27. Synthesis of (5*R*,8*S*,10*R*)-6-(Allyloxy)- and (5*R*,8*S*,10*R*)-6-(Propyloxy)ergolines from the 6-Methyl Precursors

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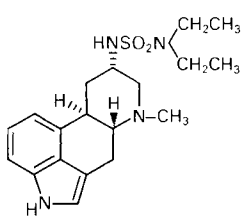
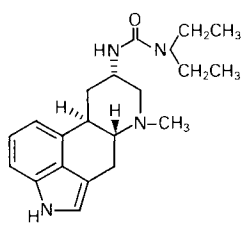
Novel (5*R*,8*S*,10*R*)-6-(allyloxy)- and (5*R*,8*S*,10*R*)-6-(propyloxy)ergolines have been synthesized by use of a *Meisenheimer* [2,3]-sigmatropic rearrangement of a (5*R*,8*S*,10*R*)-6-allyl-ergoline N^6-oxide as key step.

1. Introduction. – Much work has been devoted to the chemical modification of biologically active ergot alkaloids [1]. In recent years, a number of ergot compounds have been described as dopamine agonists and some of them, such as bromocriptine, pergolide, and lisuride have found use in the treatment of hyperprolactinemia, acromegaly, and *Parkinsonism*. We have chosen the potent dopaminomimetic ergot derivatives **1** (CQ 32-084) and **2** (DH-lisuride) for further chemical modification.



1 (CQ 32-084)

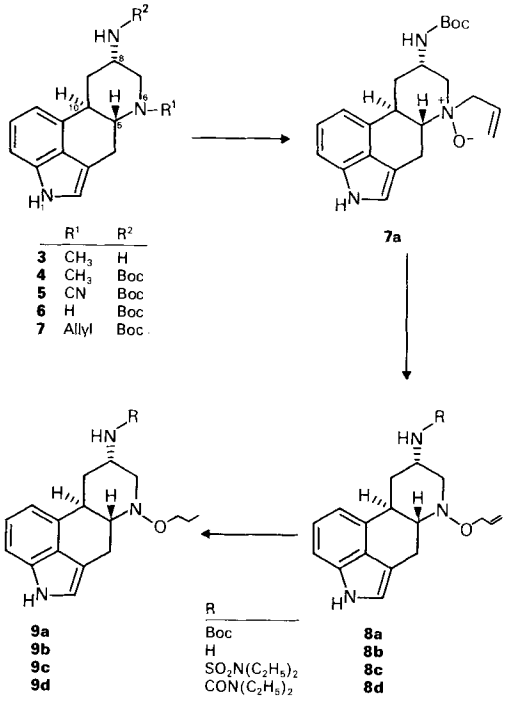


2 (DH-Lisurid)

Table. *Reaction Conditions and Chemical Yields*

Conversion	Conditions	Yield
3→**4**	$(Boc)_2O$, Et_3N, CH_3CN, 2 h, r.t.	97%
4→**5**	BrCN, $CHCl_3$, 65 h, r.t.	85%
5→**6**	*Raney*-Ni, H_2, DMF, 96 h, r.t.	65%
6→**7**	Allyl bromide, K_2CO_3, DMF, 96 h, r.t.	64%
7→**7a**→**8a**	a) *m*-Chloroperbenzoic acid, CH_2Cl_2, 1 h, −10°C; b) CH_3CN, 45 min, reflux	53%
8a→**9a**	H_2, 10% Pd/C, 16 h, r.t.	77%
8a→**8b**	CF_3COOH, 30 min, r.t.	59%
9a→**9b**		53%
8b→**8c**	Et_2NSO_2Cl, $CHCl_3$, 16 h, 50°C	29%
9b→**9c**		25%
8b→**8d**	Et_2NCOCl, $CHCl_3$, 16 h, 50°C	31%
9b→**9d**		33%

Scheme



We report here the successful application of a *Meisenheimer* [2,3]-sigmatropic rearrangement [2] on a (5*R*,8*S*,10*R*)-6-allyl-ergoline N^6-oxide, which has ultimately led to analogues of **1** and **2** where N^6 has become part of a substituted hydroxylamine function. The *Scheme* illustrates our synthesis, whereas reaction conditions and chemical yields are summarized in the *Table*.

