PART I

Syntheses of amides, amines and aminoesters containing undec-10-enyl moiety

Peck and Rosenfield (24) reported that olefinic fatty acids were more powerful antifungal agents compared to saturated acids. Undecenoic acid and its zinc salts are still used as potent antifungal agents. Antifungal activity was also observed among amides (132,133), amines (134,135) and diamines (136-138). It was therefore considered desirable to prepare a number of amides (B) aminoesters (D) of undec-10-enolic acid as well as secondary and tertiary amines (E) containing 10-undecenyl group.

\[ \text{CH}_2-\text{CH}_3-(\text{CH}_2)_8\text{COCl} \]

\[ R, N=\text{CO}(\text{CH}_2)_8\text{CH}=\text{CH}_2 \]

\[ R', \text{O} \]

\[ \text{R}-\text{O-C}(\text{CH}_2)_8\text{CH}=\text{CH}_2 \]

\[ \text{R}-\text{N-}(\text{CH}_2)_9\text{CH}=\text{CH}_2 \]

\[ \text{R'} \]

The amides have been prepared by the usual manner i.e. by the interaction of an amine with undec-10-enoic acid chloride. The aminoesters were prepared by the interaction of the acid chloride with appropriate amino alcohol. Amines of the type (E) have been prepared by reduction of the corresponding amide (B) with LAH in ether. IR spectra of the compounds of the types (B) and (D) correspond to the characteristic groups. IR spectra of amines of the type (E) show the absence of carbonyl group and presence of \(-\text{NH}\) group in secondary amines. Most of the compounds were isolated as liquids and they corresponded well to the elemental analytical data.
Antifungal testing of some compounds was carried out at Bristol Laboratories, N.I. and Bose Research Institute, Calcutta.

In vitro antifungal activity was determined in the following procedure (343), against T. mentagrophytes, M. canis, C. neoformans and H. capsulatum by a two fold serial dilution method. The tests for determining the activity against T. mentagrophytes and M. canis were carried in Sabouraud's broth containing 50 mcg/ml streptomycin and 15 mcg/ml oxacillin, C. neoformans in antibiotic medium no.3 (Difco) and H. capsulatum in Salvins Y-P medium. Various concentrations (100, 50, 25, 12.5, 6.25, 3.12 and 1.56 mcg/ml) of the test compounds were prepared in medium suitable for the particular fungus organism.

For stock suspensions of the test cultures T. mentagrophytes and M. canis were grown on Sabouraud's dextrose agar slants at 28° for 7-10 days. The surface growth was taken up into 5 ml of sterile water, homogenized and diluted 500 folds with sterile water. C. neoformans was grown on Sabouraud's dextrose agar slants at 22° for 2 days. The surface growth was taken up in a similar manner as above and diluted 25 fold with sterile water. H. capsulatum was grown in Salvins Y-P semifluid medium at 22° for 7 days and 0.5 ml of surface growth was suspended in 25 ml of sterile H2O.

Stock suspensions of the test cultures thus prepared were used at the rate of 0.05 ml of inoculum per 2 ml of medicated broth. The solutions were incubated at 28° for 5 days for T. mentagrophytes and M. canis while C. neoformans and H. capsulatum at 37° for 2 and 4 days respectively.

The concentration (mcg/ml) at which there was no grossly detectable growth of the test organism after incubation for a suitable period at the desired temperature was expressed as MIC of the test compound.

Amphotericin B served as the sensitivity control.

The experimental results are shown in Table I.
### PHARMACOLOGY (Contd.)

**TABLE I**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>R</th>
<th>R'</th>
<th>Minimum in vitro inhibitory concentration (mcg/ml)</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>T. mentagrophytes</td>
</tr>
<tr>
<td>1</td>
<td>CH₅</td>
<td>H</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>C₂H₅</td>
<td>H</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>n-C₅H₇</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td>4</td>
<td>n-C₄H₉</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td>5</td>
<td>n-C₆H₁₃</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td>6</td>
<td>1-Indanyl</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td>7</td>
<td>1-(1,2,3,4-</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td></td>
<td>Tetrahydro-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>naphthyl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>C₆H₅OCOCH₂⁻</td>
<td>H</td>
<td>n</td>
</tr>
<tr>
<td>9</td>
<td>CH₅</td>
<td>CH₃</td>
<td>n</td>
</tr>
<tr>
<td>10</td>
<td>C₂H₅</td>
<td>C₂H₅</td>
<td>n</td>
</tr>
<tr>
<td>11</td>
<td>n-C₅H₇</td>
<td>n-C₅H₇</td>
<td>n</td>
</tr>
<tr>
<td>12</td>
<td>n-C₄H₉</td>
<td>n-C₄H₉</td>
<td>n</td>
</tr>
<tr>
<td>13a</td>
<td>(C₂H₅)₂NH₂CH₂⁻</td>
<td>H</td>
<td>n</td>
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</tbody>
</table>

