

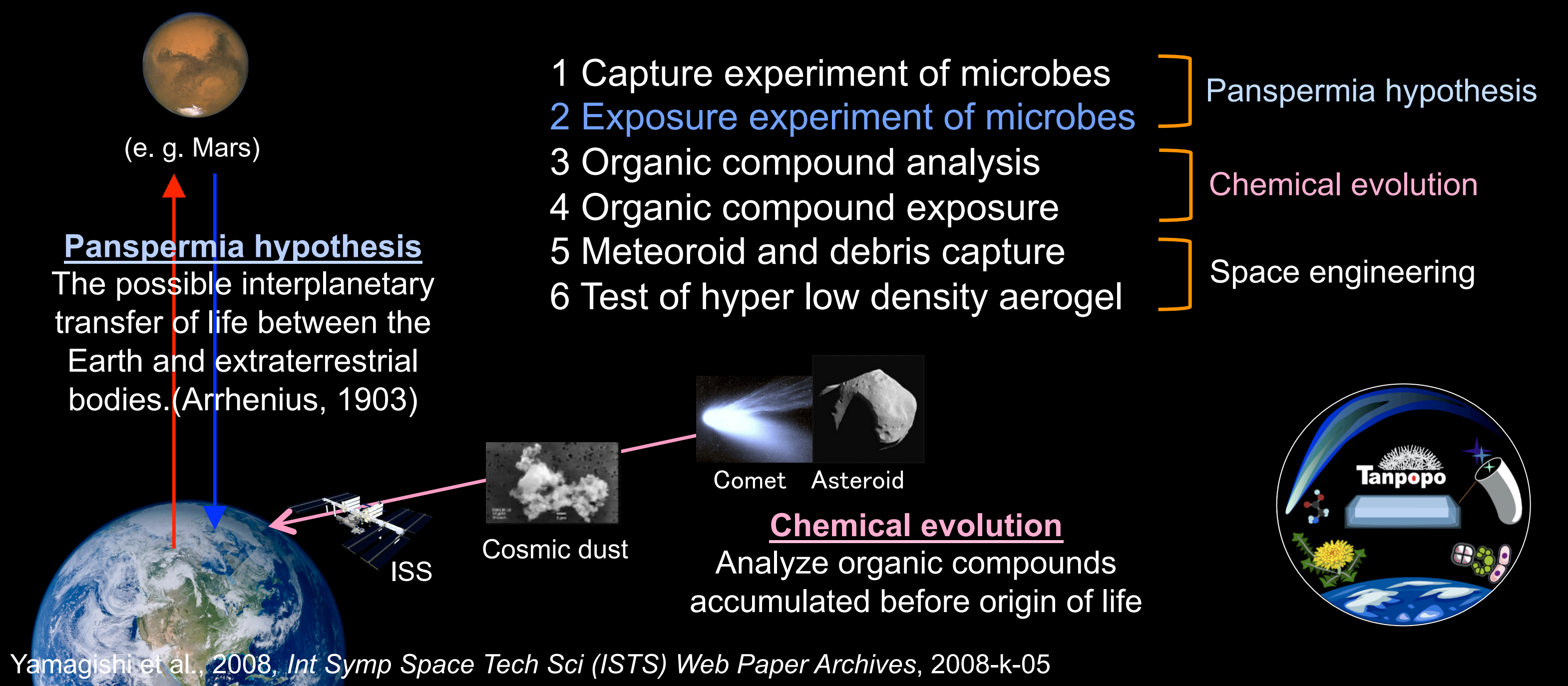
Analysis of survival and DNA damage of space exposed *Deinococcus* spp.

