

## NANOEGG Research Laboratories, Inc.

Savvy growth strategy with its proprietary transdermal drug delivery platform technologies

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NANOEGG Research Laboratories, Inc. C/O Institute of Medical Science St. Marianna University School of Medicine 2-16-1 Sugao, Miyamae-ku Kawasaki, Kanagawa 216-851 JAPAN	Founded in No. of employees State of Ownership Primary stock exchange	2006 22 private N/A
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**August 2009:** NANOEGG Research Laboratories, a spin-off from the Institute of Medical Science at St. Marianna University, located around 25km southwest of Tokyo, develops transdermal drug delivery platform technologies and applies them to various fields. Its initial application to cosmetics demonstrated the proof of concept.

Venture Valuation (VV) interviewed Mr. Hidehiko Otake, President and CEO.



**VV:**

**Would you please describe your business and its strengths?**

Otake:

We are a research and development company focusing on drug delivery system (DDS) technologies, specifically transdermal delivery systems called NANOEGG® and NANOCUBE®. As their names imply, nanotechnology is used to improve the absorption into the skin. The company name came from our primary platform technology NANOEGG®.

NANOEGG® encapsulation technology was developed to deliver all-trans retinoic acid (ATRA), a physiologically active part of vitamin A. ATRA induces production of hyaluronic acid in the epidermis and accelerates the turnover of the skin. However, it causes skin irritation and inflammation. In Japan, ATRA ointment is not approved as medical supply by the Ministry of Health, Labour and Welfare. Only a few hospitals make it available by formulating in hospital dispensary as an exception.

NANOEGG® substantially reduces ATRA side effects and maximizes its inherent effects by using ATRA micelles as molds which are coated with calcium carbonate (CaCO<sub>3</sub>). The diameter of the micelle-nanocapsule is 15nm (15 billionth of a meter). This improves skin penetrability. Furthermore, the amphiphilic surface of the nanocapsule helps it pass easily through both the aqueous pathways and lipid matrix. Another advantage of NANOEGG® is that, because target substances such as ATRA form their own capsule, the concentration in capsule is almost 100%.

NANOCUBE®, a bio-mimetic technology, was invented in the process of developing NANOEGG® encapsulation technology. As an endermic absorption enhancer, NANOCUBE® triggers homeostatic reactions for repairing the injury and activates epidermic cells.

NANOCUBE® technology has been applied to the cosmetic field and has established the proof of concept. We successfully commercialized our cosmetic product line MARIANNA.

Our current strategy is to profit from the products applying NANOCUBE® technology and invest in developing pharmaceuticals with NANOEGG® encapsulation technology.

With regard to our strengths:

- We proactively collaborate with different industries;
- We are developing several projects with ten companies in pharmaceuticals, food and beverage, and cosmetics;
- The proof of concept that NANOCUBE® has established in the cosmetic industry helps us attract potential collaboration and alliance partners;
- We have built up our patent portfolio and continue to enhance intellectual property; and
- Our multidisciplinary R&D staff members interact and create new ideas. Their expertise includes physics, agriculture, engineering, pharmacology, and veterinary medicine.

**VV:**

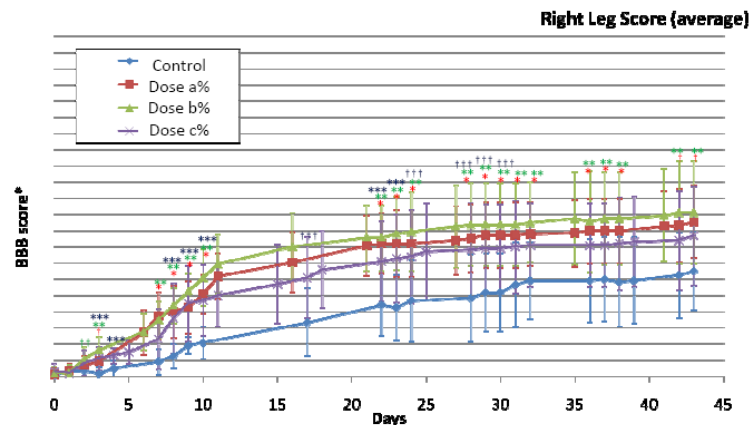
**What are your objectives in the future?**

Otake:

We are intending to go public in a few years and grow as a global company. Our business consists of three lines: cosmetics, cosmetic raw materials, and DDS applications to drug development.



