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Simple, Facile, and One-Pot Conversion of the Baylis−Hillman Adducts into Functionalized 1,2,3,4-Tetrahydroacridines and Cyclopenta[*b*]quinolines

Deevi Basavaiah,* Jamjanam Srivardhana Rao, and Raju Jannapu Reddy

School of Chemistry, University of Hyderabad, Hyderabad 500 046, India

dbsc@uohyd.ernet.in

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Abstract: A simple, facile, and one-pot synthesis of functionalized 1,2,3,4-tetrahydroacridines and cyclopenta[*b*]-quinolines from the Baylis−Hillman alcohols, i.e., 2-[hydroxy-(2-nitroaryl)methyl]cycloalk-2-enones, is described.

The Baylis−Hillman reaction is an atom-economical, carbon−carbon, bond-forming reaction providing densely functionalized molecules whose applications in many organic transformation methodologies have been well documented.[1,2] Acridine moiety is an important structural unit present in many biologically important molecules such as amsacrine (cytotoxic, antiviral agent),[3a,b] botiacrine (antiparkinasonian drug),[3c,d] clomacran (tranquilizer),[3e,f] monometacrine (antidepressant),[3g,h] and in natural products such as plakinidine A and B[3i] and dercitin.[3j] Also, acridine derivatives have been employed or examined as antitumor agents,[3k] acetylcholinesterase inhibitors,[3l] anticancer agents,[3m] and DNA binding agents.[3n] Cyclopenta[*b*]quinoline derivatives are yet another class of important molecules which are found to possess biological properties such as antiinflammatory activity,[4a] antimalarial activity,[4b] and cholinesterase inhibition activity.[4c] Also, cyclopenta[*b*]quinoline moiety is present in certain natural products such as isoschizogaline[4d] and isoschizogamine.[4d,e] Therefore, development of simple and convenient methodologies for synthesis of acridine derivatives[3l,m,5a−h] and cyclopenta[*b*]quinoline derivatives[4b−d,5f−j] is an interesting and attractive endeavor in synthetic organic chemistry. In continuation of our interest in the synthesis of heterocyclic molecules with Baylis−Hillman chemistry,[6] we herein report a facile and one-pot synthesis of functionalized 1,2,3,4-tetrahydroacridines and cyclopenta[*b*]quinolines using the Baylis−Hillman adducts.

Applications of the Baylis−Hillman adducts for synthesis of quinolines, 1,4-dihydroquinolines, and quinoline *N*-oxides have been well demonstrated.[6f,7] However, literature survey reveals that there is no report on the synthesis of acridines and cyclopenta[*b*]quinolines with the Baylis−Hillman adducts. Recently, we have reported a simple synthesis of substituted quinolines from the

* To whom correspondence should be addressed. Fax: +91-40-23012460.

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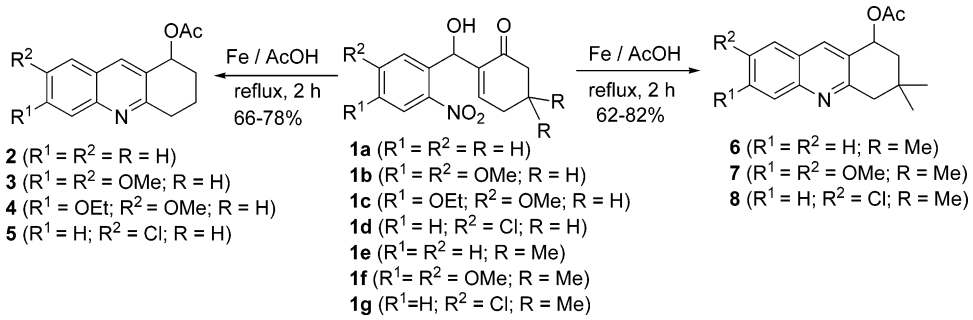
SCHEME 1. Reductive Cyclization of Baylis−Hillman Alcohols (1a−g) with Fe/AcOH into 1,2,3,4-Tetrahydroacridines

