LeeonIPL

PROJECT NAME (Ingredient Trade Name): *Cordyceps militaris* cultured on germinated soybeans

Active Ingredient Scientific Name: Cordycepin, isoflavonoid, novel isoflavonoid

Submission Date: April 16,

Description of Product:

- *Cordyceps militaris* is a kind of fungus that grows parasitically on insects such as silkworms and cicadas, using the insects for nutrition. It is known to have effects of enhancing stamina and immunity, improving liver function, enabling recovery from fatigue, etc.

[*Cordyceps militaris* collected in nature]

- Currently, in the Orient, *Cordyceps militaris* is being used in various categories of food products, including food additives, health foods and alcoholic beverages.

- However, *Cordyceps militaris* has the disadvantage that it must be cultured on dead insects.

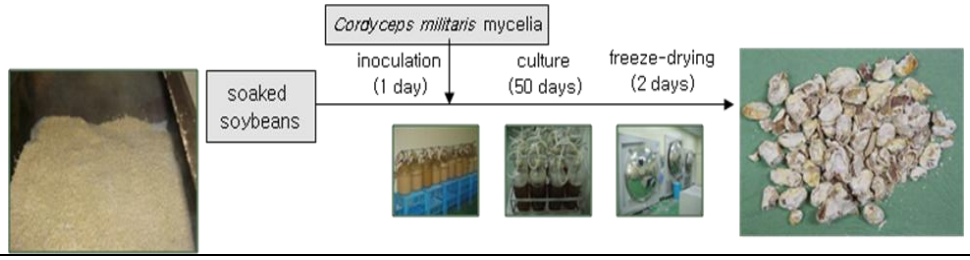
This technology relates to* Cordyceps *militaris obtained by inoculating and culturing* Cordyceps *militaris mycelia on germinated soybeans (hereinafter referred to "*Cordyceps militaris*/germinated soybean")

- The raw material which is obtained by this technology has characteristics in that it contains all active ingredients obtainable from soybeans and *Cordyceps militaris* and, at the same time, does not cause revulsion among consumers, because *Cordyceps militaris* is not cultured on an animal host.

- *Cordyceps militaris*/germinated soybean enables a new health food to be prepared using, as a growth medium, soybeans, which are known to have an excellent effect on the prevention of adult diseases such as hypertension and obesity; while *Cordyceps militaris* is known to act as a strong tonic (energy enhancer).

- *Cordyceps militaris*/germinated soybean contains large amounts of novel physiologically active substances resulting from the binding of two health foods, soybean and *Cordyceps militaris,* and thus has various effects, including an allergy prevention effect and the effect of increasing human immune activity (particularly antiviral activity).

- *Cordyceps militaris*/germinated soybean is produced by a standardized process, and thus is easily supplied in large amounts.



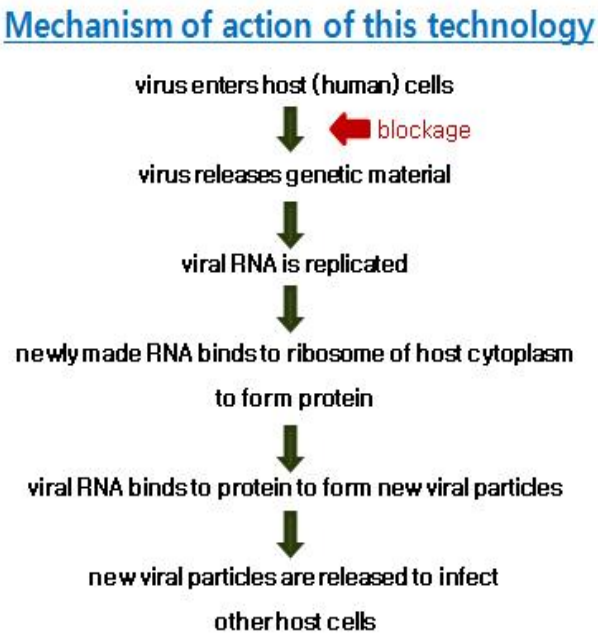
[Process of preparing *Cordyceps militaris*/germinated soybean]

Cordyceps militaris/germinated soybean can be introduced into products, including drinks, functional foods and capsule nutritional supplements, which enhance functionalities such as allergy prevention and increased immune activity.

1. Supporting Evidence (Efficacy/Functionality):

1) Mechanism of Action/s (MOA)

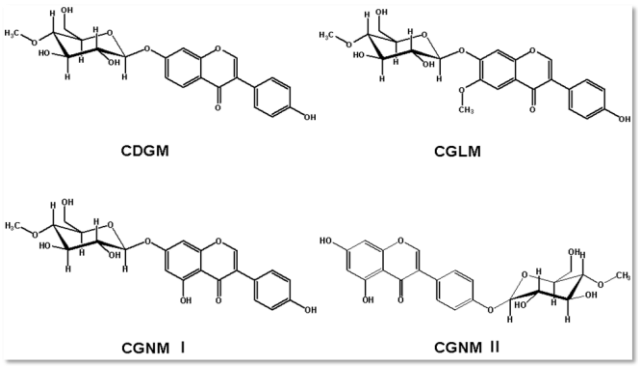
This technology is a mixture, and Cormilan, the main component of the mixture, induces an increase in cytokines TNF-α and IFN-γ and increases the activity of macrophages, thus inhibiting the occurrence of viral diseases such as the flu.



