THE FATTY ACID COMPOSITION OF THE SURFACE SKIN FATS ('SEBUM') IN ACNE VULGARIS AND SEBORRHEIC DERMATITIS*


It has been contemplated that the sebum from subjects with skin diseases related to the seborrhoeic state (1) differs in composition from that of normal individuals. Two diseases, acne vulgaris and seborrhoeic dermatitis, thought to possess such an abnormal sebum, have been studied in an attempt to assess possible changes in composition. In an earlier publication Hodgson-Jones, MacKenna and Wheatley (2) demonstrated slight differences in the composition of the skin surface fats in seborrhoeic dermatitis, and calculated that the proportion of unsaturated acids was probably lowered, but the methods used did not permit a detailed analysis of these lipids. In the investigations described in this paper the detailed composition of the fatty acids has been studied and compared with results obtained with normal subjects (3).

EXPERIMENTAL

'Sebum'. All samples were collected from the back by the polyethylene cup method (3).

Fractionation and gas chromatography. The total fatty acids were separated from each specimen, methylated and submitted to analysis by gas chromatography as described in the preceding paper (3).

Dietary fats. The lipids were extracted from samples of beef, mutton and pork 'dripping' obtained on domestic roasting joints of these meats, and from plain chocolate. The fatty acids were isolated from the lipids after saponification; they were then methylated, using methanol and H2SO4, and submitted to analysis by gas chromatography.

Feeding experiments. A group of 3 hairless rats were maintained on a pellet diet, and samples of the skin surface fats were obtained by wiping the entire back of each rat several times with cotton wool swabs moistened with carbon tetrachloride. These specimens were collected twice a week for a period of 4 weeks. On the evening prior to collection of the surface fat, the back of each animal was cleaned thoroughly with swabs moistened with carbon tetrachloride. These swabs were discarded, and the animal was then placed in a clean cage until the sebum specimen had been collected. The swabs containing the surface fat specimen, obtained on one occasion from the whole group of rats, were placed in a Soxhlet extractor and the lipids extracted with carbon tetrachloride. The fatty acids from the isolated surface lipids were methylated using methanol and H2SO4 and analyzed on the gas chromatogram. At the end of the control period, about 7 gm. of plain chocolate per day was added to the diet of each rat and the surface lipid samples collected for a further period of 3 weeks. These were analyzed, and the results were compared with those obtained for the control period.

RESULTS

Acne vulgaris

'Sebum' fatty acid composition. Samples of the surface skin fats from 6 cases (4 men and 2 women) of untreated acne and 6 cases (3 men and 3 women) of treated acne were collected and the fatty acids analyzed. The detailed results of these analyses are shown in Table 1, and a summary of the proportions of the three main groups of acids is given in Table 2. These results, which have been presented as recommended in the preceding paper (3) show that there is no significant difference in composition between the fatty acids of the sebum of untreated acne subjects and those obtained from normal healthy subjects. Neither did any change occur on treatment. The untreated group of fatty acids showed, however, greater variations in both the a and b types of acids than did the treated group.

Effect of gonadotropin therapy. Three patients who received gonadotropin therapy for periods up to 13 weeks were studied. Measurement of the sebum level (2) of the back before and during
<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (yr.)</th>
<th>Sex</th>
<th>&lt;C&lt;sub&gt;12&lt;/sub&gt;</th>
<th>C&lt;sub&gt;12&lt;/sub&gt;</th>
<th>C&lt;sub&gt;14&lt;/sub&gt;</th>
<th>C&lt;sub&gt;16&lt;/sub&gt;</th>
<th>C&lt;sub&gt;18&lt;/sub&gt;</th>
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<td>0.3</td>
<td>0.4</td>
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<td>M</td>
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<td>0.05</td>
<td>0.7</td>
<td>0.4</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>3.7</td>
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<td>0.05</td>
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<td>0.4</td>
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<td>PC</td>
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<td>0.0</td>
<td>3.0</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
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<td>SS</td>
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**Untreated Subjects**