## Nanoegg Administration (by dose) (Spinal Cord Damage/One time admin.)



\*Basso, Beattie, Bresnahan's BBB locomotor rating scale

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For the cosmetics, we are planning to expand distribution channels to Asian countries. Sales of cosmetic raw materials are going to be actively promoted in the U.S., Europe, Asia and South America.

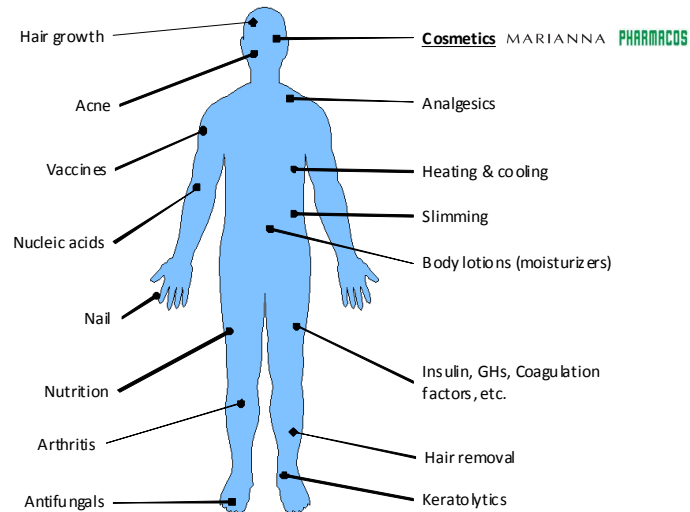
In terms of DDS applications to drug development, ATRA applying NANOEGG® shows intriguing pre-clinical data for treatment of spinal cord damage (See BBB locomotor rating scale chart). We are planning to explore collaboration opportunities in the U.S. market in the near future.

**VV: What opportunities are you exploring?**

Otake: Our business model is "NANOEGG®/NANOCUBE® Inside". This means that by leveraging the versatility of our two DDS platform technologies, we create applications with NANOEGG®/NANOCUBE® in various areas. (See chart)



## Applications Under Consideration (NANOEGG® /NANOCUBE® Inside)



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Major advance with ATRA applying NANOEGG® technology is continuously in progress in clinical applications such as spinal cord injury and diabetes. In addition to ATRA, we are conducting studies with alpha-lipoic acid, which is named LIPOEGG®.

Recently we announced a new research project on hair restoration applying both technologies. The project will be funded by NEDO (New Energy and Industrial Technology Development Organization), a part of the Ministry of Economy, Trade and Industry.

Another clinical application is a transdermal vaccine called "paint vaccine" for infectious diseases. Once it is fully developed and approved in the future, we will volunteer to give it away to deprived children in developing countries.

**VV: How do you differentiate from your competitors and position your company?**

Otake: Our direct competitors are DDS developers. However, their solutions are mostly concentrated on oral administration and injection whereas we excel in the transdermal approach.

In terms of targeted delivery technologies in the form of micellar nanoparticles, NANOEGG® encapsulation technology uses a target substance such as ATRA to form its own capsule. Therefore, the concentration in capsule is almost 100%. The other technologies contain 30% of substance and 70% of capsule. NANOEGG® is capable of delivering the target substance more effectively.

We believe NANOCUBE®, as endermic absorption enhancer, has no competitor. Any "NANOCUBE® Inside" applications are welcome.

**VV Comments after the Interview:**

NANOEGG Research Laboratories has opened up new horizons to biotech ventures in Japan at a time many of them are struggling in the current economic crisis. The company has at least three remarkable characteristics. First, it is a rare biotech venture that has been in the black since its inception. For the first two and a half years the total income was amounted to 591 million JPY (approx. 6.3 million USD) of which 50.8% from cosmetics MARIANNA sales, 33.7% from licensing, research collaborations and grants, and 15.4% from cosmetic raw materials sales.

Second, NANOEGG demonstrates its global vision coupled with scientific commitment. By donating a part of cosmetic sales income to the Japan Committee of "Children's Vaccines Initiative" (JCV), the company is committed to pursue its mission as a life science company. (JCV is a non-profit organization established in 1990 by UNICEF, WHO, UNDP, the Rockefeller Foundation and the World Bank.)

Third, being founded by two female scientists, the company consciously employs female professionals raising small children. (More than half staff members are female.) Many companies in Japan are reluctant to hire or rehire young mothers although they are competent and well educated. NANOEGG is aware of the importance of tapping their expertise and skills.

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