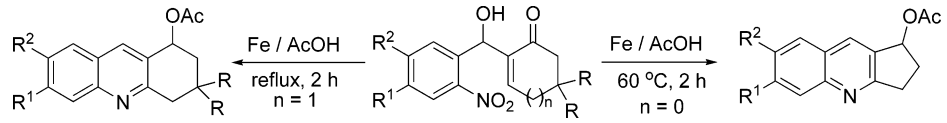


2 ($R^1 = R^2 = R = H$)
3 ($R^1 = R^2 = OMe$; $R = H$)
4 ($R^1 = OEt$; $R^2 = OMe$; $R = H$)
5 ($R^1 = H$; $R^2 = Cl$; $R = H$)

1a ($R^1 = R^2 = R = H$)
1b ($R^1 = R^2 = OMe$; $R = H$)
1c ($R^1 = OEt$; $R^2 = OMe$; $R = H$)
1d ($R^1 = H$; $R^2 = Cl$; $R = H$)
1e ($R^1 = R^2 = H$; $R = Me$)
1f ($R^1 = R^2 = OMe$; $R = Me$)
1g ($R^1 = H$; $R^2 = Cl$; $R = Me$)

6 ($R^1 = R^2 = H$; $R = Me$)
7 ($R^1 = R^2 = OMe$; $R = Me$)
8 ($R^1 = H$; $R^2 = Cl$; $R = Me$)

TABLE 1. Synthesis of Functionalized 1,2,3,4-Tetrahydroacridines and Cyclopenta[*b*]quinolines[a]



B-H alcohol	R^1	R^2	R	*n*	product[b]	yield[c] (%)	mp (°C)
1a	H	H	H	1	**2**[d]	73	71−73
1b	OMe	OMe	H	1	**3**[d]	76	98−100
1c	OEt	OMe	H	1	**4**[d]	66	58−61
1d	H	Cl	H	1	**5**	78	79−81
1e	H	H	Me	1	**6**[d,e]	82	62−64
1f	OMe	OMe	Me	1	**7**[d]	62	112−115
1g	H	Cl	Me	1	**8**[d]	80	124−126
1h	H	H	H	0	**9**	79	
1i	OMe	OMe	H	0	**10**[d]	63	108−111
1j	OEt	OMe	H	0	**11**	61	97−99
1k	H	Cl	H	0	**12**[d]	74	90−92

[a] All reactions were carried out on 1 mmol scale of Baylis−Hillman alcohol with Fe powder (6 mmol)/AcOH (5 mL) at reflux (for **1a**−**g**) or 60 °C (for **1h**−**k**) for 2 h. [b] **2**−**8** and **10**−**12** were obtained as solids while compound **9** was obtained as a viscous liquid. **2**−**12** were characterized by IR, ^{1}H NMR (200 MHz/400 MHz), ^{13}C NMR (50 MHz) spectral data and elemental analysis. [c] Yields of pure products (based on alcohols) after purification through silica gel column chromatography. [d] Structures of these molecules were further confirmed by mass spectral analyses. [e] The structure of this molecule was also established from the single-crystal X-ray data.

Baylis−Hillman adducts obtained from 2-nitrobenzaldehydes and acyclic enones, via the treatment with Fe/AcOH.[6f] It occurred to us that the Baylis−Hillman adducts derived from 2-nitrobenzaldehydes and cycloalk-2-enones could be easily transformed into acridines and cyclopenta[*b*]quinolines by treatment with Fe/AcOH in one-pot operation. In this direction, we first carried out the reaction of 2-[hydroxy(2-nitrophenyl)methyl]-cyclohex-2-enone (**1a**), Baylis−Hillman alcohol obtained from 2-nitrobenzaldehyde and cyclohex-2-enone, with Fe powder in AcOH. The best results were obtained when Baylis−Hillman alcohol **1a** was treated with Fe powder in acetic acid at reflux for 2 h, providing the desired product 1-acetoxy-1,2,3,4-tetrahydroacridine (**2**) in 73% yield (Scheme 1).