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<th>C&lt;sub&gt;14&lt;/sub&gt;</th>
<th>C&lt;sub&gt;16&lt;/sub&gt;</th>
<th>C&lt;sub&gt;18&lt;/sub&gt;</th>
<th>C&lt;sub&gt;8&lt;/sub&gt;</th>
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<td>M</td>
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<td>0.05</td>
<td>0.7</td>
<td>0.4</td>
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<td>0.5</td>
<td>0.4</td>
<td>3.7</td>
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<td>M</td>
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<td>0.1</td>
<td>0.7</td>
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<td>0.1</td>
<td>3.2</td>
</tr>
<tr>
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<td>M</td>
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<td>0.1</td>
<td>1.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>0.1</td>
<td>3.2</td>
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<tr>
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<td>F</td>
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<td>0.1</td>
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<td>0.1</td>
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<td>F</td>
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<td>0.4</td>
<td>0.3</td>
<td>0.1</td>
<td>4.3</td>
</tr>
<tr>
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<td>F</td>
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<td>0.0</td>
<td>1.4</td>
<td>0.4</td>
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<td>0.1</td>
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**Treated Subjects**

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<th>C&lt;sub&gt;14&lt;/sub&gt;</th>
<th>C&lt;sub&gt;16&lt;/sub&gt;</th>
<th>C&lt;sub&gt;18&lt;/sub&gt;</th>
<th>C&lt;sub&gt;8&lt;/sub&gt;</th>
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<td>M</td>
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<td>0.05</td>
<td>0.7</td>
<td>0.4</td>
<td>0.3</td>
<td>0.5</td>
<td>0.4</td>
<td>3.7</td>
</tr>
<tr>
<td>RH</td>
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<td>M</td>
<td>0.6</td>
<td>0.1</td>
<td>0.7</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
<td>0.1</td>
<td>3.2</td>
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<td>0.2</td>
<td>0.1</td>
<td>1.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>0.1</td>
<td>3.2</td>
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<tr>
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<td>F</td>
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<td>0.1</td>
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<td>0.3</td>
<td>0.3</td>
<td>0.1</td>
<td>4.4</td>
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**Mean**

- Untreated: 0.2, 0.1, 1.2, 0.4, 0.3, 0.4, 0.2, 3.4, 8.4, 2.5, 3.9, 5.1, 1.2, 22.4, 23.8, 4.8, 3.7, 1.2, 2.3, 11.3, 3.3
- Treated: 0.2, 0.1, 1.2, 0.4, 0.3, 0.4, 0.2, 3.4, 8.4, 2.5, 3.9, 5.1, 1.2, 22.4, 23.8, 4.8, 3.7, 1.2, 2.3, 11.3, 3.3
### TABLE 2
Composition of the principal groups of fatty acids of 'sebum' from the backs of subjects with acne vulgaris

