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Pyrido[2,3-*d*]pyrimidines, II [1]. One Step Synthesis of Pyrido[2,3-*d*]pyrimidines and Pyrimido[4,5-*b*]quinolines from 6-Amino Uracils

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Summary. Reduction of 6-azidouracils **2** with hydrogen palladium or sodium dithionite afforded the corresponding 6-aminouracils **5** which could also be obtained by reaction of **2** with triphenylphosphane *via* phosphazenes and subsequent hydrolysis (*Staudinger* reaction). The use of trimethylphosphite instead of phosphanes yields with **2b** the expected trimethoxyphosphazene **3c**, whereas **2a** reacts to the phosphonoaminopyrimidine **4**. The syntheses of 5-hydroxy pyrido[2,3-*d*]pryimidine-2,4,7-triones **6**, pyrido[2,3-*d*]pyrimidine-2,4,5-triones **8**, cyclopenta[*e*]pyrido[2,3-*d*]pyrimidin-2,4,5-triones **7a**, **c**, and tetrahydro-pyrimido[4,5-*b*]quinolin-2,4,5-triones **7b**, **d** by condensation of 6-aminouracils **5** with malonates, ethylaceto/benzoylacetate, ethyl 2-oxocyclopentanecarboxylate and ethyl 2-oxocyclohexanecarboxylate, respectively, are described.

Keywords. 6-Aminouracils; Phosphanes; Phosphazines; *Staudinger* reaction; Pyrido[2,3-*d*]pyrimidines; Pryimido[4,5-*b*]quinolines.

Pyrido[2,3-*d*]pyrimidine, 2. Mitt. [1]. Einstufige Synthese von Pyrido[2,3-*d*]pyrimidinen und Pyrimido[4,5-*b*]chinolinen aus 6-Aminouracilen

Zusammenfassung. Reduktion der 6-Azidouracile **2** mit Wasserstoff/Palladium oder Natriumdithionit ergibt die entsprechenden 6-Aminouracile **5**, die auch durch Reaktion von **2** mit Triphenylphosphin und anschließende Hydrolyse erhalten werden können (*Staudinger*-Reaktion). Die Verwendung von Trimethylphosphit anstelle von von Trimethylphosphin ergibt mit **2b** das erwartete Trimethoxyphosphazin **3c**, während **2a** zum Phosphonoaminopyrimidin **4** reagiert. Die Synthesen der 5-Hydroxy-pyrido[2,3-*d*]pyrimidin-2,4,7-trione **6**, der Pyrido[2,3-*d*]pyrimidin-2,4,5-trione **8**, der Cyclopenta[*e*]pyrido[2,3-*d*]pyrimidin-2,4,5-trione **7a**,**c** und der Tetrahydro-pyrimido[4,5-*b*]chinolin-2,4,5-trione **7b**, **d** durch Kondensation der 6-Aminouracile **5** mit Malonat, Acetat, Ethyl-2-oxocyclopentancarboxylat und Ethylcyclohexancarboxylat werden beschrieben.

Introduction

The pyrido[2,3-*d*]pyrimidine ring system has found interest because of its biological activity [2]. In view of these interesting biological implications we aimed to

synthesize novel bicyclic compound which include an enolized 1,3-dicarbonyl moiety in the pyridine ring. The condensation of enamines or azomethines with malonic acid derivatives is a known reaction [3]. It was applied to 6-aminouracil derivatives which are typical heterocyclic enamines in order to synthesize pyrido[2,3-*d*]pyrimidines **6**, **7a**, **c**, and **8** and pyrimido[4,5-*b*] quinolines **7c**, **d** in one step. In the literature, a synthesis of pyrido[2,3-*d*]pyrimidines is described starting from 5-cyanoacetyl-6-aminouracils [4]. A similar system was obtained from the reaction of 6-glycopyranosylamino-pyrimidin-4-ones with malonic acids [5].

