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REACTION OF 3-AMINO-2-CYCLOHEXEN-1-ONES WITH DIBENZOYLETHYLENE: REGIOSELECTIVE SYNTHESIS OF 4-OXOTETRAHYDROINDOLES AND 5-OXOTETRAHYDROQUINOLINES

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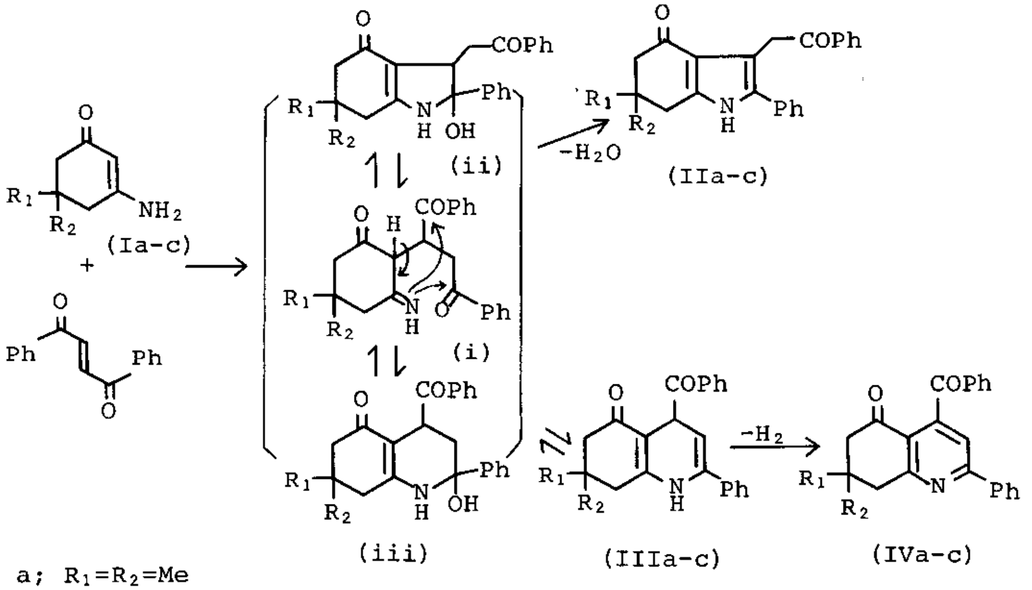
Reaction of 3-amino-2-cyclohexen-1-ones (Ia-c) with dibenzoylethylene gave either 4-oxotetrahydroindoles (IIa-c) or 5-oxotetrahydroquinolines (IVa-c) by the selection of reaction conditions.

The reaction of enaminoketone with 1,4-benzoquinone has been extensively investigated as the Nenitzescu indole synthesis.[1] However, there is no report on the reaction of enaminoketone with acyclic 1,2-diacylethylene,[2] which is expected to cyclize into both hydroindole and hydroquinoline rings. We are interested in the regioselective synthesis of hydroindole or hydroquinoline from the reaction of 3-amino-2-cyclohexen-1-one (I) with 1,2-diacylethylene. We now report that the reaction of (I) with dibenzoylethylene (DBE) gives an indole derivative (II) in acidic medium and gives a quinoline derivative (IV) under dehydrogenation condition. These reactions appear to offer a potentially useful synthetic method for the 2,3-disubstituted 4-oxotetrahydroindoles and 2,4-disubstituted 5-oxotetrahydroquinoline derivatives.

Treatment of the enaminoketone (Ia; $R_1=R_2=Me$) in acetic acid with DBE under reflux for 3 h gave a 47% yield of 3-benzoylmethyl-4,5,6,7-tetrahydro-6,6-dimethyl-4-oxo-2-phenylindole (IIa) [M^+ 357; ν_{max} 3440, 1680 and 1640 cm^{-1}; τ ($CDCl_3$) 0.95 (1H, bs), 1.8-2.1 (2H, m), 2.4-2.8 (8H, m), 5.47 (2H, s), 7.48 (2H, s), 7.83 (2H, s) and 8.94 (6H, s)], which is also obtained by prolonged heating in ethanolic solution.

The enaminoketone (Ia) was treated with DBE in ethanol under reflux in less than 4 h to give a 65% yield of 4-benzoyl-1,4,5,6,7,8-hexahydro-7,7-dimethyl-5-oxo-2-phenylquinoline (IIIa) [M^+ 357, ν_{max} 3450, 1680 and 1610 cm^{-1}; τ ($CDCl_3$) 1.8-2.1 (2H, m), 2.4-2.8 (8H, m), 3.52 (1H, bs), 4.69 (1H, d, J 5 Hz), 4.91 (1H, dd, J 5 and 1.5 Hz), 7.70 (2H, s), 7.84 (2H, s), 8.82 (3H, s) and 8.91 (3H, s)], which is readily dehydrogenated in the presence of 5% Pd-C in xylene to give an 84% yield of 4-benzoyl-5,6,7,8-tetrahydro-7,7-dimethyl-5-oxo-2-phenylquinoline (IVa) [M^+ 355; ν_{max} 1680 cm^{-1}; τ ($CDCl_3$) 1.8-2.7 (11H, m), 6.80 (2H, s), 7.50 (2H, bs) and 8.82 (6H, s)]. The quinoline (IVa) was also obtained in one-step in a 36% yield by directly refluxing in a solution of (Ia), DBE and 5% Pd-C in xylene. Thus, selection of reaction conditions was found to change the course (Ia)→(IIa) into (Ia)→(IVa).

Similar reactions to that employed for (Ia) converted (Ib; $R_1=Me$, $R_2=H$) and (Ic; $R_1=R_2=H$) to the corresponding 4-oxotetrahydrindoles (IIb,c) and 5-oxotetrahydroquinolines (IVb,c), respectively. The results are summarized in the Table.



a; $R_1=R_2=Me$

b; $R_1=Me$, $R_2=H$

c; $R_1=R_2=H$

	R_1	R_2	Conditions	Product	Yield(%)	mp(°C)
Ia	Me	Me	AcOH reflux 3 h	IIa	47	200-203
			EtOH reflux 2 days	IIa	40	200-203
			EtOH reflux 4 h	IIIa	65	178-182
			$(CH_3)_2C_6H_4$, Pd-C reflux 4 h	IVa	36	199-200
Ib	Me	H	AcOH reflux 5 h	IIb	50	189-191
			$(CH_3)_2C_6H_4$, Pd-C reflux 4 h	IVb	32	224-226
Ic	H	H	AcOH reflux 4 h	IIc	24	188-190
			$(CH_3)_2C_6H_4$, Pd-C reflux 5 h	IVc	23	175-177

REFERENCES

1 G.R. Aleen Jr, Org. Reactions, 1973, **20**, 337 and references therein.

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