**Research theme**

Suppression of cancer cell proliferation by a combination of light-emitting diode (LED) irradiation and administration of rare sugars

*(Keywords: Light-emitting diode (LED), D-Allose, Cancer cells, Light therapy)*

**Research representative**

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**Outline of technology**

The growth of cancer cells can be inhibited by both the light of high-brightness light-emitting diode (LED) (particularly blue and green lights) and the rare sugar D-allose alone, but it can be inhibited more effectively by their concomitant use. Since both treatments have few adverse effects and are minimally invasive to patients, the combination has a great potential as a new treatment for cancer. Cancers on the surface such as skin cancer can be directly irradiated with LED. Blood cancers such as leukemia can be exposed to LED by leading blood temporarily out of the body as in hemodialysis. Cancers of the digestive, respiratory, and reproductive systems such as stomach cancer, lung cancer, and uterine cancer may be irradiated by LED using an LED irradiator attached to various fiberscopes. Intraperitoneal cancers such as liver cancer can be irradiated using a laparoscope mounted with an LED irradiator. D-Allose can be administered by injection, intravenous injection, instillation, topical spraying, or external application as a solution. This treatment is also considered to be effective for the treatment of diseases due to abnormal proliferation of cells other than cancer (such as psoriasis vulgaris and verruca).

**Sales points**

- Proliferation of cancer cells can be suppressed effectively by a combination of LED irradiation and administration of a rare sugar, both of which have few adverse effects and are minimally invasive.

**Expected application fields and products**

1. Treatment for skin cancer
2. Treatment for leukemia
3. Treatment for esophageal, stomach, and colon cancers
4. Treatment for lung and laryngeal cancers
5. Treatment for penile, vaginal, and uterine cancers
6. Treatment for liver, pancreatic, and ovarian cancers
7. Treatment for diseases due to abnormal cell proliferation

**Comparison with existing treatments**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED irradiation + D-Allose administration</td>
<td>Stress to patients: No pain</td>
<td>Therapeutic effect: Effective only for early cancers</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>Hemorrhage, etc.: No hemorrhage</td>
<td>Inexpensive</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>Cost: Inexpensive</td>
<td>Causes immunsuppression</td>
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<tr>
<td>Surgery</td>
<td>Time course</td>
<td>Expensive</td>
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<tr>
<td></td>
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<td>Symptomatic therapy</td>
</tr>
</tbody>
</table>

**References, patents, etc.**

- Related industrial property rights: Kokai number (2005) 65977 [Application for evaluation have been made]

**Other matters to note**

(Developer’s comment)

While this study was an experiment of *in vitro* nature, it showed that cancer cell proliferation can be suppressed by the addition of a trace amount of D-allose to the medium and irradiating the medium with blue LED in cancer cell cultures (liver cancer and leukemia cells). However, the cell growth inhibiting effect of blue LED light was slightly reduced by the addition of D-allose in some experiments.

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