Results and Discussion

Pyrido[2,3-*d*]pyrimidines **6**, **7a**, **c**, and **8** and pyrimido[4,5-*b*]quinolines **7b**, **d** were synthesized in good to excellent yields by thermal reaction of 6-aminouracils **5** with the appropriate 1,3-dicarbonylic compounds. The 6-aminouracils **5** were prepared from the corresponding 6-azidouracils **2** using an adapted literature method [6]. Thus, the reduction of 6-azidouracils was performed catalytically with hydrogen or with sodium dithionite affording 6-amino uracils in 53–93% yield.

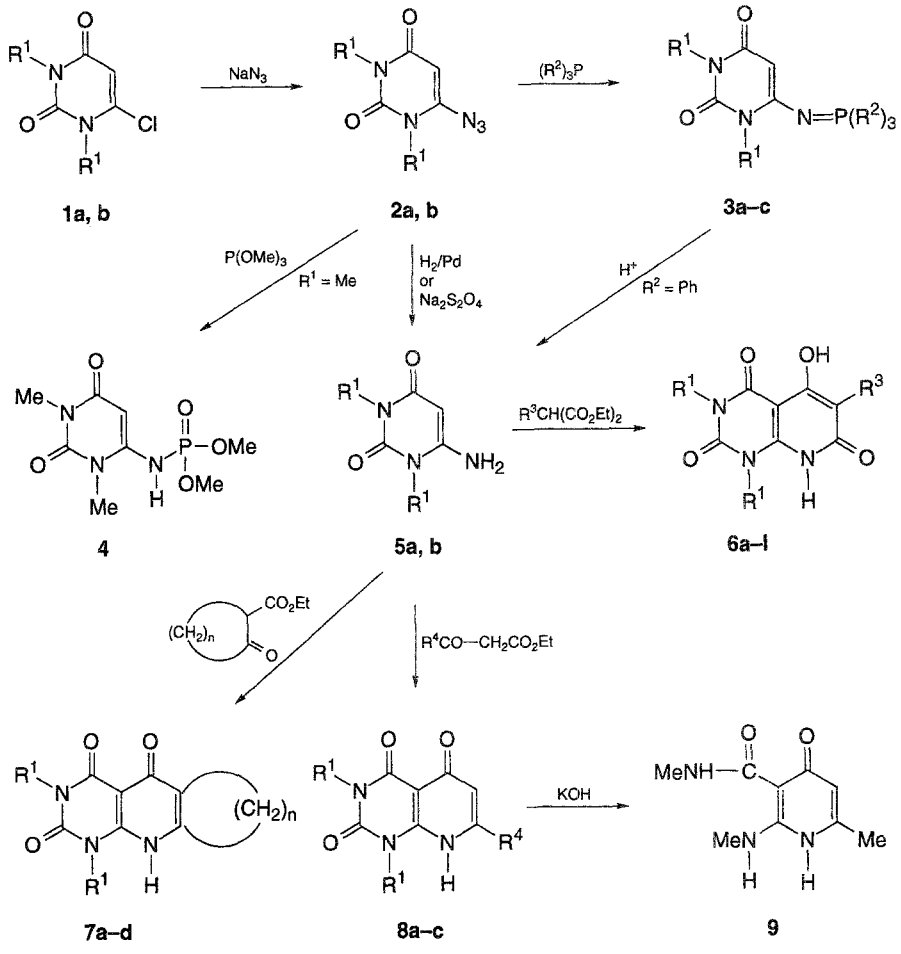
An elegant method for the reduction of azides to amines is offered by the *Staudinger* reaction [7] in which an azide reacts with a phosphane (or phosphite) to yield a phosphazine. Hydrolysis of the phosphazenes with aqueous acids or bases leads to the corresponding amines and the phosphane oxide [8]. We have applied this reaction to azidouracils and found that, as expected, **2a**, **b** reacts smoothly in toluene at reflux temperature with triphenylphosphane with evolution of nitrogen to yield the phosphazenes **3a**, **b** which, upon hydrolyzation, gave the aminouracils **5a**, **b**. Trimethylphosphite reacts with **2b** in methanol at room temperature to furnish 1,3-diphenyl-6-(trimethoxyphosphoranylideneamino)-pyrimidin-2,4-(1,3*H*)-dione (**3c**). The ^{1}H NMR spectrum of **3c** shows a doublet at $\delta = 3.60$ ppm for 9 aliphatic protons of the three methoxy groups. However, reaction of trimethylphosphite with **2a** under the same conditions does not yield a trimethoxylphosphoran ylidene derivative (such as **3c**), but affords 1,3-dimethyl-6-(dimethoxyphosphonoamino)-pyrimidin-2,4-(1,3*H*)-dione **4** in 31% yields. Its ^{1}H NMR spectrum shows a doublet at $\delta = 3.83$ ppm for the aliphatic protons of the methoxy groups and a signal at $\delta = 7.55$ ppm ($J = 1.2$ Hz) for the NH proton. The migration of an alkyl group from oxygen to the phosphazyl nitrogen in *Staudinger* products with the removal of the phosphonate group has been recently observed [7, 9]. Attempts to perform a similar rearrangement with compounds **3c** and **4** failed. When the reaction temperature was increased, only decomposition products could be obtained.