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (yr.)</th>
<th>Sex</th>
<th>Percentage of Total Fatty Acids</th>
<th>a: n-saturated acids</th>
<th>b: Mono-unsaturated and single branched acids</th>
<th>c: Highly unsaturated and highly branched acids</th>
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</thead>
<tbody>
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<td>26</td>
<td>M</td>
<td>39.5</td>
<td>46.4</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>RH</td>
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<td>M</td>
<td>39.8</td>
<td>47.1</td>
<td>13.0</td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td>15</td>
<td>M</td>
<td>53.2</td>
<td>37.4</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td>LC</td>
<td>37</td>
<td>M</td>
<td>39.7</td>
<td>50.0</td>
<td>10.2</td>
<td></td>
</tr>
<tr>
<td>PC</td>
<td>25</td>
<td>F</td>
<td>43.5</td>
<td>46.4</td>
<td>10.2</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>20</td>
<td>F</td>
<td>46.5</td>
<td>42.9</td>
<td>10.5</td>
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</tr>
<tr>
<td>Range</td>
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<td></td>
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<td>9.4—14.0</td>
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<tr>
<td>Mean</td>
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<td></td>
<td>43.7 ± 5.0</td>
<td>45.0 ± 4.0</td>
<td>11.2 ± 1.3</td>
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<tr>
<td>Treated Subjects</td>
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<td>26</td>
<td>M</td>
<td>42.5</td>
<td>44.7</td>
<td>13.6</td>
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<tr>
<td>RH</td>
<td>25</td>
<td>M</td>
<td>43.8</td>
<td>44.8</td>
<td>11.4</td>
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<tr>
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<td>M</td>
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<td>42.6</td>
<td>11.1</td>
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<tr>
<td>CT</td>
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<td>F</td>
<td>42.6</td>
<td>47.5</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td>NE</td>
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<td>F</td>
<td>43.6</td>
<td>45.2</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>JR</td>
<td>18</td>
<td>F</td>
<td>41.2</td>
<td>47.7</td>
<td>11.0</td>
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<tr>
<td>Range</td>
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<td></td>
<td>41.2—46.3</td>
<td>42.6—47.7</td>
<td>9.9—13.6</td>
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</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>43.3 ± 1.6</td>
<td>45.4 ± 1.8</td>
<td>11.3 ± 1.5</td>
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<td>Normal Subjects*</td>
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<tr>
<td>Range</td>
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<td></td>
<td>37.5—53.8</td>
<td>37.6—51.4</td>
<td>9.4—15.7</td>
<td></td>
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<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>42.7 ± 4.4</td>
<td>46.1 ± 2.5</td>
<td>11.3 ± 1.8</td>
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</table>

* Boughton and Wheatley (3).

### TABLE 3
Variations in the sebum level of the backs of patients with acne vulgaris during treatment with gonadotropin

<table>
<thead>
<tr>
<th>Subject</th>
<th>Period of Treatment (weeks)</th>
<th>Sebum Level (g./sq. cm.)</th>
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<tbody>
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<td></td>
<td>3</td>
<td>93</td>
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<td></td>
<td>8</td>
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### TABLE 4
Composition of the principal groups of fatty acids of 'sebum' from the back of two male subjects with acne during treatment with gonadotropin

<table>
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<tr>
<th>Subject</th>
<th>Period (weeks)</th>
<th>a: n-saturated acids</th>
<th>b: Mono-unsaturated and single branched acids</th>
<th>c: Highly unsaturated and highly branched acids</th>
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<tbody>
<tr>
<td>MR</td>
<td>0</td>
<td>39.5</td>
<td>46.5</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>39.8</td>
<td>47.3</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>41.7</td>
<td>44.7</td>
<td>13.6</td>
</tr>
<tr>
<td>RH</td>
<td>0</td>
<td>39.7</td>
<td>47.4</td>
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<td>44.0</td>
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<td>8.5</td>
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<td></td>
<td>6</td>
<td>43.8</td>
<td>44.8</td>
<td>11.5</td>
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</table>
treatment was made on all three subjects and the results (shown in Table 3) show a decrease in one subject but no significant change in the other two. Analyses of the composition of the surface lipid fatty acids were also made on two of the subjects before and during treatment. The results (Table 4) show no change in composition as a result of treatment, though a marked clinical improvement was observed in each case.

**Effect of pregnancy.** Analyses were performed of the fatty acids isolated from the surface lipids obtained from an untreated acne subject during pregnancy. The results, shown in Table 5, show no significant alteration during pregnancy although there was definite clinical improvement of the acne.