Encouraged by this result, we have successfully transformed representative Baylis−Hillman alcohols (B−H alcohols) (**1b**−**d**) obtained from various 2-nitrobenzaldehydes and cyclohex-2-enone via the treatment with Fe/AcOH at reflux for 2 h into the desired substituted 1-acetoxy-1,2,3,4-tetrahydroacridines (**3**−**5**) in 66−78% yields (Scheme 1, Table 1).

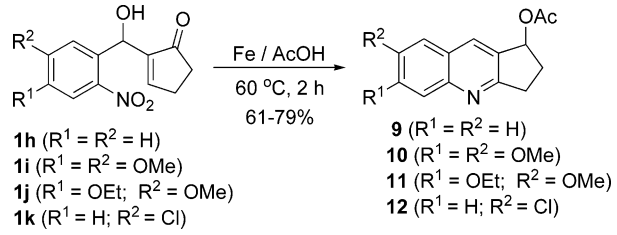
We have also transformed the Baylis−Hillman alcohols, 5,5-dimethyl-2-[hydroxy(2-nitroaryl)methyl]cyclohex-2-enones (**1e**−**g**), obtained from 5,5-dimethylcyclohex-2-enone and various 2-nitrobenzaldehydes, into the corresponding acridine derivatives (**6**−**8**), via the treatment with Fe/AcOH under reflux for 2 h, in 62−82% yields (Scheme 1, Table 1). In fact, we could obtain the single crystals for 1-acetoxy-3,3-dimethyl-1,2,3,4-tetrahydroacridine (**6**) and further confirmed the structure of this molecule **6** by the single-crystal X-ray data (see Supporting Information).

After developing a simple methodology for synthesis of acridine derivatives, we directed our attention toward the synthesis of cyclopenta[*b*]quinoline derivatives. Thus, we have successfully employed the Baylis−Hillman alcohols, 2-[hydroxy(2-nitroaryl)methyl]cyclopent-2-enones (**1h**−**k**), obtained from cyclopent-2-enone and various 2-nitrobenzaldehydes for the synthesis of 2,3-dihydro-1*H*-cyclopenta[*b*]quinolines (**9**−**12**) via treatment with Fe/AcOH at 60 °C for 2 h (the reaction was not clean at reflux temperature) in 61−79% yields (Scheme 2, Table 1).

A plausible mechanism for the formation of tetrahydroacridines and cyclopenta[*b*]quinolines is presented in Scheme 3. We have in fact proposed a similar mechanism for the formation of quinoline derivatives from the Baylis−Hillman adducts derived via the reaction of 2-nitrobenzaldehydes with alkyl vinyl ketones or acrylates.[6f]

We have also transformed representative acetates **2** and **3** into the corresponding alcohols, 1-hydroxy-1,2,3,4-tetrahydroacridine (**13**) and 6,7-dimethoxy-1-hydroxy-

SCHEME 2. Reductive Cyclization of Baylis−Hillman Alchols (1h−k) with Fe/AcOH into Cyclopenta[*b*]quinolines



1h ($R^1 = R^2 = H$)
1i ($R^1 = R^2 = OMe$)
1j ($R^1 = OEt$; $R^2 = OMe$)
1k ($R^1 = H$; $R^2 = Cl$)

9 ($R^1 = R^2 = H$)
10 ($R^1 = R^2 = OMe$)
11 ($R^1 = OEt$; $R^2 = OMe$)
12 ($R^1 = H$; $R^2 = Cl$)

1,2,3,4-tetrahydroacridine (**14**), by treating them respectively with aqueous K_2CO_3/MeOH (Scheme 4).

In conclusion, we have successfully developed a convenient, operationally simple, one-pot procedure for the synthesis of functionalized 1,2,3,4-tetrahydroacridines and cyclopenta[*b*]quinolines from Baylis−Hillman alcohols, thus demonstrating the application of Baylis−Hillman chemistry in synthetic organic chemistry.