The synthesis of 5-hydroxy-1,3,6-trisubstituted-pyrido[2,3-*d*]pyrimidine-2,4,7-triones **6a–i** was achieved by condensation of 6-aminouracils **5a**, **b** with ethyl malonates at 220–250 °C using diphenyl ether as a solvent. Structural assignment by IR spectroscopy showed that **6** exists as 5-hydroxy tautomer rather than as 7-hydroxy tautomer; the latter structure would include a γ-pyridone system which should be indicated by carbonyl frequencies below 1600 cm^{-1} [10].

It has been reported in the literature [11] that 6-aminouracil **5a** reacts with an excess of ethyl acetoacetate to 5-oxo-pyrido[2,3-*d*]pyrimidine **8a** in 2% yield in presence of triethylamine at reflux temperature for 10 hours. In the present investigation it was found that thermal condensation of 6-aminouracils **5** with ethyl acetoace-

tate and ethyl benzoylacetate at 250 °C furnishes 5-oxo-pyrido[2,3-*d*] pyrimidines **8a–c** after a reaction time of 1 hour. The yields range between 88 and 92%, showing that no further activation step is necessary in this reaction. The structure of an isomeric 7-oxo-pyrido[2,3-*d*]pyrimidine could be excluded on behalf of the IR spectra (carbonyl absorptions below 1600^{-1} [10]). Alkaline hydrolysis of **8a** afforded the γ-pyridene derivative **9**.

In a similar manner, cyclic 1,3-dicarbonylic compounds were used to test this hypothesis. Thus, 1,3-disubstituted-7,8-dihydro-6*H*,9*H*-cyclopenta[*e*]pyrido[2,3-*d*]pyrimidine-2,4,5(1,3*H*)-triones **7a, c** and 1,3-disubstituted-6,7,8,9-tetrahydro-10*H*-pyrimido[4,5-*b*]quinoline-2,4,5(1,3*H*)-triones **7b, d** were synthesized by thermal reaction of 6-aminouracils **5** with ethyl 2-oxocyclopentane carboxylate and ethyl 2-oxo-cyclohexane carboxylate, respectively.



1, 2, 5	*R*
a	CH_3
b	C_6H_5

3	a	b	c
R^1	CH_3	C_6H_5	C_6H_5
R^2	C_6H_5	C_6H_5	OCH_3

Experimental

Melting points were obtained on a Gallenkamp melting point apparatus, Mod. MFB-595 (open capillary tubes). IR spectra (cm^{-1}) measured on a Perkin-Elmer 298 IR Spectrometer (KBr pellets). ^1H NMR spectra were recorded on a Varian Gemini 200 instrument (*TMS* as internal standard, δ in ppm). Microanalyses were performed on a C,H,N-Automat Carlo Erba 1106.

