

# **The First**

New solution from the most resistant Microbe in the world



#### Background







## **Rising concern, The Blue-light**

- High energy visible (HEV) light
- Not only the eyes, but also skin needs to be protected from blue light radiation.





## One of the most resistant microbe Known 'Deinococcus sp.'

The world's toughest bacterium in The Guinness book of World Records

## **Deinococcus sp.'** is well known as a 'Super bug'

Over 2 billion years, It survives strongly from the radiation which is treated as the worst condition for all organism

## The most interesting bacteria in science today

studying and understanding its mechanisms can lead to nuclear waste pick up and medical uses associated with cancer.





*Deinococcus* sp. is first discovered in 1956 in a can of ground meat. It had been **treated with large doses of radiation to remove all hazardous bacteria** from the product .

*Deinococcus* sp. is one of the **extraordinary microorganisms** which can **survive against extreme conditions** such as UV irradiation, gamma-ray and oxidative stress.

They have **special ability to recover damaged DNA** caused by strong UV irradiation or ROS **towards its inborn state** 

Space Sci Rev DOI 10.1007/s11214-017-0365-5

SPECIAL COMMUNICATION

#### Space as a Tool for Astrobiology: Review and Recommendations for Experimentations in Earth Orbit and Beyond

Hervé Cottin<sup>1</sup> • Julia Michelle Kotler<sup>2,3,4</sup> • Daniela Billi<sup>5</sup> • Charles Cockell<sup>6</sup> • René Demets<sup>7</sup> • Pascale Ehrenfreund<sup>8</sup> • Andreas Elsaesser<sup>9,10</sup> • Louis d'Hendecourt<sup>11</sup> • Jack J.W.A. van Loon<sup>12,13</sup> • Zita Martins<sup>14</sup> • Silvano Onofri<sup>15</sup> • Richard C. Quinn<sup>16</sup> • Elke Rabbow<sup>17</sup> • Petra Rettberg<sup>17</sup> • Antonio J. Ricco<sup>16</sup> • Klaus Slenzka<sup>18,19</sup> • Rosa de la Torre<sup>20</sup> • Jean-Pierre de Vera<sup>21</sup> • Frances Westall<sup>22</sup> • Nathalie Carrasco<sup>23</sup> • Aurélien Fresneau<sup>1</sup> • Yuko Kawaguchi<sup>24</sup> • Yoko Kebukawa<sup>25</sup> • Dara Nguyen<sup>1</sup> • Olivier Poch<sup>1</sup> • Kafila Saiagh<sup>1</sup> • Fabien Stalport<sup>1</sup> • Akihiko Yamagishi<sup>24</sup> • Hajime Yano<sup>26</sup> • Benjamin A. Klamm<sup>16</sup>

Received: 30 September 2015 / Accepted: 5 April 2017 © The Author(s) 2017. This article is published with open access at Springerlink.com

- <sup>13</sup> European Space Research and Technology Centre (ESTEC), TEC-MMG, Life & Physical Science, Instrumentation and Life Support Laboratory, European Space Agency (ESA), Keplerlaan 1, 2200 AG, Noordwijk, The Netherlands
- <sup>14</sup> Department of Earth Science and Engineering, Imperial College London, SW7 2AZ, London, UK
- <sup>15</sup> Università della Tuscia, Viterbo, Italy
- <sup>16</sup> NASA Ames Research Center, Moffett Field, CA, 94035, USA
- 17 Institute of Aerospace Medicine, Radiation Biology Department, Research Group Astrobiology, DLR, Koeln, Germany
- <sup>18</sup> Jacobs Univ., Bremen, Germany
- <sup>19</sup> OHB, Bremen, Germany
- <sup>20</sup> INTA, Instituto Nacional de Técnica Aeroespacial, Crta. Ajalvir, km. 4, 28850 Torrejón de Ardoz, Madrid, Spain
- 21 Institute of Planetary Research, Management and Infrastructure, Research Group Astrobiology Laboratories, DLR, Berlin, Germany
- <sup>22</sup> CNRS, CBM, UPR 4301, rue Charles Sadron, 45071 Orléans, France
- <sup>23</sup> Université Versailles St-Quentin, UPMC Univ. Paris 06, CNRS, LATMOS, 11 Blvd. d'Alembert, 78280 Guyancourt, France
- <sup>24</sup> Department of Applied Life Sciences, Tokyo University of Pharmacy and Life Sciences, Hachioji 192-0392, Japan
- <sup>25</sup> Faculty of Engineering, Yokohama National University, Yokohama 240-8501, Japan
- 26 Institute of Space and Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA), Sagamihara 252-5210, Japan

Ref. Space as a tool for astrobiology.., Space science reviews, July 2017, volume209

Including NASA & JAXA, France, Netherland, Germany, Italy, Spain, USA and Japan – 8 countries 26 Research agents are researching the *Deinococcus* sp. as a tool for Astrobiology in space.

CrossMark

#### **DNA Repairing**



Proof of DNA repairing (Pulse-field gel electrophoresis (PFGE)

0h - DNA of *D. radiodurans* was completely destroyed after exposure to the high energy  $(7 \text{ kGy/1h}) \gamma$ -ray.

3h ~ 4.5h - indicates the recovery of *D. radiodurans*' DNA in chronological order without any outside interferences.



Ref. Oxidative stress resistance in Deinococcus radiodurans Microbiology and Molecular Biology reviews, March 2011, Vol.75





#### LABIO's Deinococcus sp.





Boost your formulation with Carotenoid colorless ingredient with better efficacy

#### **Effect of 'The First'**



Anti-Pollution Effect1. Anti-oxidant





% of Control

Concentration (mg/ml)

Fermented Deinococcus sp. extract shows free radical scavenger effect

Anti-Pollution Effect2. Anti-inflammation

% of CTL



## NO assay



Concentration (mg/ml)

Fermented Deinococcus sp. extract inhibits NO production

Anti-Pollution Effect3. Anti-blue light

Cumulative absorbance (400-500nm)



## **Blue light protection**



Fermented Deinococcus sp. extract has blue-light protection effect

Anti-Pollution Effect4. Whitening





## Melanin assay

Concentration (mg/ml)

% of CTL

#### Fermented *Deinococcus* sp. extract shows 50% more $\alpha$ -MSH inhibition ability



### **UV Recovery**

#### \* 35 Relative luciferase activity (fold increase) 30 25 20 15 \*P<0.05 10 5 0 DREAM-Luc + + + Fermented Deinococcus extract (100 µg/ml) + UVB (20 mJ/cm<sup>2</sup>) + +

Dream system luciferase

#### Thymine dimer dot-blot



\*Total gDNA : Total genomic DNA was visualized by staining the transferred membrane with methylene blue staining solution

#### Fermented Deinococcus sp. extract reduces the DNA damage from UVB



## **Anti-pollution ingredient** \_ The First

The ingredient from the first organism 'Deinococcus sp.'

**Blue light protection ingredient** 

**Carotenoid colorless ingredient** 

Strong antioxidant effect

INCI name	Deinococcus Ferment Extract Filtrate, Butylene glycol, 1,2- Hexanediol
CFDA	Micrococcus Lysate, Butylene glycol, 1,2-Hexanediol
Define	Carotenoids colorless ingredient with Anti-blue light and Multi functional effect by microbial fermentative production.
Physical characteristic	Transparent light pink to light brown Water soluble
Function	<ul> <li>✓ Anti-oxidant activity</li> <li>✓ Anti-inflammation</li> <li>✓ Anti-blue light</li> <li>✓ Whitening</li> </ul>