2. Synthesis. – To generate the substrate for the *Meisenheimer* rearrangement, 8α-aminoergoline **3** [3] was first protected with $(Boc)_2O$ to give **4**, which was converted to ergoline **6** *via* **5** by an earlier developed modification of the *von Braun* degradation [4]. Alkylation to 6-allylergoline **7** (crystallized as hydrochloride) completed the first part of our synthesis. Oxidation of the free base **7** with *m*-chloroperbenzoic acid gave a polar product, presumably the N^6-oxide **7a**, which was not isolated but rearranged to 6-(allyloxy)ergoline **8a**. Catalytic hydrogenation of **8a** was surprisingly specific: the terminal double bond was hydrogenated without major cleavage of the N–O bond to yield 6-propyloxyergoline **9a**. The protecting group on the 8α-amino function was cleaved from both compounds **8a** and **9a** to give **8b** and **9b**, respectively, which were in turn converted to the derivatives **8c** and **9c** as well as **8d** and **9d** bearing the C(8) substituents of **1** and **2**, respectively.

The analytical data of all novel compounds are summarized in the *Table, Section 4.*

3. Pharmacological Evaluation. – Compounds **8c**, **8d**, **9c**, and **9d** were evaluated for their pharmacological activity. None of them inhibited ovum implantation in rats [5] at doses of 3 mg/kg s.c. (*cf.* **1** (CQ 32-084): ID_{50} = 0.028 mg/kg s.c. [6]). We conclude that the

modification of N^6 into a hydroxylamine function has completely abolished the dopamine-agonistic activity of **1** (CQ 32-084) and **2** (DH-lisuride) for two reasons: The N-atom of the novel hydroxylamine function in **8c**, **8d**, **9c**, and **9d** is no longer basic. The hydroxylamine derivative **9c** has a $pK_a < 3$ while the pK_a of **1** is *ca.* 6. The second reason for the loss of the dopamine-agonist activity might be the novel sidechain at N^6 with 4 atoms, while the introduction of a propyl substituent into position 6 of the ergoline skeleton brings an impressive potention of the dopaminometic action as demonstrated first with pergolide [7].

We thank *P. Graff* and *C. Holder* for their capable technical assistance in the synthetic work, *T. Zardin* for interpretation of NMR spectras and *H. R. Wagner* for pharmacological testing. Thanks are also due to Dr. *H. Braunschweiger* and *F. Seemann* for the supply of ample quantities of intermediates.

4. Analytical Data[1]). – *(5R,8S,10R)-8-(*tert*-Butoxycarbonylamino)-6-methylergoline* (**4**). M.p. 197–199°. $[\alpha]_D^{20} = +10°$ (*c* = 1.0, $CHCl_3$). IR ($CHCl_3$, 5%): 3480*m*, 3440*w*, 1700*s*, 1610*w*, 1495*s*. ^{1}H-NMR ($CDCl_3$): 1.46 (*s*), 1.61 (*td*, *J* = 12, 3, together 10 H, *t*-Bu, H_{ax}–C(9)); 2.17 (*td*, *J* = 12, 4, H–C(5)); 2.39 (*s*), 2.45 (part of *d*, together 4 H); 2.68 (*t*, *J* = 12), 2.75 (*d*, *J* = 12, together 2 H, H_{ax}–C(4), H_{eq}–C(9)); 2.87 (*d*, *J* = 12, H_{eq}–C(7)); 3.07 (*ca. t*, *J* = 12, H–C(10)); 3.38 (*dd*, *J* = 12, 4, H_{eq}–C(4)); 4.07 (br., H–C(8)); 5.58 (*d*, *J* = 8, NH); 6.86 (part of *d*), 6.89 (*s*, together 2 H, H–C(12), H–C(2)); 7.15 (*t*, *J* = 8), 7.18 (*d*, *J* = 8, together 2 H, H–C(13), H–C(14)); 7.95 (br., NH). MS (EI): 341 (52, M^+), 285 (88), 268 (31), 267 (29), 224 (78), 223 (100). Anal. calc. for $C_{20}H_{27}N_3O_2$ (341.45): C 70.4, H 8.0, N 12.3, O 9.4; found: C 70.6, H 8.3, N 12.1, O 9.1.