Experimental Section:

Typical Experimental Procedure. 1-Acetoxy-1,2,3,4-tetrahydroacridine (2): To a stirred solution of Baylis−Hillman alcohol, i.e., 2-[hydroxy(2-nitrophenyl)methyl]cyclohex-2-enone (**1a**) (1 mmol, 0.247 g), in acetic acid (5 mL) was added Fe powder (6 mmol, 0.335 g) and the reaction mixture was heated under reflux for 2 h. Then the reaction mixture was cooled to room temperature and acetic acid was removed under reduced pressure. The reaction mixture was diluted with EtOAc (10 mL) and stirred for 2 min and filtered to remove any iron impurities. The insoluble iron residue was washed with EtOAc (10 mL). The filtrate and washings were combined and dried over anhydrous Na_2SO_4. Solvent (EtOAc) was removed under reduced pressure and the crude product thus obtained was purified by column chromatography (silica gel, 10% EtOAc in hexanes) to afford the desired 1-acetoxy-1,2,3,4-tetrahydroacridine **2** as a light yellow solid in 73% (0.176 g) yield; mp 71−73 °C; IR (KBr) 1726, 1620 cm^{-1}; ^1H NMR (400 MHz) δ 1.98−2.31 (m, 7H), 3.07−3.32 (m, 2H), 6.23 (t, 1H, $J = 5.2$ Hz), 7.48−7.54 (m, 1H), 7.68−7.75 (m, 1H), 7.80 (d, 1H, $J = 7.6$ Hz), 8.02 (d, 1H, $J = 8.8$ Hz), 8.14 (s, 1H); ^{13}C NMR δ 18.6, 21.3, 28.8, 32.9, 69.8, 125.8, 126.8, 127.7, 128.3, 128.8, 129.7, 136.6, 147.6, 158.5, 170.5; EIMS (*m*/*z*) 241 (M^+). Anal. Calcd for $C_{15}H_{15}NO_2$: C, 74.67; H, 6.27; N, 5.80. Found: C, 74.87; H, 6.26; N, 5.75.

1-Acetoxy-6,7-dimethoxy-1,2,3,4-tetrahydroacridine (3): yield 76%; mp 98−100 °C; IR (KBr) 1730, 1620 cm^{-1}; ^1H NMR (200 MHz) δ 1.88−2.29 (m, 7H), 2.91−3.30 (m, 2H), 3.99 (s, 3H), 4.01 (s, 3H), 6.17 (t, 1H, $J = 4.8$ Hz), 7.01 (s, 1H), 7.34 (s, 1H), 7.97 (s, 1H); ^{13}C NMR δ 18.6, 21.4, 28.9, 32.5, 55.9, 56.1, 70.0, 105.0, 106.8, 122.4, 126.8, 135.4, 144.7, 149.4, 153.0, 155.9, 170.7; LCMS (*m*/*z*) 302 ($M^+ + 1$). Anal. Calcd for $C_{17}H_{19}NO_4$: C, 67.76; H, 6.36; N, 4.65. Found: C, 67.87; H, 6.35; N, 4.67.

1-Acetoxy-6-ethoxy-7-methoxy-1,2,3,4-tetrahydroacridine (4): yield 66%; mp 58−61 °C; IR (KBr) 1707, 1622 cm^{-1}; ^1H NMR (200 MHz) δ 1.55 (t, 3H, $J = 7.4$ Hz), 1.90−2.29 (m, 7H), 2.90−3.28 (m, 2H), 3.98 (s, 3H), 4.25 (q, 2H, $J = 7.4$ Hz), 6.17 (t, 1H, $J = 4.8$ Hz), 7.00 (s, 1H), 7.31 (s, 1H), 7.95 (s, 1H); ^{13}C NMR δ 14.5, 18.8, 21.5, 29.0, 32.7, 56.0, 64.4, 70.1, 105.2, 107.8, 122.3, 126.8, 135.2, 145.0, 149.7, 152.3, 156.0, 170.8; EIMS (*m*/*z*) 315 (M^+). Anal. Calcd for $C_{18}H_{21}NO_4$: C, 68.55; H, 6.71; N, 4.44. Found: C, 68.39; H, 6.78; N, 4.41.