*a = Exhibited weak local anesthetic activity.*

Contd....
TABLE I (Contd.)

Compounds Tested:  

\[
\text{RCO}_2(\text{CH}_2)_g\text{CH=CH}_2
\]

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>R \text{ or } R'</th>
<th>Minimum \textit{in vitro} inhibitory concentration (\text{mcg/ml})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T. mentagrophytes M. canis C. neoformans H. capsulatum</td>
</tr>
<tr>
<td>14</td>
<td>((\text{CH}_3)_2\text{NCH}_2\text{CH}_2) (-)</td>
<td>n n n n</td>
</tr>
<tr>
<td>15</td>
<td>((\text{CH}_3)_2\text{NCH}_2\text{CH(CH}_3)(-)</td>
<td>50 n n n</td>
</tr>
<tr>
<td>16</td>
<td>((\text{C}_2\text{H}_5)_2\text{NCH}_2\text{CH}_2) (-)</td>
<td>50 n n n</td>
</tr>
<tr>
<td>17</td>
<td>((\text{C}_2\text{H}_5)_2\text{N-(CH}_3)\3)(-)</td>
<td>n n n n</td>
</tr>
<tr>
<td>18</td>
<td>((\text{C}_4\text{H}_9)_2\text{N-CH}_2\text{CH}_2) (-)</td>
<td>50 n n n</td>
</tr>
</tbody>
</table>

\[
\text{RCO}_2(\text{CH}_2)_g\text{CH=CH}_2
\]

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>R \text{ or } R'</th>
<th>Minimum \textit{in vitro} inhibitory concentration (\text{mcg/ml})</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>T. mentagrophytes M. canis C. neoformans H. capsulatum</td>
</tr>
<tr>
<td>19</td>
<td>\text{CH}_3</td>
<td>50 50 n n</td>
</tr>
<tr>
<td>20\textbf{b}</td>
<td>\text{C}_2\text{H}_5</td>
<td>50 50 n 100</td>
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<td>\text{n-C}_3\text{H}_7</td>
<td>50 100 n 100</td>
</tr>
<tr>
<td>22</td>
<td>\text{n-C}_4\text{H}_9</td>
<td>100 100 n</td>
</tr>
<tr>
<td>23\textbf{c}</td>
<td>1-Indanyln (as HCl)</td>
<td>25 3.25 1.6 12.5</td>
</tr>
<tr>
<td>24</td>
<td>\text{CH}_3</td>
<td>50 50 n n</td>
</tr>
<tr>
<td>25</td>
<td>\text{C}_2\text{H}_5</td>
<td>50 50 n n</td>
</tr>
<tr>
<td>26</td>
<td>\text{n-C}_3\text{H}_7</td>
<td>50 50 50 100</td>
</tr>
<tr>
<td>27</td>
<td>\text{n-C}_4\text{H}_9</td>
<td>100 n n</td>
</tr>
<tr>
<td></td>
<td>Amphotericin B</td>
<td>6.25 0.25 1.0 0.5</td>
</tr>
</tbody>
</table>

n = \text{Not active below 100 mcg/ml}  
\textbf{b} = \text{Showed high cytotoxic activity}  
\textbf{c} = \text{Showed weak morphine antagonist activity.}
EXPERIMENTAL

Undec-10-enolic acid chloride (A):

The method followed was due to Kapp and Knoll (344). Undec-10-enolic acid (156.5 g) on reacting with thionyl chloride (106 g) over a period of one hour yielded the acid chloride, which was distilled under reduced pressure in a stream of dry N₂ gas. The yield was 80% (120 g); b.p. 114-116°/1.5 mm.