*(5R,8S,10R)-8-(*tert*-Butoxycarbonylamino)-6-carbonitril* (**5**). M.p. 236–238°. $[\alpha]_D^{20} = +54°$ (*c* = 0.52, $CHCl_3$/EtOH 1:1). IR ($CHCl_3$, 5%): 3480*m*, 3450*w*, 2215*s*, 1710*s*, 1605*w*, 1500*s*. ^{1}H-NMR ($CDCl_3$): 1.51 (*s*, *t*-Bu); 1.63 (*td*, *J* = 12, 3, H_{ax}–C(9)); 2.1–2.26 (*m*, 2 H); 2.34 (*t*, *J* = 12, H_{ax}–C(4)); 3.01 (*td*, *J* = 12, 4, H–C(10)); 3.26 (*d*, *J* = 12, H_{ax}–C(7)); 3.35 (*dd*, *J* = 12, 4, H_{eq}–C(4)); 3.60 (*d*, *J* = 12, H_{eq}–C(7)); 4.1 (br., H–C(8)); 5.21 (*d*, *J* = 6, NH); 6.79 (*d*, *J* = 8, H–C(12)); 6.95 (*s*, H–C(2)); 7.19 (*t*, *J* = 8, H–C(13)); 7.28 (*d*, *J* = 8, H–C(14)); 8.16 (br., NH). MS (FD): 352 (100, M^+). Anal. calc. for $C_{20}H_{24}N_4O_2$ (352.43): C 68.2, H 6.9, N 15.9, O 9.1; found: C 68.0, H 7.2, N 15.7, O 9.3.

*(5R,8S,10R)-8-(*tert*-Butoxycarbonylamino)ergoline* (**6**). Brownish foam. $[\alpha]_D^{20} = +27°$ (*c* = 0.23, $CHCl_3$). IR ($CHCl_3$, 5%): 2980*m*, 2945*m*, 2350*w*, 1700*s*, 2605*w*, 1495*s*. ^{1}H-NMR ($CDCl_3$): 1.45 (*s*), 1.64 (*td*, *J* = 12, 3, superimposed by br. signal, together 11 H, *t*-Bu, H_{ax}–C(9), NH(6)); 2.7–3.0 (*m*, 6 H); 3.09 (*d*, *J* = 12, 1 H); 4.02 (br., H–C(8)); 5.56 (br., NH); 6.83 (part of *d*), 6.84 (*s*, together 2 H, H–C(12), H–C(2)); 7.12 (*t*, *J* = 8), 7.16 (*d*, *J* = 8, together 2 H, H–C(13), H–C(14)); 7.90 (br., NH). MS (EI): 327 (5, M^+), 271 (36), 209 (61). Anal. calc. for $C_{19}H_{25}N_3O_2$ (327.42): C 69.7, H 7.7, N 12.8, O 9.8; found: C 69.4, H 8.0, N 12.6, O 9.8.