### Table 5
Composition of the principal groups of fatty acids of 'sebum' from the back of an untreated acne subject during pregnancy

<table>
<thead>
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<th>Weeks Pregnant</th>
<th>Percentage of Total Fatty Acids</th>
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<td>a n-saturated acids</td>
<td>b Mono-unsaturated and single-branched acids</td>
<td>c Highly unsaturated and highly branched acids</td>
<td></td>
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<tr>
<td>5</td>
<td>43.5</td>
<td>46.4</td>
<td>10.2</td>
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<tr>
<td>9</td>
<td>43.5</td>
<td>46.4</td>
<td>10.1</td>
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<td>43.7</td>
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<td>10.5</td>
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<td>31</td>
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<td>44.3</td>
<td>9.4</td>
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### Table 7
Composition of the principal groups of fatty acids of 'sebum' from the backs of patients with seborrheic dermatitis before and after treatment

<table>
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<th>Subject</th>
<th>Sex</th>
<th>Sebum Level (μg./sq. cm.)</th>
<th>Percentage of Total Fatty Acids</th>
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<tr>
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<td>a n-saturated acids</td>
<td>b Mono-unsaturated and single-branched acids</td>
<td>c Highly unsaturated and highly branched acids</td>
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<td>37.7</td>
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<td>43.2</td>
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<td>Mean</td>
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<td>47.0 ± 10.1</td>
<td>28.6 ± 51.1</td>
<td>7.6 ±13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treated Subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BH</td>
<td>M</td>
<td>57</td>
<td>42.9</td>
<td>47.5</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>M</td>
<td>110</td>
<td>42.3</td>
<td>48.0</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>AS</td>
<td>M</td>
<td>53</td>
<td>39.1</td>
<td>51.9</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>DH</td>
<td>M</td>
<td>65</td>
<td>47.2</td>
<td>46.8</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>42.9 ± 3.3</td>
<td>46.8 ± 51.9</td>
<td>6.2 ±9.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Subjects*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>39.1—47.2</td>
<td>46.8—51.9</td>
<td>6.2—9.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>42.9 ± 3.3</td>
<td>46.8 ± 2.2</td>
<td>8.8 ± 1.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Boughton and Wheatley (3).
### TABLE 6

**Detailed composition of the total fatty acids from the 'sebum' of the backs of subjects with seborrheic dermatitis**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Sex</th>
<th>Percentage of Total Fatty Acids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>&lt;C₁₀</strong>&lt;br&gt;b</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>C₁₉</strong>&lt;br&gt;b</td>
</tr>
<tr>
<td>BH</td>
<td>M</td>
<td>0.1</td>
</tr>
<tr>
<td>CG</td>
<td>M</td>
<td>0.4</td>
</tr>
<tr>
<td>AS</td>
<td>M</td>
<td>0.1</td>
</tr>
<tr>
<td>DH</td>
<td>M</td>
<td>0.1</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>BH</td>
<td>M</td>
<td>0.1</td>
</tr>
<tr>
<td>CG</td>
<td>M</td>
<td>0.2</td>
</tr>
<tr>
<td>AS</td>
<td>M</td>
<td>1.8</td>
</tr>
<tr>
<td>DH</td>
<td>M</td>
<td>0.2</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>0.6</td>
</tr>
</tbody>
</table>
Seborrheic dermatitis

'Sebum' fatty acids. Analyses were made of the 'sebum' fatty acids from 4 subjects with seborrheic dermatitis before and after treatment. Detailed results of these analyses are given in Table 6 and a summary in Table 7. With one subject the proportion of unsaturated fatty acids was appreciably below normal before treatment and returned to normal after treatment, which resulted in marked clinical improvement. The other three patients showed normal values for these acids both before and after treatment, One of these patients, however, showed a low normal value for the C16b acid (Table 6) which returned to a normal value after treatment; there was also some indication that the highly branched and highly unsaturated group of acids were somewhat lowered as a result of treatment but no significance is attached to this observation.