6-Azido-1,3-dimethylpyrimidin-2,4(1,3H)-dione (**2a**)

The preparation was accomplished as described in Ref. [12] from the corresponding 6-chlorouracil.

6-Azido-1,3-diphenylpyrimidene-2,4-(1,3H)-dione (**2b**)

The preparation was accomplished as described in Ref. [13] from the corresponding 6-chlorouracil.

1,3-Dimenthyl-6-(triphenylphosphoranylideneamino)-pyrimidin-2,4(1,3H)-dione (**3a**)

A solution of azidouracil **2a** (1.8 g, 10 mmol) and triphenylphosphane (2.6 g, 10 mmol) in 50 ml of toluene was refluxed for 30 min. Then the solvent was removed *in vacuo* and the resulting residue was digested with hot peroleum ether b.p. 60–80 °C). The obtained white precipitate was collected by filtration. Yield: 3.9 g (94%; reported yield: 63% [14]); white prisms; m.p.: 233–235 °C (ethanol; reported m.p.: 238 °C [14]); IR: 3060 m, 1680 s, 1630 s, 1580 w, 1430 s; ^1H NMR ($CDCl_3$): $\delta = 3.25$ (s, CH_3), 3.65 (s, CH_3), 4.6 (s, 5-H), 7.4–7.8 (m, 15 ArH); $C_{24}H_{22}N_3O_3P$ (415.4); calcd.: C 69.39, H 5.34, N 10.11; found: C 69.40, H 5.27, N 10.11.

1,3-Diphenyl-6-(triphenylphosphoranylideneamino)-pyrimidin-2,4(1,3H)-dione (**3b**)

A solution of azidouracil **2b** (0.6 g, 2 mmol) and triphenylphosphane (0.52 g, 2 mmol) in 10 ml of toluene was refluxed for 20 min. The crude product was obtained after working up as described for **3a**. Yield: 0.8 g (80%); white prisms; m.p.: 282–284 °C (ethanol); IR: 1700 sm 1650 s; $C_{34}H_{26}N_3O_3P$ (539.6); calcd.: C 75.68, H 4.86, N 7.79; found: C 75.46, H 4.87, N 7.74.

1,3-Diphenyl-6-(trimethoxyphosphoranylideneamino)-pyrimidin-2,4(1,3H)-dione (**3c**)

Trimethylphosphite (1.2 g, 10 mmol) was added slowly to a stirred solution of azido compound **2b** (3 g, 10 mmol) in 30 ml of methanol at room temperature. Vigorous reaction took place with evolution of nitrogen gas. After stirring for 30 min, the solvent was removed *in vacuo* and the residue was digested with water. The obtained yellowish white precipitate was filtered, washed with water, and dried. Yield: 2.3 g (57%); white prisms; m.p.: 167–168 °C (ethanol); IR: 1710 s, 1650 s, 1600 s; ^1H NMR ($CDCl_3$); $\delta = 3.60$ (d, 12 H, OCH_3), 5.4 (s, 5-H), 7.35–7.52 (m, 10 ArH); $C_{19}H_{20}N_3O_5P$ (401.4); calcd.: C 56.86, H 5.02, N 10.47; found: C 56.80, H 5.01, N 10.40.