*(5R,8S,10R)-6-Allyl-8-(*tert*-butoxycarbonylamino)ergoline Hydrochloride* (**7**·HCl). M.p. 250° (dec.). $[\alpha]_D^{20} = -62°$ (*c* = 0.43, EtOH/H_2O 1:1). IR (free base, $CHCl_3$, 5%): 3480*m*, 3450*m*, 2860*w*, 2810*w*, 1700*s*, 1610*w*, 1495*s*. ^{1}H-NMR (free base, $CDCl_3$): 1.47 (*s*), 1.60 (*ca. t*, *J* = 12, together 10 H, *t*-Bu, H_{ax}–C(9)); 2.46–2.58 (*m*, 2 H); 2.65–2.8 (*m*, 2 H); 2.93 (*d*, *J* = 12, 1 H); 3.09 (*ca. t*, *J* = 12, H–C(10)); 3.32 (*dd*, *J* = 12, 5, H_{eq}–C(4)); 3.37–4.03 (*m*, CH_2); 4.05 (br., H–C(8)); 5.18 (*d*, *J* = 10, 1 H); 5.21 (*d*, *J* = 18, 1 H); 5.55 (*d*, *J* = 6, NH); 5.85–6.0 (*m*, CH=); 6.86 (part of *d*), 6.88 (*s*, together 2 H, H–C(12), H–C(2)); 7.14 (*t*, *J* = 8), 7.18 (*d*, *J* = 8, together 2 H, H–C(13), H–C(14)); 7.92 (br., NH). MS (EI): 367 (42, M^+), 311 (55), 249 (86). Anal. calc. for $C_{22}H_{30}ClO_2$ (403.95): C 65.4, H 7.5, N 10.4, O 7.9, Cl 8.8; found: C 65.4, H 7.4, N 10.2, O 8.0, Cl 8.6.

*(5R,8S,10R)-6-Allyloxy-8-(*tert*-butoxycarbonylamino)ergoline* (**8a**). M.p. 78–84°. $[\alpha]_D^{20} = +85.5°$ (*c* = 0.8, Py). IR (CH_2Cl_2, 5%): 3475*m*, 3440*w*, 1700*s*, 1605*w*, 1490*s*. ^{1}H-NMR ($CDCl_3$): 1.48 (*s*, 10 H, *t*-Bu, H_{ax}–C(9) (not visible)); 2.64 (*d*(*t*), *J* = 12, H_{eq}–C(9)); 2.7–2.84 (*m*, 3 H); 3.1–3.2 (*m*, 1 H); 3.43 (br. *d*, *J* = 12, H_{eq}–C(7)); 3.60 (*d*, *J* = 14, H_{eq}–C(4)); 4.18–4.25 (*m*, H–C(8)); 4.30 (*d*, *J* = 6, CH_2); 5.25 (*d*, *J* = 10, 1 H); 5.3–6.0 (*m*, NH) superimposed by 5.34 (*d*, *J* = 18, together 2 H); 5.94–6.07 (*m*, 1 H); 6.86 (*ca. d*, *J* = 8, H–C(12)); 6.89 (*s*, H–C(2)); 7.14 (*t*, *J* = 8, H–C(13)); 7.18 (*d*, *J* = 8, H–C(14)); 7.88 (br., NH). MS (EI): 384 (8), 383 (33, M^+), 327 (25), 326 (100),

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[1]) M.p.: *Büchi-SMP-20* apparatus; not corrected. ^{1}H-NMR: *Bruker Spektrospin WH 360* (360 MHz) with TMS (δ = 0.00 ppm) as internal standard, *J* [Hz] = coupling constant. MS: *AEI MS 30* or *Varian MAT 212* spectrometer (EI = electron ionisation, FD = field desorption); *m/z* (% relative abundance). IR ($\tilde{\nu}$ [cm^{-1}]): *Perkin Elmer 21*. $[\alpha]_D^{20}$: *Perkin Elmer 241 MC*.

325 (32), 311 (8), 310 (37), 287 (16), 286 (69). Anal. calc. for $C_{22}H_{29}N_3O_3$ (383.50): C 68.9, H 7.6, N 11.0, O 12.5; found: C 68.7, H 7.6, N 10.7, O 12.6.