N-Methylundec-10-enamide (B; R = H, R' = CH₃):

Undec-10-enolic acid chloride (8 g; 0.04 mol) was added under stirring to 25% solution of methylamine (14 ml; 0.09 mol) at 10-15°. The stirring was continued for one hour more. The product was filtered, washed with water, dried and crystallised from alcohol in colourless needles, m.p. 44-45° (Literature m.p. 46°). The yield was 99% (7.5 g) (354).

N-Ethylundec-10-enamide (B; R = H, R' = C₂H₅):

Undec-10-enolic acid chloride (8 g; 0.04 mol) was added under stirring to 50% solution of ethyl amine (10 ml; 0.09 mol) at 10-15°. Stirring was continued for one hour more, the mass was acidified with dilute HCl and extracted with ether. The ethereal layer was washed successively with alkali, water and was finally dried over anhydrous Na₂SO₄. The product was distilled at 175°/3 mm. Crystallised from alcohol, m.p. 35-37°. The yield was 96% (8.0 g) (Literature m.p. 36°) (354).

N-n-Propylundec-10-enamide (B; R = H, R' = n-C₃H₇):

The amide was prepared from the acid chloride (8 g; 0.04 mol) and n-propylamine (5.31 g; 0.09 mol) in the same manner as described above. It distilled at 185°/1.5 mm. The yield was 81% (7.9 g). IR (Liquid film) 3380 (NH), 1680 cm⁻¹ (amide CO).

(Found: C, 74.61; H, 11.3; N, 6.4. C₁₄H₂₇NO requires C, 74.86; H, 12.0; N, 6.22%).
N-n-Butylundec-10-enamide \( (B; R = H, R' = n-C_4H_9) \):

The acid chloride \( (8 \text{ g}; 0.04 \text{ mol}) \) was allowed to react with \( n \)-butylamine \( (6.6 \text{ g}; 0.09 \text{ mol}) \). It distilled at 195°/1.5 mm. The yield was 90% (8.6 g). IR (Liquid film) 3380(NH), 1680 cm\(^{-1}\) (amide CO).

(Found: C, 74.9; H, 11.8; N, 5.5. \( C_{16}H_{29}O \) requires C, 75.3; H, 12.13; N, 5.8%).

N-n-Hexylundec-10-enamide \( (B; R = H, R' = n \)-hexyl) :

The acid chloride \( (8 \text{ g}; 0.04 \text{ mol}) \) was made to react with \( n \)-hexylamine \( (10.1 \text{ g}; 0.09 \text{ mol}) \) in usual manner. The amide distilled at 255°/2 mm. The yield was 90% (9.6 g). IR (Liquid film) 3380(NH), 1680 cm\(^{-1}\) (amide CO).

(Found: C, 75.3; H, 12.7; N, 5.6. \( C_{17}H_{35}O \) requires C, 76.4; H, 12.39; N, 5.24%).

N-(1-Indanyl)undec-10-enamide \( (B; R = H, R' = 1 \)-indanyl) :

To the mixture of 1-aminoindan \( (5.3 \text{ g}; 0.04 \text{ mol}) \) and triethylamine \( (6 \text{ g}; 0.06 \text{ mol}) \) in 100 ml of dry benzene was added the acid chloride \( (8 \text{ g}; 0.04 \text{ mol}) \) dissolved in 100 ml of dry benzene under thorough mechanical stirring. The temperature was maintained below 15° and the stirring was continued for one hour more. After the reaction was over the benzene layer was washed successively with dilute hydrochloric acid (2N), sodium hydroxide solution (IN), water and finally dried over anhydrous \( \text{Na}_2\text{SO}_4 \). Benzene was removed and the product was crystallised from rectified spirit, m.p. 60-61°. The yield was 80% (9.6 g). IR(Nujol) 3440(NH), 1680 cm\(^{-1}\) (amide CO).

(Found: C, 80.1; H, 9.41; N, 4.5. \( C_{20}H_{29}O \) requires C, 80.2; H, 9.69; N, 4.68%).