1,3-Dimethyl 6-(dimethylphosphonoamino)-pyrimidin-2,4(1,3H)-dione (**4**)

Trimetylphosphite (1.2 g, 10 mmol) was added dropwise to a stirred solution of azido compound **2a** (1.8 g, 10 mmol) in 20 ml of methanol. After stirring for 2 hours at room temperature, the crude product was obtained after working up as described for **3c**. Yield: 0.8 g (31%); white prisms; m.p.: 188–189 °C (ethanol); IR: 3150 mb, 1705 s, 1650 s; ^1H NMR ($CDCl_3$): $\delta = 3.3$ (s, N–CH_3), 3.51 (s, N–CH_3), 3.8 (s, O–CH_3), 3.86 (s, O–CH_3), 5.5 (s, 5-H), 7.55 (d, $J = 1.2$ Hz, NH); $C_8H_{14}N_3O_5P$ (263.2);calcd.: C 36.15, H 5.36, N 15.97; found: C 36.26, H 5.27, N 15.90.

6-Amino-1,3-dimethylpyrimidin-2,4(1,3H)-dione (**5a**)

Method A: A solution of azidouracil **2a** (1.0 g) in 50 ml methanol was hydrogenated at room temperature for 1 hour in presence of 0.1 g of Palladium on charcoal (10%). The warmed solution was filtered from the catalyst and evaporated *in vacuo*. The white residue obtained was digested with a small amount of ethanol and filtered. Yield: 0.73 g (85%); white crystals; m.p.: 285–287 °C (ethanol); IR: 3400 m, 3325 m, 1660 s, 1630 s; ^{1}H NMR (*DMSO*-d_6): $\delta = 3.1$ (s, CH_3), 3.25 (s, CH_3), 4.7 (s, 5-H), 6.75 (bs, NH_2); $C_6H_9N_3O_2$ (155.2); calcd.: C 46.45, H 5.85, N 27.08; found; C 46.34, H 5.73, N 27.24.

Method B: To a suspension of azidouracil **2a** (0.5 g) in 40 ml of a methanol water mixture (1:1) sodium dithionite (about 1.5 g) was added portionwise while stirring and warming until a clear solution was obtained. After concentration and cooling, the obtained precipitate was filtered and dried. Yield: 0.25 g (58%); m.p.: 285–287 °C (ethanol).

Method C: A solution of iminophosphorane **3a** (4.2 g, 10 mmol) in 60 ml of glacial acetic acid containing 1 ml of trifluoroacetic acid and 10 ml of water was refluxed for 6 hours. After cooling, 100 ml of water were added and triphenylphosphin oxide is extracted with 3 portions of 10 ml benzene. The acetic acid – water layer was evaporated and the residue was digested with 5 ml of cold ethanol. Yield: 1.0 g (62%).

6-Amino-1,3-diphenylpyrimidin-2,4(1,3H)-dione (**5b**)

Method A: A solution of azido compound **2b** (1.4 g, 5 mol) in 50 ml of methanol was hydrogenated at room temperature for 30 min in presence of 0.2 g of palladium on charcoal (10%). The crude product was obtained after working up as described for **5a** (Method A). Yield: 1.3 g (93%); white prisms; m.p.: 278–280 °C ethanol; (279–281 °C [13]); IR: 3460 s, 3300 w, 3140 mb, 1710 s, 1635 sb; ^{1}H NMR ($CDCl_3$): $\delta = 4.7$ (s, NH_2), 5.15 (s, 5-H), 7.25–7.6 (m, 10 ArH); $C_{16}H_{13}N_3O_2$(279.3); calcd.: C 68.80, H 4.69, N 15.05; found: C 68.89, H 4.82, N 15.07.

Method B: From azidocompound **2b** (0.6 g) in 40 ml methanol-water mixture (1:1) and sodium dithionite (1.5 g) as described for **5a** (Method B). Yield: 0.3 g (53%).

Method C: A solution of iminophosphorane **3b** (5.4 g, 10 mmol) in 60 ml of glacial acetic acid containing 1 ml of trifluoroacetic acid and 10 ml of water was refluxed for 8 hours. The crude product was obtained after working up as described of **5a** (Method C). Yield: 17 g (61%).