(5R,8S,10R)-6-Allyloxy-8-aminoergoline (**8b**). M.p. 193–195°. $[\alpha]_D^{20}$ = +63.3° (*c* = 1.09, Py). IR (CH_2Cl_2, 5%): 3470*s*, 1605*w*, 1460*w*, 1450*w*, 1440*m*. ^{1}H-NMR ($CDCl_3$): 1.70 (*ca. t*, *J* = 12, H_{ax}–C(9)); 1.88 (br. *s*, NH_2); 2.46 (*ca. d*, *J* = 12, H_{eq}–C(9)); 2.66–2.86 (*m*, 3 H); 3.25–3.35 (*m*, H–C(10)); 3.48 (*ca. d*, *J* = 10, H_{eq}–C(7), H–C(8) (not visible)); 3.60 (*d*, *J* = 14, H_{eq}–C(4)); 4.31 (*d*, *J* = 8, 2 H); 5.22 (*d*, *J* = 10, 1 H); 5.32 (*d*, *J* = 18, 1 H); 5.96–6.08 (*m*, 1 H); 6.85 (*d*, *J* = 8, H–C(12)); 6.89 (*s*, H–C(2)); 7.14 (*t*, *J* = 8, H–C(13)); 7.18 (*d*, *J* = 8, together 2 H, H–C(14)); 7.90 (br. *s*, NH). MS (FD): 284 (22), 283 (100, M^+). Anal. calc. for $C_{17}H_{21}N_3O$ (283.38): C 72.1, H 7.5, N 14.8, O 5.6; found: C 71.7, H 7.7, N 14.2, O 6.0.

N-*[(5R,8S,10R)-6-(Allyloxy)ergoline-8-yl]*-N′,N′-*diethylsulfamide* (**8c**). M.p. 144–145°. $[\alpha]_D^{20}$ = +52.7° (*c* = 1.1, Py). IR (CH_2Cl_2, 5%): 3470*s*, 3380*w*, 1605*w*, 1460*w*, 1450*w*, 1440*m*, 1410*m*, 1330*s* (br.), 1140*s*. ^{1}H-NMR ($CDCl_3$): 1.22 (*t*, *J* = 8, 6 H); 1.57 (*ca. t*, *J* = 12, H_{ax}–C(9)); 2.63–2.82 (*m*, 4 H); 3.12–3.24 (*m*, H–C(10)); 3.32 (*q*, *J* = 8, 4 H); 3.47–3.64 (*m*, 2 H); 3.84–3.92 (*m*, H–C(8)); 4.29 (*d*, *J* = 8, 2 H); 5.04 (*ca. d*, *J* = 8, NH); 5.26 (*d*, *J* = 10, 1 H); 5.34 (*d*, *J* = 18, 1 H); 5.94–6.06 (*m*, 1 H); 6.82 (*ca. d*, *J* = 8, H–C(12)); 6.90 (*s*, H–C(2)); 7.15 (*t*, *J* = 8, H–C(13)); 7.20 (*d*, *J* = 8, together 2 H, H–C(14)); 7.90 (br. *s*, NH). MS (EI): 418 (11, M^+), 377 (16), 363 (9), 362 (30), 361 (100), 360 (22). Anal. calc. for $C_{21}H_{30}N_4O_3S$ (418.56): C 60.3, H 7.2, N 13.4, O 11.5, S 7.7; found: C 60.0, H 7.2, N 13.3, O 11.5, S 7.8.

