γ), 122.8, 132.5, 139.9, 145.0, 147.0, 161.5, 165.2 (C^δ).

The 1-(2-nitrobenzoyl)-2-ethoxycarbonyl-3-aminoindole was acetylated with acetic anhydride according to known methods, yield 92%, mp 154-156°; ir: (cm^{-1}) 3100 (br NH), 1731, 1698, 1652 (CO); ^1H nmr: (δ) 1.04 (t, 3 H, $J = 7.0$ Hz), 2.10 (s, 3 H), 3.82 (q, 2 H, $J = 7.0$ Hz), 7.15 (m, 1 H), 7.4 (m, 2 H), 7.8 (m, 4 H), 8.28 (m, 1 H), 10.08 (s, NH); ^{13}C nmr: (δ) 13.6 (C^α), 22.7 (C^β), 61.0 (C^γ), 115.0, 121.6, 124.4, 125.3, 126.1, 129.2, 130.6, 134.8 (C^δ), 122.0, 126.2, 130.6, 136.2, 146.8, 160.6, 164.9, 168.9.

Thus 1-(2-nitrobenzoyl)-2-ethoxycarbonyl-3-acetylaminoindole (2 mmoles) was heated at reflux in ethanol (100 ml) with *N,N*-diethylaminoethylamine (3 mmoles) for three hours, the solution was poured into acid water (pH 3) and the solid material filtered and recrystallized from toluene, yield 86%, mp 194° dec.

2-Propyloxycarbonyl-3-(*N*-benzyl-*N*-acetyl)aminobenzofuran (**13**).

Compound **12a** (0.1 mole) was treated in dioxane (200 ml) with 80% sodium hydride (0.1 mole) and, after one hour of stirring,

benzyl chloride (0.15 mole) and refluxed for six hours. The solution was filtered and evaporated. The solid residue was recrystallized from cyclohexane; ^1H nmr: (δ) 0.9 (t, 3 H), 1.7 (m, 2 H), 1.8 (s, 3 H), 4.2 (m, 2 H), 4.65 (d, 1 H, $J = 13.8$), 5.09 (d, 1 H, $J = 13.8$), 7.1-7.8 (m, 8 H).

2-Carboxy-3-(*N*-benzyl-*N*-acetyl)aminobenzofuran (**14**).

Compound **13** (0.07 mole) was hydrolyzed in 10% sodium hydroxide solution for 18 hours at room temperature; the solution was made acid with hydrochloric acid to pH 2 and the white solid precipitate was collected and dried; ^1H nmr: (δ) 1.83 (s, 3H), 4.60 (d, 1H, $J = 14.3$), 5.21 (d, 1H, $J = 14.3$), 7.1-7.7 (m, 8H).

12-Acetyl-11,12-dihydro-6*H*-benzofuro[3,2-c][2]benzazepin-6-one (**15**).

Compound **14** (0.14 mole) was treated in dichloromethane (400 ml) with dicyclohexyl carbodiimide (0.07) at 0° for eight hours. The dicyclohexylurea was filtered off and the solvent was evaporated. The residue was redissolved in carbon disulfide (400 ml), treated with aluminum chloride (0.4 mole) and heated at reflux for five days. The solvent was evaporated, the residue poured into crashed ice (approximately 500 g), the solid material filtered, washed with 5% bicarbonate solution and purified.

11,12-Dihydro-6*H*-benzofuro[3,2-c][2]benzazepin-6-one (**16**).

Compound **15** (0.01 mole) was suspended in 10% sodium hydroxide-ethanol (2:1) (100 ml) and heated at 60° for four hours. The solid was collected by filtration and recrystallized from ethanol.

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