1-Acetoxy-7-chloro-1,2,3,4-tetrahydroacridine (5): yield 78%; mp 79−81 °C; IR (KBr) 1734, 1620 cm^{-1}; ^1H NMR (400 MHz) δ 1.94−2.27 (m, 7H), 2.99−3.11 (m, 1H), 3.15−3.25 (m, 1H), 6.15 (t, 1H, $J = 4.0$ Hz), 7.57 (dd, 1H, $J = 2.0$ and 8.8 Hz), 7.71 (d, 1H, $J = 2.0$ Hz), 7.90 (d, 1H, $J = 8.8$ Hz), 8.00 (s, 1H); ^{13}C NMR δ 18.6, 21.4, 28.8, 32.9, 69.8, 126.3, 127.5, 130.0, 130.8, 131.6, 135.7, 146.0, 159.0, 170.6. Anal. Calcd for $C_{15}H_{14}NO_2Cl$: C, 65.34; H, 5.12; N, 5.08. Found: C, 65.40; H, 5.09; N, 5.10.

1-Acetoxy-3,3-dimethyl-1,2,3,4-tetrahydroacridine (6): yield 82%; mp 62−64 °C; IR (KBr) 1732, 1622 cm^{-1}; ^1H NMR (200 MHz) δ 1.08 (s, 3H), 1.17 (s, 3H), 1.75−1.89 (m, 1H), 2.05−2.27 (m, 4H), 2.92 and 3.03 (ABq, 2H, $J = 17.2$ Hz), 6.25 (t, 1H, $J = 7.4$ Hz), 7.40−7.55 (m, 1H), 7.60−7.71 (m, 1H), 7.77 (d, 1H, $J = 7.8$ Hz), 8.00 (d, 1H, $J = 8.6$ Hz), 8.05 (s, 1H); ^{13}C NMR δ 21.3, 27.2, 30.3, 30.6, 41.7, 47.1, 69.5, 125.8, 126.9, 127.5, 128.0, 128.3, 129.5, 135.2, 147.5, 157.9, 170.7; EIMS (*m*/*z*) 269 (M^+). Anal. Calcd for $C_{17}H_{19}NO_2$: C, 75.81; H, 7.11; N, 5.20. Found: C, 75.88; H, 7.17; N, 5.19. Crystal data for **6**: empirical formula, $C_{17}H_{19}NO_2$; formula weight, 269.33; crystal color and habit, colorless, rectangular; crystal dimensions, $0.6 \times 0.5 \times 0.4$ mm^3; crystal system, triclinic; lattice type, primitive; lattice parameters, $a = 9.2092(9)$ Å, $b = 11.5236(12)$ Å, $c = 16.450(3)$ Å, $\alpha = 95.221(12)°$; $\beta = 106.244(13)°$; $\gamma = 113.528(9)°$; $V = 1495.4(4)$ $Å^3$; space group, $P\bar{1}$ (no. 2); $Z = 4$; $D_{calcd} = 1.196$ g/cm^3; $F_{000} = 576$; λ(Mo Kα) = 0.71073 Å; R ($I \geq 2\sigma_I$) = 0.0565, $wR^2 = 0.1353$. Detailed X-ray crystallographic data are available from the Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ, UK (for compound **6** CCDC No. 238062).

1-Acetoxy-6,7-dimethoxy-3,3-dimethyl-1,2,3,4-tetrahydroacridine (7): yield 62%; mp 112−115 °C; IR (KBr) 1732, 1622 cm^{-1}; ^1H NMR (200 MHz) δ 1.06 (s, 3H), 1.15 (s, 3H), 1.70−1.89 (m, 1H), 2.05−2.24 (m, 4H), 2.84 and 2.96 (ABq, 2H, $J = 16.6$ Hz), 3.99 (s, 3H), 4.01 (s, 3H), 6.22 (t, 1H, $J = 6.8$ Hz), 7.01 (s, 1H), 7.33 (s, 1H), 7.90 (s, 1H); ^{13}C NMR δ 21.2, 27.2, 30.1, 30.6, 41.7, 46.8, 55.76, 55.82, 69.6, 104.9, 107.0, 122.3, 125.9, 133.5, 144.7, 149.4, 152.7, 155.2, 170.7; LCMS (*m*/*z*) 330 ($M^+ + 1$). Anal. Calcd for $C_{19}H_{23}NO_4$: C, 69.28; H, 7.04; N, 4.25. Found: C, 69.16; H, 7.00; N, 4.29.

