INTRODUCTION

Today it is evident that the use of sunscreen is necessary to prevent not only sunburn but also skin cancer. In recent years there has been an increased interest in the use of antioxidants, and their use in combination with sunscreens can provide advantages to sunscreen formulations. Melatonin is an antioxidant which scavenges and detoxifies Reactive Oxygen Species (ROS) (1) and able to suppress ultraviolet (UV)-induced damage to skin cells and shows strong antioxidant activity in UV exposed cells (2). Considering these relevant biological properties and its extremely low toxicity, melatonin could be candidate as a drug for several diseases and presently it is indicated for therapeutic applications. The aim of this study was to evaluate if the presence of a solar filter in combination with melatonin in different formulations influences in permeation and retained amounts in skin of melatonin, and to evaluate the influence of this hormone in the antioxidant activity of these formulations.

MATERIALS AND METHODS

Materials
- Melatonin
- Excipients: Benzophenone-3 (3-Bph), Octyl salicylate (OS), Octyl methoxycinnamate (OMC), Perhydroescaulen, Medium chain triglycerides and Montanov®86.
  - 2,2-diphenyl-2-picyrylhydraylate (DPPH).

Methods:
There were elaborated 3 different glucidic emulsions using perhydroescaulen, medium chain triglycerides and Montanov®86, a 5% of a solar filter (Octyl salicylate, Octyl methoxycinnamate or Benzophenone-3) and a 1% of melatonin.
- In vitro permeation studies: Franz diffusion cells of 2.54 cm². Human abdominal skin (0.4 mm). Temperature: 32±0.5°C. Samples obtained at 24 and 50h.
- Skin retention study: Temperature of 32±0.5°C for 24h in different extraction medium by ultrasound technique.
- Antioxidant activity: DPPH radical scavenging assay: Samples measured at 515 nm on a UV/visible light spectrophotometer. Samples were kept in the dark for 30 min at room temperature. (3)
- Statistical analysis: All the results were compared by non-parametric analysis (Kruskall-Wallis) with a significance level of 0.05.

RESULTS AND DISCUSSION

Tables 1 and 2: (1) Quantities of Melatonin (µg) permeated at each time for the 3 formulations, expressed by mean and (2) Non parametric test of Kruskall-Wallis

<table>
<thead>
<tr>
<th>Formulation</th>
<th>C(µg)</th>
<th>Skin weight (g)</th>
<th>Drug (mg/100g)</th>
<th>Drug % (mg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT + OS</td>
<td>3.34E+01</td>
<td>1.14E+02</td>
<td>1.14E+02</td>
<td>3.34E+01</td>
</tr>
<tr>
<td>MT + OMC</td>
<td>4.31E+01</td>
<td>1.01E+02</td>
<td>1.01E+02</td>
<td>4.31E+01</td>
</tr>
<tr>
<td>MT + 3-Bph</td>
<td>4.34E+01</td>
<td>1.02E+02</td>
<td>1.02E+02</td>
<td>4.34E+01</td>
</tr>
</tbody>
</table>

There were no differences in the quantity of melatonin permeated (p=0.8694), reaching values over 100 µg after 24 h of experience in all cases.

Table 3. Results of the 3 extractive solutions studied, with the average and the standard deviation for different solvents. ACN (acetone).

<table>
<thead>
<tr>
<th>Solution</th>
<th>Average %</th>
<th>DE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACN/arter</td>
<td>23.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Meth/arter</td>
<td>37.2</td>
<td>17.6</td>
</tr>
<tr>
<td>Eth/arter</td>
<td>86</td>
<td>26.9</td>
</tr>
</tbody>
</table>

There are significant differences between the formulations in the antioxidant activity (Table 4).

Table 4. Extractive amount (mg), skin weight (g), extractive amount normalized by g and cm² on skin and retained amount in skin at 50h, for each formulation, expressed by median.

The remaining amounts in skin at 50h for the 3 formulations were about 125 and 145 µg/g/cm². (**) P > 0.05 the results showed non significantly statistical differences between the values of retained amounts from the different formulations.

Table 5. % of reduction of radical DPPH at 1.000 ppm (w/v) of each compound or formulation.

There were compared the sunscreen formulation with and without melatonin. In absence of melatonin, none of the 3 formulations have antioxidant activity. In contrast, the addition of 1% of melatonin increased the antioxidant activity of the formulation containing 3-Bph and OMS, with a percentage of reduction of 64.52±2.26 and 23.10±1.15 respectively. In the case of the formulation with OS, the addition of melatonin to the formula didn’t offer any improvement in antioxidant activity.

CONCLUSION

The results of the study shows that melatonin formulated at 1% with different solar filters as topical formulations applied to human skin, presented permeation and retention capacity. The different nature of the filters didn’t influence in the quantity of melatonin permeated and retained in the skin. The use of melatonin in combination with some solar filters enhances the antioxidant activity of sunscreens.

REFERENCES

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