TABLE 8
Percentage composition of the total fatty acids from some dietary fats

<table>
<thead>
<tr>
<th>Acid</th>
<th>Percentage of Total Fatty Acids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cholesterol fat</td>
</tr>
<tr>
<td>n-C18</td>
<td>0.2</td>
</tr>
<tr>
<td>n-C19</td>
<td>—</td>
</tr>
<tr>
<td>n-C20</td>
<td>—</td>
</tr>
<tr>
<td>Mono-enoic and iso*</td>
<td>—</td>
</tr>
<tr>
<td>C16</td>
<td>1.2</td>
</tr>
<tr>
<td>Mono-enoic and iso*</td>
<td>—</td>
</tr>
<tr>
<td>n-C14</td>
<td>0.2</td>
</tr>
<tr>
<td>Mono-enoic and iso*</td>
<td>—</td>
</tr>
<tr>
<td>C16</td>
<td>0.2</td>
</tr>
<tr>
<td>n-C16</td>
<td>25.5</td>
</tr>
<tr>
<td>Mono-enoic and iso*</td>
<td>—</td>
</tr>
<tr>
<td>C17</td>
<td>—</td>
</tr>
<tr>
<td>n-C17</td>
<td>—</td>
</tr>
<tr>
<td>Dienoic and polyiso*</td>
<td>—</td>
</tr>
<tr>
<td>C18</td>
<td>33.3</td>
</tr>
<tr>
<td>Mono-enoic and iso*</td>
<td>—</td>
</tr>
<tr>
<td>C18</td>
<td>5.3</td>
</tr>
</tbody>
</table>

*Iso-* indicates a single-branched acid and *polyiso-* a highly branched acid.

Bromination studies on certain specimens showed that the C16b peak consisted almost entirely of the unsaturated member, there was no indication of an increase in the branched member.

The effect of dietary fats on the composition of sebum. Certain dietary factors, in particular pork fat and chocolate, are known from clinical experience to aggravate acne. It is also known that the sebaceous glands, in addition to elaborating their own characteristic secretion, are capable of excreting certain lipids from the blood if these are ingested to excess. It is possible, therefore, that the action of these dietary factors in acne is to cause an alteration of the composition of the sebum. This problem has been studied in two ways.

Fatty acid composition of some dietary fats. Analyses have been made of the fatty acids from pork 'dripping' (selected because it represented a typical form in which pork fat would be ingested) and chocolate, and the results compared with analyses of the fatty acids from beef and mutton 'dripping'. The results, Table 8, failed to show striking differences in composition which could account for any acnegenic effect of these fats.

Effect of chocolate feeding on the 'sebum' fatty

TABLE 9
Comparison of the total fatty acid composition of the 'sebum' from normal and hairless rats

<table>
<thead>
<tr>
<th>Acid</th>
<th>Percentage of Total Fatty Acids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal rats*</td>
</tr>
<tr>
<td>n-C12</td>
<td>Trace</td>
</tr>
<tr>
<td>n-C13</td>
<td>Trace</td>
</tr>
<tr>
<td>Mono-enoic and iso-C14</td>
<td>3.1</td>
</tr>
<tr>
<td>n-C14</td>
<td>1.6</td>
</tr>
<tr>
<td>Mono-enoic and iso-C15</td>
<td>1.1</td>
</tr>
<tr>
<td>n-C15</td>
<td>0.8</td>
</tr>
<tr>
<td>Mono-enoic and iso-C16</td>
<td>6.8</td>
</tr>
<tr>
<td>n-C16</td>
<td>17.4</td>
</tr>
<tr>
<td>Mono-enoic and iso-C17</td>
<td>5.0</td>
</tr>
<tr>
<td>n-C17</td>
<td>3.1</td>
</tr>
<tr>
<td>Dienoic and polyiso*</td>
<td>4.8</td>
</tr>
<tr>
<td>C18</td>
<td>22.6</td>
</tr>
<tr>
<td>Mono-enoic and iso-C19</td>
<td>8.9</td>
</tr>
<tr>
<td>n-C19</td>
<td>3.1</td>
</tr>
<tr>
<td>Mono-enoic and iso-C20</td>
<td>4.1</td>
</tr>
<tr>
<td>Dienoic and polyiso-C20</td>
<td>6.8</td>
</tr>
</tbody>
</table>