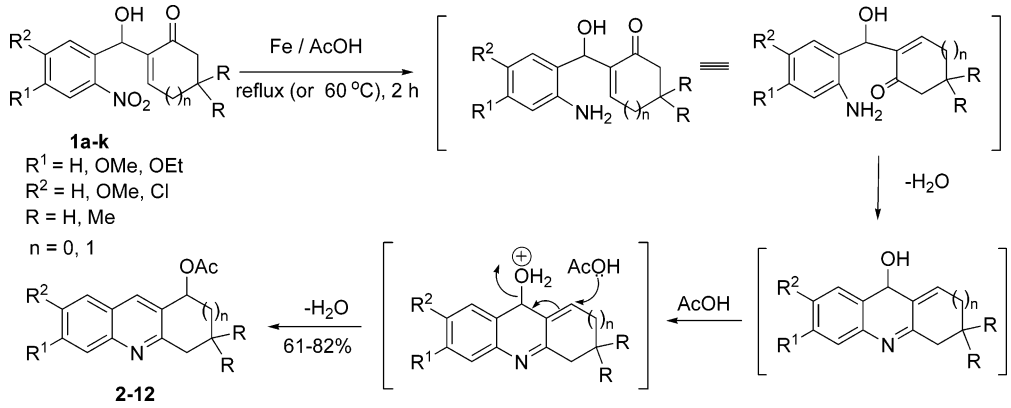
1-Acetoxy-7-chloro-3,3-dimethyl-1,2,3,4-tetrahydroacridine (8): yield 80%; mp 124−126 °C; IR (KBr) 1726, 1614 cm^{-1}; ^1H NMR (200 MHz) δ 1.07 (s, 3H), 1.16 (s, 3H), 1.71−1.90 (m, 1H), 2.06−2.31 (m, 4H), 2.88 and 2.99 (ABq, 2H, $J = 18.6$ Hz), 6.22 (t, 1H, $J = 6.8$ Hz), 7.59 (dd, 1H, $J = 1.8$ and 8.8 Hz), 7.76 (d, 1H, $J = 1.8$ Hz), 7.92 (d, 1H, $J = 8.8$ Hz), 7.96 (s, 1H); ^{13}C NMR δ 21.3, 27.3, 30.4, 30.7, 41.7, 47.1, 69.3, 126.2, 127.5, 129.2, 130.1, 130.5, 131.5, 134.2, 145.9, 158.4, 170.7; EIMS (*m*/*z*) 303 (M^+), 305 ($M^+ + 2$). Anal. Calcd for $C_{17}H_{18}NO_2Cl$: C, 67.21; H, 5.97; N, 4.61. Found: C, 67.49; H, 6.00; N, 4.58.