[Process of Mechanism of Action]

2) Chemistry/Characterization data

Cordyceps militaris/germinated soybean was analyzed and, as a result, four single compounds, which are the active ingredients thereof, were obtained.

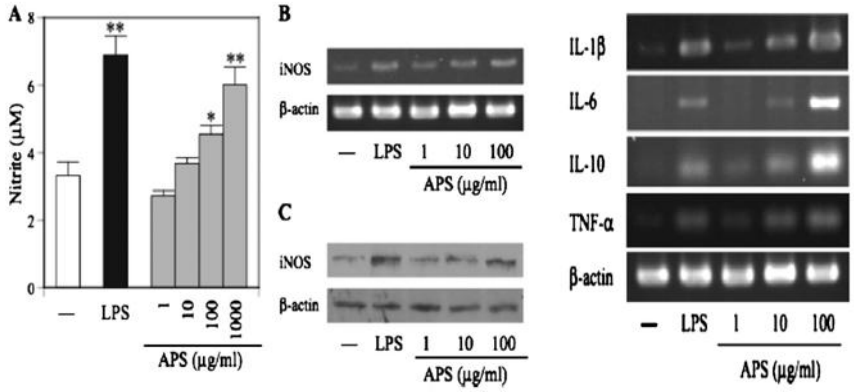


[Active ingredients of *Cordyceps militaris*/germinated soybean]

3) *In vitro* bioassay data

(1) Increase in activity of macrophages

- Cormilan, the active ingredient of *Cordyceps militaris*/germinated soybean, increases the activity of macrophages.

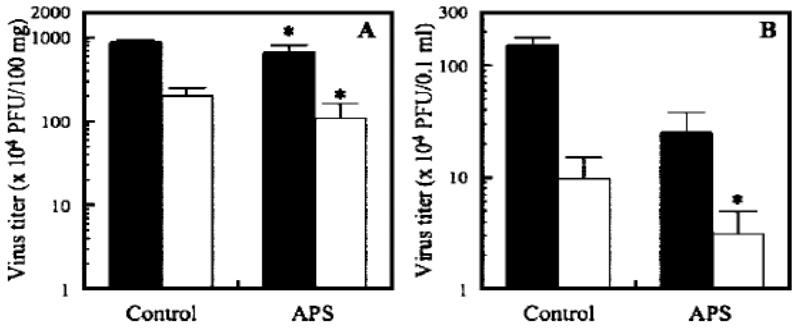


[Macrophage-activating effect of Cormilan]

(2) Effect of impairing viral replication

- Treatment with *Cordyceps militaris*/germinated soybean resulted in a decrease in the concentration of viruses in a solution in which pulmonary and bronchial alveolar cells were washed.

- Such results suggest that *Cordyceps militaris*/germinated soybean impairs viral replication and thus has an effect of preventing and treating bronchial diseases.



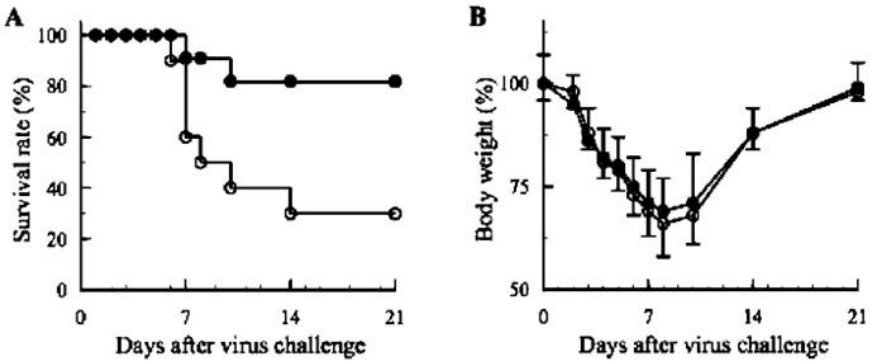
[Measurement of antiviral effect]

4) In vivo testing

(1) Preclinical test (conducted on rats)

- It was found that Cormilan, the active ingredient of *Cordyceps militaris*/germinated soybean has an antiviral effect against influenza A viruses, and thus increase the viability of animals.

- Also, *Cordyceps militaris*/germinated soybean did not cause a great change in the weight of animals.