* Values obtained by Wheatley and James (7).  
† See Table 8.
acids of the hairless rat. An attempt was made to demonstrate any possible alteration in the composition of sebum of an experimental animal as a result of chocolate feeding. The experimental animal selected was a genetically hairless strain of the rat, since with this animal it is possible to collect specimens of the skin surface lipids easily and without having to shave the skin prior to the sebum collection. An examination was first made of the composition of the surface fat of these animals so that its composition could be compared with that of the normal fur-bearing strains. The results (Table 9) show that the fatty acids of the skin surface lipids from the two different strains of rat have essentially the same composition. In order to establish that these rats possess sebaceous glands, Dr. F. J. Aumonier kindly made a histological examination of the skin of the hairless strain and reported the presence of numerous sebaceous glands (3). The composition of the fatty acids from the food pellets, which formed the main diet of these animals, was also studied with the results shown in Table 10. Results of the effect of chocolate feeding to these animals are given in Table 11. These show that the chocolate caused no detectable change in the fatty acid composition of the surface lipids.

**DISCUSSION**

Study of the fatty acid composition of the skin surface lipids in acne vulgaris, both before and after treatment, has failed to show any significant alteration which could indicate that the sebum secreted by these subjects was essentially different from that of normal individuals. There is some indication, however, that in some subjects with seborrheic dermatitis there is a significant reduction of the proportion of unsaturated acids. This may be due to a definite metabolic impairment, though it would also occur if the sebaceous activity of the subject was greatly below normal (4). Such a reduction in sebaceous activity could occur in the *nicca* type of seborrheic dermatitis, but there is, as yet, no experimental evidence for this. If the lower concentration of unsaturated acids is due to a definite metabolic defect in this condition, this is of interest since there is evidence that the unsaturated fatty acids of sebum play a role in the self-sterilization of the skin (5).

The results of this study of a few cases of seborrheic dermatitis is sufficiently encouraging to merit a wider study of the sebum fatty acid secretion in this condition, but the results with the cases of acne vulgaris are not sufficiently striking to warrant further investigations. Study of the fatty acids would reveal any general and widespread alteration of the composition of sebum, but would not reveal a small and more specific derangement of metabolic activity. Indeed, there is evidence that the change in acne vulgaris may be in the ketosteroid metabolism rather than in general lipid synthesis, for it has been claimed by Dubovii (6) that a marked increase of ketosteroid excretion through the sebaceous glands occurs in this condition. It is considered that future work on the sebaceous activity in acne vulgaris should attempt to find such a small but specific change or abnormality in sebum composition, since the present work has indicated that an overall change in composition does not occur.
Analysis of dietary fats has failed to give any clue to the mode of action of pork fat and chocolate in aggravating acne vulgaris. There is no evidence that chocolate fats, when fed in moderate amounts, are excreted through the sebaceous glands. It is more likely that the action of chocolate in acne vulgaris is as a follicular irritant rather than having any direct influence on sebum composition.

**SUMMARY**

1. Analysis of the composition of the skin surface lipid fatty acids from subjects with acne vulgaris, both before and after treatment, failed to reveal any abnormality in sebum composition in this disease. In one of four cases of seborrhoeic dermatitis, however, the proportion of unsaturated acids in the sebum was significantly lower than the values for normal subjects, with a return to more normal values after treatment.

2. Analysis of dietary fats and feeding experiments of chocolate to hairless rats has failed to show that the deleterious action of chocolate and pork fat in acne vulgaris is due to alteration of the sebum composition by these fats.

3. The significance of these findings has been discussed.

The authors wish to thank the Treasurer and the Board of Governors of this Hospital for grants which have defrayed some of the expenses of these investigations.

**REFERENCES**