General procedure for the preparation of 1,3-dimethyl/diphenyl-6-(unsubstituted, methyl, ethyl, n-butyl, phenyl, benzyl)-5-hydroxypyrido[2,3-d]pyrimidin-2,4,7(1,3,8H)-triones (**6**)

A mixture of aminopyrimidines **5a**, **b** (10 mmol) and the appropriate malonic ester (10 mmol) in diphenyl ether (10 g) was heated in an oil bath for 20–90 min to 220–250 °C using a short air condenser to remove the liberated ethanol (time and temperature, see Table 1). After cooling, the reaction mixture was digested with diethyl ether and petroleum ether, the obtained precipitate was filtered, washed with petroleum ether, and dried. Experimental data: Table 1; Spectroscopic data: Table 2.

7,8-Dihydro-6H,9H-cyclopenta[e]pyrido[2,3-d] pyrimidin-2,4,5-(1H,3H)-triones **7a** and **7c**

A mixture of aminopyrimidines **5a**, **b** (5 mmol) and ethyl 2-oxocyclopentane carboxylate (1.56 g, 10 mmol) in 5 g of diphenyl ether was heated at reflux for 1.5 hours. After cooling, the reaction mixture was digested with 20 ml of a 1:1 mixture of diethyl ether and petroleum ether. The obtained white precipitate was filtered, washed with petroleum ether, and dried. Experimental data: Table 3; spectroscopic data: Table 4.

Table 1. Experimental data of compounds **6**

	R^1	R^3	Time (min) Temp. (°C)	Yield (%)	Mp. (°C) Solvent	Molecular formula[a]
6a	CH_3	H	30 240–250	87	273–275 *DMF*/H_2O	$C_9H_9N_3O_4$ 223.2
6b	CH_3	CH_3	40 220–230	64	279–281 AcOH	$C_{10}H_{11}N_3O_4$ 237.2
6c	CH_3	C_2H_5	60 220–230	77	266–268 AcOH	$C_{11}H_{13}N_3O_4$ 251.2
6d	CH_3	C_4H_9	30 250	52	180–182 ethanol	$C_{13}H_{17}N_3O_4$ 279.3
6e	CH_3	C_6H_5	30 250	91	262–264 *DMF*	$C_{15}H_{13}N_3O_4$ 299.3
6f	CH_3	$CH_2C_6H_5$	60 250	72	240–242 ethanol	$C_{16}H_{15}N_3O_4$ 313.3
6g	C_6H_5	H	20 230–250	80	181–183 ethanol	$C_{19}H_{13}N_3O_4$ 347.3
6h	C_6H_5	CH_3	90 220–230	86	256–258 ethanol	$C_{20}H_{15}N_3O_4$ 361.3
6i	C_6H_5	C_2H_5	90 220–230	88	223–225 cyclohexane	$C_{21}H_{17}N_3O_4$ 375.4
6j	C_6H_5	*n*-C_4H_9	90 250	80	160–168 cyclohexane	$C_{23}H_{21}N_3O_4$ 403.4
6k	C_6H_5	C_6H_5	20 250	93	224–224 ethanol	$C_{25}H_{17}N_3O_4$ 423.4
6l	C_6H_5	$CH_2C_6H_5$	90 250	76	180–182 ethanol	$C_{26}H_{19}N_3O_4$ 437.5

[a] Satisfactory microanalyses obtained within $\pm 0.4\%$

6,7,8,9-Tetrahydro-10H-pyrimido[4,5-b]quinolin-2,4,5-(1,3H)-triones **7b** and **7d**

A mixture of aminopyrimidines **5a**, **b** (5 mmol) and ethyl 2-oxcyclohexane carboxylate (1.7 g, 10 mmol) in 5 g of diphenyl ether was heated at reflux for one hour. After cooling, the reaction mixture was digested with a 1:1 mixture of diethyl ether and petroleum ether. The obtained white precipitate was filtered, washed with petroleum ether, and dried. Experimental data: Table 3; Spectroscopic data: Table 4.