N-(1,2,5,4-Tetrahydronaphthyl)undec-10-enamide \( (B; R = H, R' = 1,2,3,4\)-tetrahydronaphthyl) :

The amide was prepared from 1,2,3,4-tetrahydronaphthylamine \( (5.8 \text{ g}; 0.04 \text{ mol}) \), triethylamine \( (6 \text{ g}; 0.06 \text{ mol}) \) and the acid chloride \( (8 \text{ g}; 0.04 \text{ mol}) \) in the same
manner as described above. It was crystallised from rectified spirit, m.p. 68°.
The yield was 55% (6.6 g). IR (Nujol) 3440 (NH), 1680 cm⁻¹ (amide CO).
(Found: C, 80.6; H, 9.5; N, 4.7. C₂₁H₃₁NO requires C, 80.5; H, 9.9; N, 4.47%).

Ethylundec-10-enovlaminocetate (B; R = H, R¹ = CH₃COOC₂H₅):

A mixture of glycine ethyl ester hydrochloride (5.6 g; 0.04 mol), triethylamine
(6 g; 0.06 mol) and the acid chloride (5.3 g; 0.04 mol) was allowed to react. The
product was taken up in benzene and was just acidified with dilute hydrochloric acid
(2N). The aqueous layer was drawn off and the benzene layer was washed with sodium
bicarbonate solution and water. It was finally dried over anhydrous Na₂SO₄. Solvent
was removed and the product was distilled at 195-197°/0.3 mm. The yield was 98%
(10.2 g). IR (Liquid film) 3450 (NH), 1730 (ester CO), 1690 cm⁻¹ (amide CO).
(Found: C, 66.4; H, 9.9; N, 5.5. C₁₅H₂₇NO requires C, 66.9; H, 10.03; N, 5.2%).

N-Dimethylandec-10-enamide (B; R = R¹ = CH₃):

The acid chloride (8 g; 0.04 mol) was added to 25% solution of dimethylamine
(16 ml; 0.09 mol) under thorough stirring and the product was isolated in the usual
manner. It distilled at 108°/2 mm; yield was 94% (7.9 g) (Literature 115-122°/1-2 mm)
(345).

N-Diethylundec-10-enamide (B; R = R¹ = C₂H₅):

The amide was prepared from the acid chloride (8 g; 0.04 mol) and diethylamine
(6.5 g; 0.09 mol) in an analogous manner. It distilled at 162-164°/1.5 mm; yield
was 73% (6.9 g) (Literature 145-150°/2 mm) (345).

N-di-Propylandec-10-enamide (B; R = R¹ = n-C₃H₇):

The amide was similarly prepared from the acid chloride (8 g; 0.04 mol) and
di-n-propylamine (9.0 g; 0.09 mol) in the usual way. It boiled at 181°/2.5 mm;
yield was 81% (8.6 g). IR (liquid film) 1680 cm⁻¹ (amide CO).
N-n-Di-butyl-10-undec-10-enamide (B; R = R' = n-C\textsubscript{4}H\textsubscript{9}):  
The acid chloride (8 g; 0.04 mol) was allowed to react with di-n-butylamine (11.52 g; 0.09 mol) in the usual way. The product was distilled at 190\degree/1.5 mm; yield was 86\% (10.1 g). IR (liquid film) 1680 cm\textsuperscript{-1} (amide CO).

(Found: C, 76.1; H, 12.31; N, 5.5. C\textsubscript{17}H\textsubscript{33}ON requires C, 76.4; H, 12.39; N, 5.24\%).

N-(2-Dimethylamino)ethyl-10-undec-10-enamide (B; R = H, R' = CH\textsubscript{2}CH\textsubscript{2}N(CH\textsubscript{3})\textsubscript{2}):  
The acid chloride (8 g; 0.04 mol) was added under stirring to 2-dimethylaminoethyl amine (11.5 g; 0.09 mol) at 15\degree. After the reaction was over the mass was basified with dilute sodium hydroxide solution (1N) and was extracted with ether. The ethereal layer was washed with water and dried over anhydrous Na\textsubscript{2}SO\textsubscript{4}. Ether was removed and the product was distilled at 199-200\degree/1 mm; yield was 90\% (10.1 g). IR (Liquid film) 3300 (NH), 1670 cm\textsuperscript{-1} (amide CO).

(Found: C, 77.01; H, 12.7; N, 5.1. C\textsubscript{19}H\textsubscript{37}ON requires C, 77.28; H, 12.5; N, 4.74\%).