N-*[(5R,8S,10R)-6-(Allyloxy)ergoline-8-yl]*-N′,N′-*diethylcarbamamide* (**8d**). M.p. 183–184°. $[\alpha]_D^{20}$ = +139.2° (*c* = 1.02, Py). IR (CH_2Cl_2, 5%): 3470*m*, 3250*w*, 1635*s*, 1505*s*, 1460*m*, 1450*m*, 1440*m*. ^{1}H-NMR (DMSO, 150°): 1.09 (*t*, *J* = 8, 6 H); 1.52 (*ca. t*, *J* = 12, H_{ax}–C(9)); 2.52–2.90 (*m*, 4 H and H_2O); 3.12–3.25 (*m*, H–C(10)) superimposed by 3.22 (*q*, *J* = 8, together 5 H); 3.36–3.50 (*m*, 2 H); 4.20 (br. *s*, H–C(8)); 4.28 (*d*, *J* = 8, 2 H); 5.18 (*d*, *J* = 10, 1 H); 5.30 (*d*, *J* = 18, 1 H); 5.50 (br. *s*, 1 H); 5.95–6.10 (*m*, 1 H); 6.71 (*d*, *J* = 8, H–C(12)); 6.92 (*s*, H–C(2)); 7.00 (*t*, *J* = 8, H–C(13)); 7.11 (*d*, *J* = 8, H–C(14)); 10.18 (br. *s*, NH). MS (EI): 383 (31), 382 (88, M^+), 342 (10), 326 (31), 325 (100), 324 (19). Anal. calc. for $C_{22}H_{30}N_4O_2$ (382.51): C 69.1, H 7.9, N 14.6, O 8.4; found: C 69.0, H 8.1, N 14.4, O 8.6.

*(5R,8S,10R)-8-(*tert-*Butoxycarbonylamino)-6-(propyloxy)ergoline* (**9a**). M.p. 87–92°. $[\alpha]_D^{20}$ = +80.2° (*c* = 1.14, Py). IR (CH_2Cl_2, 5%): 3470*m*, 3440*w*, 1700*s*, 1605*w*, 1490*s*. ^{1}H-NMR ($CDCl_3$): 0.98 (*t*, *J* = 8, 3 H); 1.48 (*s*, 10 H, *t*-Bu, H_{ax}–C(9) (not visible)); 1.57–1.68 (*m*, CH_2); 2.6–2.85 (*m*, 4 H); 3.08–3.20 (*m*, 1 H); 3.39 (*d*, *J* = 12, H_{eq}–C(7)); 3.61 (*d*, *J* = 12, H_{eq}–C(4)); 3.75 (*t*, *J* = 8, CH_2); 4.16–4.25 (*m*, H–C(8)); 5.35–5.45 (br., NH); 6.85 (part of *d*, H–C(12)) superimposed by 6.89 (*s*, together 2 H, H–C(2)); 7.14 (*t*, *J* = 8, H–C(13)), 7.18 (*d*, *J* = 8, together 2 H, H–C(14)); 7.88 (*s*, NH). MS (EI): 386 (6), 385 (27, M^+), 329 (30), 328 (100), 327 (10), 326 (63), 325 (36), 313 (8), 312 (50), 311 (48). Anal. calc. for $C_{22}H_{31}N_3O_3$ (385.51): C 68.5, H 8.1, N 10.9, O 12.5; found: C 68.4, H 8.3, N 10.6, O 12.8.

(5R,8S,10R)-8-Amino-6-(propyloxy)ergoline (**9b**). M.p. 183–184°. $[\alpha]_D^{20}$ = +61.20° (*c* = 1.29, Py). IR (nujol): 1600*w*, 1570*w*. ^{1}H-NMR (DMSO): 0.93 (*t*, *J* = 8, 3 H); 1.49 (*t(d)*, *J* = 12, H_{ax}–C(9)); 1.58 (*t*, *J* = 8, 2 H); 2.36 (*d*, *J* = 12, H_{ax}–C(7)); 2.46–2.54 (*ca. t*, H–C(5)); 2.62 (*d*, *J* = 10, H_{eq}–C(9)); 2.74 (*t*, *J* = 12, H_{ax}–C(4)); 3.20 (*ca. t*, *J* = 10, H–C(10)); 3.25–3.35 (*d*, *J* = 12, superimposed by *m*, H_{eq}–C(7), H–C(8)); 3.50 (*dd*, *J* = 12, H_{eq}–C(4)); 3.68 (*t*, *J* = 8, 2 H); 3.8–6.6 (br., NH_2); 6.71 (*d*, *J* = 8, H–C(12)); 6.95 (*s*, H–C(2)); 7.01 (*t*, *J* = 8, H–C(13)); 7.12 (*d*, *J* = 8, H–C(14)); 10.62 (*s*, NH). MS (FD): 286 (11), 285 (100, M^+). Anal. calc. for $C_{17}H_{23}N_3O$ (285.39): C 71.5, H 8.1, N 14.7, O 5.6; found: C 71.0, H 8.1, N 14.3, O 6.0.