1-Acetoxy-2,3-dihydro-1*H*-cyclopenta[*b*]quinoline (9): To a stirred solution of Baylis−Hillman alcohol, 2-[hydroxy(2-nitrophenyl)methyl]cyclopent-2-enone (**1h**) (1 mmol, 0.233 g), in acetic acid (5 mL) was added Fe powder (6 mmol, 0.335 g) and the reaction mixture was heated at 60 °C for 2 h. Then the reaction mixture was worked up following the similar procedure as mentioned for **2** and the product thus obtained was purified by column chromatography (silica gel, 8% EtOAc in hexanes) to afford 1-acetoxy-2,3-dihydro-1*H*-cyclopenta[*b*]quinoline (**9**) as a viscous colorless liquid in 79% yield (0.179 g). IR (neat) 1736, 1626 cm^{-1}; ^1H NMR (400 MHz) δ 2.11 (s, 3H), 2.25−2.36 (m, 1H), 2.56−2.68 (m, 1H), 3.11−3.21 (m, 1H), 3.35−3.46 (m, 1H), 6.31−6.37 (m, 1H), 7.50−7.57 (m, 1H), 7.69−7.76 (m, 1H), 7.84 (dd, 1H, $J = 1.2$ and 8.4 Hz), 8.07 (d, 1H, $J = 8.4$ Hz), 8.22 (s, 1H); ^{13}C NMR δ 21.0, 30.5, 32.0, 75.5, 125.8, 127.0, 128.2, 128.6, 129.6, 132.8, 133.4, 148.8, 166.0, 170.8. Anal. Calcd for $C_{14}H_{13}NO_2$: C, 73.99; H, 5.77; N, 6.16. Found: C, 73.77; H, 5.82; N, 6.09.

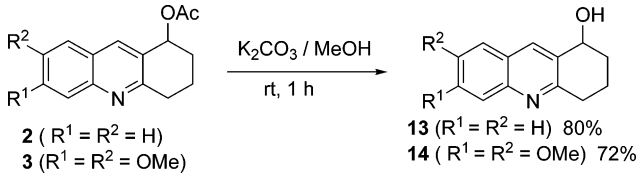
1-Acetoxy-2,3-dihydro-6,7-dimethoxy-1*H*-cyclopenta[*b*]quinoline (10): Yield 63%; mp 108−111 °C; IR (KBr) 1728, 1620 cm^{-1}; ^1H NMR (200 MHz) δ 2.07 (s, 3H), 2.17−2.35 (m, 1H), 2.47−2.69 (m, 1H), 2.97−3.16 (m, 1H), 3.25−3.44 (m, 1H), 3.99 (s, 3H), 4.02 (s, 3H), 6.28 (dd, 1H, $J = 3.6$ and 7.0 Hz), 7.05 (s, 1H), 7.39 (s, 1H), 8.04 (s, 1H); ^{13}C NMR δ 21.0, 30.4, 31.8, 55.8, 55.9, 76.0, 105.8, 107.4, 122.3, 130.9, 131.8, 145.9, 149.1, 152.6, 163.6, 170.8; EIMS (*m*/*z*) 287 (M^+). Anal. Calcd for $C_{16}H_{17}NO_4$: C, 66.89; H, 5.96; N, 4.87. Found: C, 67.08; H, 5.94; N, 4.91.

1-Acetoxy-2,3-dihydro-6-ethoxy-7-methoxy-1*H*-cyclopenta[*b*]quinoline (11): yield 61%; mp 97−99 °C; IR (KBr) 1730, 1620 cm^{-1}; ^1H NMR (200 MHz) δ 1.55 (t, 3H, $J = 6.8$ Hz), 2.08 (s, 3H), 2.16−2.36 (m, 1H), 2.49−2.70 (m, 1H), 2.99−3.20 (m, 1H), 3.24−3.47 (m, 1H), 3.99 (s, 3H), 4.26 (q, 2H, $J = 6.8$ Hz), 6.28 (dd, 1H, $J = 3.8$ and 6.8 Hz), 7.05 (s, 1H), 7.37 (s, 1H), 8.05

SCHEME 3. Reductive Cyclization of Baylis−Hillman Alcohols with Fe/AcOH: Mechanism



SCHEME 4. Hydrolysis of Acetates into Alcohols with Aqueous K_2CO_3/MeOH



(s, 1H); ^{13}C NMR δ 14.5, 21.2, 30.6, 31.9, 55.9, 64.3, 76.1, 105.9, 108.1, 122.3, 131.0, 132.0, 146.0, 149.5, 152.0, 163.7, 171.1. Anal. Calcd for $C_{17}H_{19}NO_4$: C, 67.76; H, 6.36; N, 4.65. Found: C, 67.51; H, 6.40; N, 4.63.