General procedure for the preparation of 1,3-dimethyl/diphenyl-7-substituted-8H-pyrido[2,3-d]pyrimidine-2,4,5(1,3H)-trione (**8**)

A mixture of aminopyrimidines **5a**, **b** (5 mmol) and ethyl acetoacetate, or ethyl benzoyl acetate (20 mmol) in 10 g of diphenyl ether was heated at reflux for one hour. After cooling, the reaction mixture was digested with diethyl ether (20 ml), filtered, washed with diethyl ether, and dried. Experimental data: Table 5; spectroscopic data: Table 6.

Table 2. Spectroscopic data of compounds **6**

	IR (KBr cm^{-1})	^1H NMR[a] (δ in ppm)
6a	3090 w, 2910 w, 1670 s, 1640 s	3.25 (s, N–CH_3), 3.50 (s, N–CH_3), 5.85 (s, 6-H), 11.85 (sb, NH), 12.30 (s, OH)
6b	2850–3100 wb, 1715 s, 1665 m.	
6c	2900–3000 wb, 1710 s, 1630 m	1.05 (t, J = 7.5 Hz, ethyl-CH_3), 2.5 (q, J = 8 Hz, ethyl-CH_2), 3.25 (s, N–CH_3), 3.50 (s, N–CH_3), 11.9 (sb, NH), 12.4 (s, OH)
6d	2980 w, 1720 s, 1670 w, 1620 m	0.95 (t, J = 7.5 Hz, CH_2), 1.4 (m, 2-CH_2), 2.55 (t, J = 7.5 Hz, CH_2), 3.42 (s, N–CH_3), 3.65 (s, N–CH_3), 12.55 (s, NH or OH)
6e	2900 wb, 1720 s, 1660 w, 1650 m	3.27 (s, N–CH_3), 3.5 (s, N–CH_3), 7.24–7.45 (m, ArH), 12.1 (sb, NH), 12.75 (s, OH)
6f	1710 s, 1675 s, 1635 s, 1610 w	3.25 (s, N–CH_3), 3.48 (s, N–CH_3), 3.88 (s, benzyl-CH_2), 7.1–7.25 (m, 5 ArH), 12.48 (sb, NH), 12.64 (s, OH)
6g	3300–3500 wb, 1720 w, 1610 w 1590 w	5.75 (s, 6-H), 7.2–7.6 (m, 10 ArH), 11.75 (sb, NH)
6h	3480 s, 1740 w, 1720 m, 1680 w, 1660 w, 1625 m	
6i	3300–3500 wb, 1770 m, 1660 m, 1630 s	1.1 (t, J = 6 Hz, ethyl-CH_3), 2.5 (q, J = 6 Hz, ethyl-CH_2), 7.2–7.6 (m, 10 ArH), 11.9 (sb, NH)
6j	3380–3480 mb, 2920–2960 wb, 1720 s, 1660 s, 1620 m	0.9 (t, J = 7.5 Hz, CH_3), 1.45 (m, CH_2), 2.5 (t, J = 8 Hz, CH_2), 7.25–7.8 (m, 10 ArH), 11.85 (sb, NH)
6k	3340–3500 wb, 3060 w, 2920 w, 1725 s, 1660 s, 1620 m	
6l	1725 s, 1670 s, 1620 m	3.85 (s, benzyl-CH_2), 7.1–7.56 (m, 15 ArH), 11.9 (sb, NH)

[a] Compds. **6a**, **6c**, **6e**, and **6f** were measured in *DMSO*-d_6, **6d**, **6g**, **6i**, **6j**, and **6l** in $CDCl_3$

Table 3. Experimental data of compounds **7**

	R'	n	Yield (%)	Mp. (°C) Solvent	Molecular formula[a]
7a	CH_3	3	64	148–150 ethanol	$C_{12}H_{13}N_3O_3$ 247.2
7b	CH_3	4	89	189–190 AcOH	$C_{13}H_{15}N_3O_3$ 261.3
7c	C_6H_5	3	78	205–207 ethanol	$C_{22}H_{17}N_3O_3$ 371.4
7d	C_6H_5	4	72	217–219 ethanol	$C_{23}H_{19}N_3O_3$ 385.4