N,N-*Diethyl*-N′-*[(5R,8S,10R)-6-(propyloxy)ergoline-8-yl]sulfamide* (**9c**). M.p. 142°. $[\alpha]_D^{20}$ = +63.3° (*c* = 1.09, Py). IR (CH_2Cl_2, 5%): 3450*m*, 3380*w*, 1605*w*, 1460*w*, 1450*w*, 1440*m*, 1410*m*, 1380*w*, 1320*m*, 1140*s*. ^{1}H-NMR ($CDCl_3$): 0.97 (*t*, *J* = 8, 3 H); 1.23 (*t*, *J* = 8, 6 H); 1.53 (part *ca. t*, H_{ax}–C(9)) superimposed by 1.65 (*q*, *J* = 8, together 3 H); 2.62–2.80 (*m*, 4 H); 3.12–3.24 (*m*, H–C(10)); 3.33 (*q*, *J* = 8, 4 H); 3.51 (*ca. d*, *J* = 12, H_{eq}–C(7)); 3.60 (*d*, *J* = 12, H_{eq}–C(4)); 3.73 (*t*, *J* = 6, 2 H); 3.83–3.90 (*m*, H–C(8)); 5.06 (*ca. d*, *J* = 9, NH); 6.83 (*d*, *J* = 8, H–C(12)); 6.90 (*s*, H–C(2)); 7.15 (*t*, *J* = 8, H–C(13)); 7.19 (*d*, *J* = 8, H–C(14)); 7.89 (*s*, NH). MS (EI): 421 (29), 420 (100, M^+), 363 (10), 362 (27), 361 (100), 360 (12). Anal. calc. for $C_{21}H_{32}N_4O_3S$ (420.58): C 60.0, H 7.7, N 13.3, O 11.4, S 7.6; found: C 59.8, H 7.6, N 13.2, O 11.6, S 7.9.

N,N-*Diethyl*-N′-*[(5R,8S,10R)-6-(propyloxy)ergoline-8-yl]carbamamide* (**9d**). M.p. 182°. $[\alpha]_D^{20}$ = +118.9° (*c* = 1.16, Py). IR (CH_2Cl_2, 5%): 3470*m*, 3250*w*, 1635*s*, 1500*s*, 1460*m*, 1445*m*, 1435*m*. ^{1}H-NMR (DMSO, 150°): 0.92 (*ca. t*, *J* = 8, 3 H); 1.09 (*ca. t*, *J* = 8, 6 H); 1.54 (br. *t*, *J* = 12, H_{ax}–C(9)) partially superimposed by 1.60 (*ca. q*, *J* = 8, together 3 H); 2.52–2.85 (*m*, 4 H and H_2O); 3.10–3.25 (*m*, H–C(10)) superimposed by 3.24 (*ca. q*, *J* = 8, together 5 H); 3.35–3.50 (*m*, 2 H); 3.70 (br. *s*, 2 H); 4.19 (br. *s*, H–C(8)); 5.50 (br. *s*, 1 H); 6.71 (*ca. d*, br., H–C(12)); 6.92 (*s*, H–C(2)); 7.00 (*ca. t*, br., H–C(13)); 7.61 (br. *d*, H–C(14)); 10.18 (br. *s*, NH). MS (EI): 385 (29), 384 (100, M^+), 326 (15), 325 (54), 324 (14). Anal. calc. for $C_{22}H_{32}N_4O_2$ (384.53): C 68.7, H 8.4, N 14.6, O 8.3; found: C 68.8, H 8.5, N 14.4, O 8.4.

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