1-Acetoxy-7-chloro-2,3-dihydro-1*H*-cyclopenta[*b*]quinoline (12): yield 74%; mp 90−92 °C; IR (KBr) 1724, 1622 cm^{-1}; ^{1}H NMR (200 MHz) δ 2.09 (s, 3H), 2.18−2.38 (m, 1H), 2.52−2.73 (m, 1H), 3.05−3.21 (m, 1H), 3.28−3.48 (m, 1H), 6.29 (dd, 1H, J = 4.0 and 6.8 Hz), 7.63 (dd, 1H, J = 2.0 and 8.8 Hz), 7.79 (d, 1H, J = 2.0 Hz), 7.98 (d, 1H, J = 8.8 Hz), 8.10 (s, 1H); ^{13}C NMR δ 21.0, 30.6, 32.0, 75.4, 126.9, 127.8, 130.3, 130.5, 131.6, 132.4, 134.0, 147.4, 166.6, 170.8; EIMS (m/z) 261 (M^+), 263 (M^+ + 2). Anal. Calcd for $C_{14}H_{12}NO_2Cl$: C, 64.25; H, 4.62; N, 5.35. Found: C, 64.35; H, 4.67; N, 5.40.

1-Hydroxy-1,2,3,4-tetrahydroacridine (13): A mixture of 1-acetoxy-1,2,3,4-tetrahydroacridine (**2**) (0.5 mmol, 0.120 g) and K_2CO_3 (1.5 mmol, 0.207 g) in methanol (2 mL) containing a drop of water was stirred at room temperature for 1 h. The salts were removed by filtration and washed with methanol (2 × 5 mL). The filtrate and washings were combined. Solvent was removed and the crude product thus obtained was subjected to crystallization from methanol at 0 °C to provide 1-hydroxy-1,2,3,4-tetrahydroacridine (**13**) as a colorless solid in 80% (0.079 g) yield; mp 161−163 °C; IR (KBr) 3196 cm^{-1}; ^{1}H NMR (200 MHz) δ 1.84−2.33 (m, 5H), 3.05−3.23 (m, 2H), 4.95−5.10 (m, 1H), 7.41−7.56 (m, 1H), 7.61−7.74 (m, 1H), 7.78 (dd, 1H, J = 1.2 and 8.0 Hz), 7.99 (d, 1H, J = 8.6 Hz), 8.25 (s, 1H); ^{13}C NMR δ 19.0, 32.5, 33.1, 68.6, 125.9, 127.3, 127.7, 128.3, 129.5, 133.4, 135.4, 147.4, 158.5; LCMS (m/z) 200 (M^+ + 1). Anal. Calcd for $C_{13}H_{13}NO$: C, 78.36; H, 6.58; N, 7.03. Found: C, 78.49; H, 6.55; N, 7.10.

6,7-Dimethoxy-1-hydroxy-1,2,3,4-tetrahydroacridine (14): yield 72%; mp 133−136 °C; IR (KBr) 3119 cm^{-1}; ^{1}H NMR (200 MHz) δ 1.80−2.45 (m, 5H), 2.90−3.20 (m, 2H), 3.97 (s, 3H), 3.98 (s, 3H), 4.90−5.01 (m, 1H), 6.94 (s, 1H), 7.30 (s, 1H), 8.05 (s, 1H); ^{13}C NMR δ 19.0, 32.6, 32.8, 56.0, 56.1, 68.5, 105.0, 107.0, 122.7, 131.3, 134.0, 144.5, 149.4, 152.7, 155.8. Anal. Calcd for $C_{15}H_{17}NO_3$: C, 69.48; H, 6.61; N, 5.40. Found: C, 69.26; H, 6.64; N, 5.36.

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Supporting Information Available: ORTEP diagram for compound **6**, general experimental details, and ^{13}C NMR spectra of all products **2**−**14**; crystallographic information data file for **6** (CIF). This material is available free of charge via the Internet at http://pubs.acs.org.

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