[Results of test for *Cordyceps militaris*/germinated soybean on animals]

5) Clinically tested

1) First clinical test (effect against atopic dermatitis)

- Carried out: Inha University Hospital (head of research: associate professor Kwang-Sung Choi, Department of Dermatology)

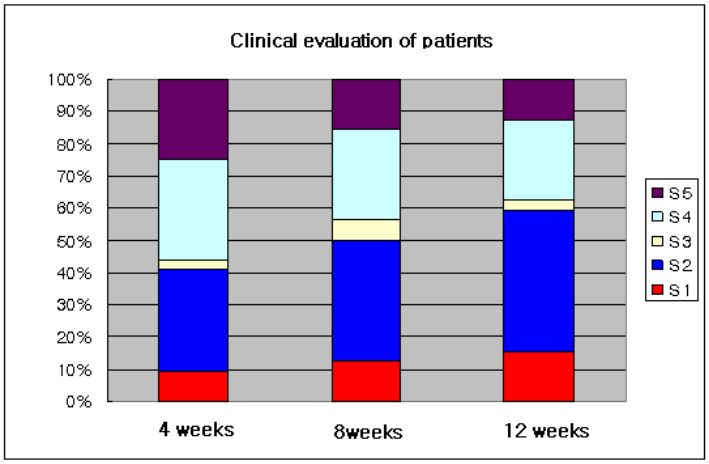
- Carried out: once

- Test design (detailed information, including volunteer number, test period, etc.):
  - forty 3-15-year-old patients (20 males and 20 females)
  - administered after meals three times daily

- clinical assessment (past medical history, pruritus intensity, presence and extremity of sleep disorder)
- Performance of statistical analysis

- Ratio of respondents (%): 80%

- Concentration and formation of raw material used in test: powder form



[Examination of treatment satisfaction of total test subjects]

Change from baseline to the end of treatment for percentage of patient's global assessment scale.

(S1: very satisfactory, S2: satisfactory, S3: average, S4: unsatisfactory, S5: very unsatisfactory)

[Effect against atopic dermatitis]

- *Cordyceps militaris*/germinated soybean was applied for 12 weeks and, as a result, an improvement in atopic dermatitis lesions was clearly apparent.
- Additional information about this clinical material can be provided upon request.

6) Conclusions from the studies

- Through the clinical study carried out on Korean patients suffering from mild and serious atopic dermatitis, *Cordyceps militaris*/germinated soybean had observable effects on the patients.

- Because *Cordyceps militaris*/germinated soybean has no side effects that can occur upon the long-term use of existing drugs, it is felt that *Cordyceps militaris*/germinated soybean can be used as adjuvant or alternative therapy in dermatitis patients who are concerned about side effects.

7) Published or not published, and in which journal(s)?

- Induction of IL-8 expression by *Cordyceps militaris* grown on germinated soybeans through lipid rafts formation and signaling pathways via ERK and JNK in A549 cells (Journal of Ethnopharmacology 127 (2010) 55–61)

- In Vivo Anti-influenza Virus Activity of an Immunomodulatory Acidic Polysaccharide Isolated from *Cordyceps militaris* Grown on Germinated Soybeans (J. Agric. Food Chem. 2007, 55, 10194–10199)

- Metabolomics Revealed Novel Isoflavones and Optimal Cultivation Time of *Cordyceps militaris* Fermentation (J. Agric. Food Chem. 2010, 58, 4258–4267)

8) Recommended Delivery form(s)?

- *Cordyceps militaris*/germinated soybean has an advantage in that it can be used in various forms, including powders, tablets and liquids.

9) Recommended dose(s)? (mg per day)

- Daily recommended dose is 6~9 ㎎/day.

10) Collaborating Organizations, professors or University Affiliations

- Professor Choong-Hwan Lee (Konkuk University)
- Professor Seung-Hyun Han (Seoul National University)

Additional information about the professors can be provided upon request.

2. Intellectual Property/Exclusivity

1) Provide patent information

- Patent documents related to this technology are as follows:

No.	Title of Invention	Korean Patent Registration No.	Filing Date
1	Method for producing functional cereals inoculated with fungi	334248	December 6, 1999
2	Method for preparing *Cordyceps militaris*/germinated soybean having function of preventing avian influenza	796303	June 26, 2007

- Registered Patent No. 1 discloses all cereals that can be inoculated with fungi, and thus the scope of the claim thereof is very broad.
- In registered Patent No. 2, the cereals are limited to soybeans, and the fungus is limited to *Cordyceps militaris*. Thus, the scope of the invention claimed in Patent No. 2 is clearer than that of Patent No. 1.
- Patent No. 1 expires in 9 years, and Patent No. 2 expires in 17 years. Thus, it is expected to be easy to subject this technology to product development with exclusive rights.

2) Describe exclusivity options (MLM, all markets, global, etc.)

- All possibilities, including technology transfer (exclusive and non-exclusive licenses), are open and will be discussed later on.