N-(2-Dimethylaminooethyl)-10-undecenoate (D; R = CH\textsubscript{2}CH\textsubscript{2}N(CH\textsubscript{3})\textsubscript{2}):  
The acid chloride (8 g; 0.04 mol) was added under stirring at 10\degree to 2-dimethylaminoethanol (3.6 g; 0.04 mol). The ester distilled at 150-152\degree/0.8 mm; yield was 50\% (5.1 g). IR (Liquid film) 1725 cm\textsuperscript{-1} (ester CO).

(Found: C, 70.1; H, 11.6; N, 5.8. C\textsubscript{15}H\textsubscript{29}O\textsubscript{2}N requires C, 70.6; H, 11.3; N, 5.49\%).

1-Methyl-2-(dimethylaminoethyl)-10-undecenoate (D; R = (CH\textsubscript{3})\textsubscript{2}NCH\textsubscript{2}CH\textsubscript{3}):  
The ester was prepared from the acid chloride (8 g; 0.04 mol) and 1-methyl-2-dimethylaminoethanol (4.1 g; 0.04 mol) in a manner described above. It distilled at 175-177\degree/1 mm; yield was 77\% (8.3 g). IR (Liquid film) 1725 cm\textsuperscript{-1} (ester CO).

(Found: C, 71.6; H, 11.3; N, 5.5. C\textsubscript{16}H\textsubscript{31}O\textsubscript{2}N requires C, 71.4; H, 11.5; N, 5.2\%).
N-Diethylaminoethyl-10-undecenoate (D; R = \( \text{C}_2\text{H}_5 \))

The acid chloride (8 g; 0.04 mol) and diethylaminoethanol (4.6 g; 0.04 mol) yielded the ester. It distilled at 170°/1.5 mm; yield was 66% (7.5 g). IR (Liquid film) 1725 cm\(^{-1}\) (ester CO).

(Found: C, 72.5; H, 11.1; N, 5.1. \( \text{C}_{17}\text{H}_{33}\text{O}_2\text{N} \) requires C, 72.08; H, 11.8; N, 4.9%).

N-Diethylaminopropyl-10-undecenoate (D; R = \( \text{C}_2\text{H}_5 \))

The acid chloride (8 g; 0.04 mol) was added to diethylaminopropanol (4.1 g; 0.04 mol) in the usual way. The distillate was collected at 205°/1 mm; yield was 95% (11.4 g). IR (Liquid film) 1725 cm\(^{-1}\) (ester CO).

(Found: C, 72.4; H, 11.2; N, 5.1. \( \text{C}_{15}\text{H}_{36}\text{O}_2\text{N} \) requires C, 72.7; H, 11.8; N, 4.7%).

N-Di-n-butylaminoethyl-10-undecenoate (D; R = \( \text{n-C}_4\text{H}_{9} \))

The ester was prepared from the acid chloride (8 g; 0.04 mol) and di-n-butyraminoethanol (7 g; 0.04 mol) as usual. It boiled at 191-193°/0.8 mm; yield was 82% (11.1 g). IR (Liquid film) 1725 cm\(^{-1}\) (ester CO).

(Found: C, 74.1; H, 12.2; N, 4.4. \( \text{C}_{21}\text{H}_{41}\text{O}_2\text{N} \) requires C, 74.3; H, 12.0; N, 4.12%).

1-Methylaminoundec-10-ene (E; R = H, R\(^{1} \) = Me)

The amide (8; R = H, R\(^{1} \) = Me, 3.9 g; 0.02 mol) dissolved in anhydrous ether (30 ml) was added slowly into a suspension of LAH (1.14 g; 0.03 mol) in dry ether (100 ml). The mixture was refluxed for six hours. Excess LAH was then decomposed with water and the ethereal solution was extracted with dilute hydrochloric acid. The acid solution was basified and the liberated amine was extracted with benzene. The benzene solution was washed with water and dried over anhydrous \( \text{N}_2\text{SO}_4 \). The solvent was removed and the product was distilled at 95-97°/1.0 mm; yield was 70% (2.6 g).

IR (Liquid film) 3400 cm\(^{-1}\) (NH).