[a] Satisfactory microanalyses obtained within $\pm$0.4%

Table 4. Spectroscopic data of compounds **7**

	IR (KBr cm^{-1})	^1H NMR ($CDCl_3$, δ in ppm)
7a	3350–3950 wb, 2980 wb, 1700 s, 1675 s, 1615 s, 1580 m	2.16 (pent, $J = 7$ Hz, CH_2), 3.0 (pent, $J = 7$ HZ, CH_2), 3.46 (s, N–H_3), 3.68 (s, N–H_3), 12.33 (s, NH)
7b	2970 m, 2870 w, 1710 s, 1660 s, 1620 s, 1585 m	1.95 (m, CH_2–CH_2), 2.64 (t, $J = 5$ Hz, CH_2), 2.84 (t, $J = 5$ Hz, CH_2), 3.4 (s, N–CH_3), 3.64 (s, N–CH_3), 12.16 (s, NH)
7c	2920 m, 1715 s, 1655 s, 1615 s, 1580 m	
7d	1720 s, 1615 s, 1620 m, 1585 m	

Table 5. Experimental data of compounds **8**

	R^1	R^4	Yield (%)	Mp. (°C) Solvent	Molecular formula[a]
8a	CH_3	CH_3	92 (Ref. [11]: 2%)	182–186 ethanol (Ref. [11]: 193 °C)	$C_9H_{11}N_3O_3$ 221.2
8b	CH_3	C_6H_5	89	238–240 AcOH	$C_{15}H_{13}N_3O_3$ 283.3
8c	C_6H_5	C_6H_5	88	219–220 AcOH	$C_{25}H_{17}N_3O_3$ 407.4

[a] Satisfactory microanalyses obtained within $\pm 0.4\%$

Table 6. Spectroscopic data of compounds **8**

	IR (KBr cm^{-1})	^1H NMR ($CDCl_3$, δ in ppm
8a	3060–3120 wb, 2960 w, 1695 s, 1660 s, 1580 m	2.5 (s, CH_3), 3.45 (s, N–CH_3), 3.6 (s, N–CH_3), 6.5 (s, 6-H), 12.1 (s, NH)
8b	3340–3500 wb, 1705 s, 1660 s, 1610 s, 1585 m	3.5 (s, N–CH_3), 3.8 (s, N–CH_3), 7.1 (s, 6-H), 7.5–7.6 (m, 3 ArH), 8–8.2 (m, 2 ArH), 12.2 (s, NH)
8c	3100–3260 wb, 1710 s, 1665 s, 1610 s, 1580 m	

2-Methylamino-3 (N-methylcarbamoyl)-5methyl-4(1H)-pyridone (**9**)

Compound **8a** (1.1 g, 5 mmol) was refluxed with intensive stirring in 20 ml of 40% potassium hydroxide for 6 hours. After cooling, the obtained clear solution was acidified with acetic acid. The obtained white precipitate was filtered, washed with water, and dried. Yield: 0.6 g (69%); mp.: 270–272 °C (ethanol); IR: 3100 wb, 1650 sb, 1580 m; ^1H NMR (*DMSO*-d_6): $\delta = 2.18$ (s, 6-CH_3), 2.75 (d, $J = 6$ Hz, NH–CH_3), 3.98 (d, $J = 6$ Hz, HN-CH_3), 5.7 (s, 5-H), 10 (s, NH), 10.65 (d, $J = 5$ Hz, 1 H, Me–NH), 11.15 (d, $J = 5$ Hz, 1 H, Me–NH); $C_9H_{13}N_3O_2$ (195.2); calcd.: C 55.37, H 6.71, N 21.52; found: C 55.12, H 6.62 N 21.31.

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