(Found: C, 78.1; H, 13.96; N, 7.8. \( \text{C}_{12}\text{H}_{25}\text{N} \) requires C, 78.6; H, 13.66; N, 7.65%).
1-Ethylaminoundec-10-ene (E; R = H, R* = C_{2}H_{5}) :

The amide (B; R = H, R* = C_{2}H_{5}; 4.2 g; 0.03 mol) was similarly treated with LAH (1.14 g; 0.03 mol). The desired amine was isolated in the usual way. The product was collected at 96-97\(^\circ\)/0.8 mm; yield was 70\% (2.7 g). IR (Liquid film) 3400 cm\(^{-1}\) (NH).

(Found: C, 73.8; H, 13.9; N, 7.4. \(C_{13}H_{27}N\) requires C, 73.1; H, 13.7; N, 7.1\%).

1-n-Propylaminoundec-10-ene (E; R = H, R* = n-C_{3}H_{7}) :

The amide (B; R = H, R* = n-C_{3}H_{7}; 4.5 g; 0.03 mol) was reduced with LAH (1.14 g; 0.03 mol) as described above. The product was isolated as usual and it distilled at 107-9\(^\circ\)/1 mm; yield was 70\% (2.9 g). IR (Liquid film) 3400 cm\(^{-1}\) (NH).

(Found: C, 79.5; H, 14.0; N, 6.9. \(C_{14}H_{29}N\) requires C, 79.6; H, 13.7; N, 6.6\%).

1-n-Butylaminoundec-10-ene (E; R = H, R* = n-C_{4}H_{9}) :

The amine was prepared from the amide (B; R = H, R* = n-C_{4}H_{9}; 4.8 g; 0.02 mol) and LAH (1.14 g; 0.03 mol) as usual. It distilled at 107-9\(^\circ\)/0.8 mm; yield was 72\% (3.2 g). IR (Liquid film) 3400 cm\(^{-1}\) (NH).

(Found: C, 80.6; H, 13.1; N, 6.5. \(C_{15}H_{31}N\) requires C, 80.0; H, 13.7; N, 6.2\%).

1-Indanylaminoundec-10-ene (E; R = H, R* = 1-indanyl) :

The amide (B; R = H, R* = 1-indanyl; 6.0 g; 0.02 mol) was reacted with LAH (1.14 g; 0.03 mol) in the usual manner. It distilled at 105-106\(^\circ\)/1.5 mm; yield was 70\% (4.0 g). Hydrochloride was crystallised from petroleum ether (40-60\(^\circ\)), m.p. was 98-99\(^\circ\). IR (Nujol) 3400 cm\(^{-1}\) (NH).

(Found: C, 74.1; H, 9.4; N, 4.7. \(C_{20}H_{32}NC\) (as hydrochloride) requires C, 74.8; H, 9.9; N, 4.55\%).
1-Dimethylaminoundec-10-ene (E; R = R' = CH₃):

The amide (B; R = R' = CH₃; 3.1 g; 0.01 mol) was reduced with LAH (0.6 g; 0.015 mol) as usual. It distilled at 105°/2.5 mm (Literature 89–91°/2 mm) (345).

1-Diethylaminoundec-10-ene (E; R = R' = C₂H₅):

The amine was prepared from the amide (B; R = R' = C₂H₅; 2.1 g; 0.01 mol) and LAH (0.6 g; 0.015 mol) in the usual manner. It distilled at 110–112°/1 mm (Literature 136–138°/11 mm) (345).

1-n-Dipropylaminoundec-10-ene (E; R = R' = n-C₃H₇):

The amide (B; R = R' = n-C₃H₇; 2.4 g; 0.01 mol) was treated with LAH (0.6 g; 0.015 mol) as usual. The product distilled at 127–129°/1.0 mm; yield was 93% (2.4 g).

(Found: C, 80.5; H, 13.7; N, 5.7. C₁₇H₃₅N requires C, 80.6; H, 13.8; N, 5.5%).

1-n-Dibutylaminoundec-10-ene (E; R = R' = n-C₄H₉):

The amide (B; R = R' = n-C₄H₉; 2.9 g; 0.01 mol) was reduced with LAH (0.6 g; 0.015 mol). It distilled at 146–148°/0.8 mm; yield was 72% (2.0 g).

(Found: C, 81.4; H, 13.5; N, 4.2. C₁₉H₃₉N requires C, 81.1; H, 13.8; N, 4.9%).