宇宙曝露した*Deinococcus*属細菌の生存とDNA損傷の解明

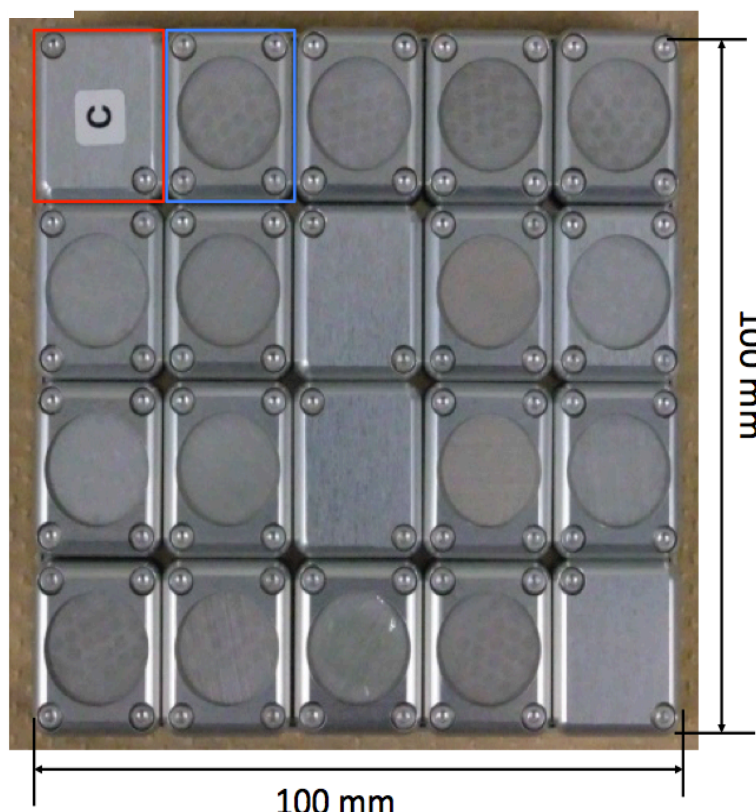
河口優子¹(kawaguch@toyaku.ac.jp), 木下伊織¹, 藤原大佑¹, 矢田部純¹, 村野由佳¹, 青木元秀¹, 谷口紀恵¹, 鳴海一成², 林宣宏³, 中川和道⁴, 橋本博文⁵, 横堀伸一¹, 山岸明彦¹ (¹東京薬科大学生命科学部、²東洋大学、³東京工業大学、⁴神戸大学、⁵ISAS/JAXA)

たんぽぽ計画ではISS日本実験棟曝露部を利用し、微生物の宇宙空間移動仮説(パンスペルミア説)を検証している。地上由来微粒子の捕集実験と地球微生物の宇宙曝露実験が1年間行われ、地上にサンプルが帰還し解析を進めている。その結果、十分な厚みを持つ微生物の凝集体は高い生存率を示した。また、宇宙で生じたDNA損傷、変異、他の微生物種についても報告する。

1. Exposure and capture experiments of microbes in ISS orbit “Tanpopo” mission (Yamagishi et al., 2008)



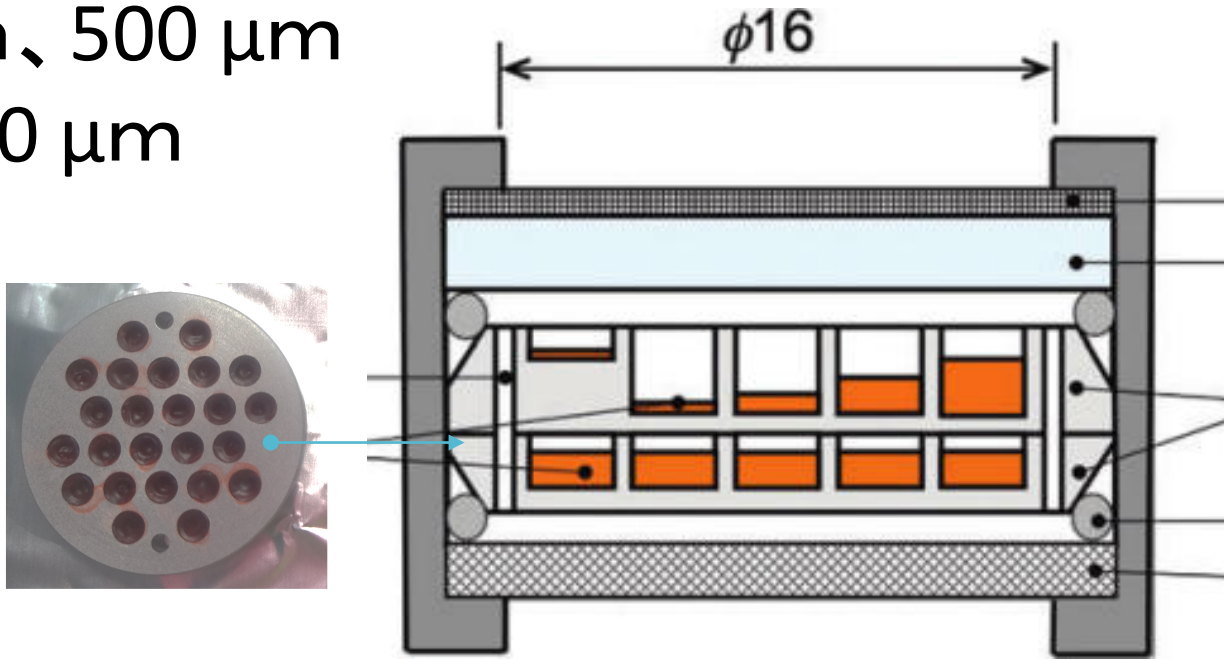
2. Exposure experiment of microbes



Exposure Panel (EPs). A passive dosimeter is placed in an exposure unit without a window shown in red rectangle.

Thickness of microbial cells

- Front plate
1 μm 、100 μm 、500 μm
1000 μm 、1500 μm
- Bottom plate
1000 μm

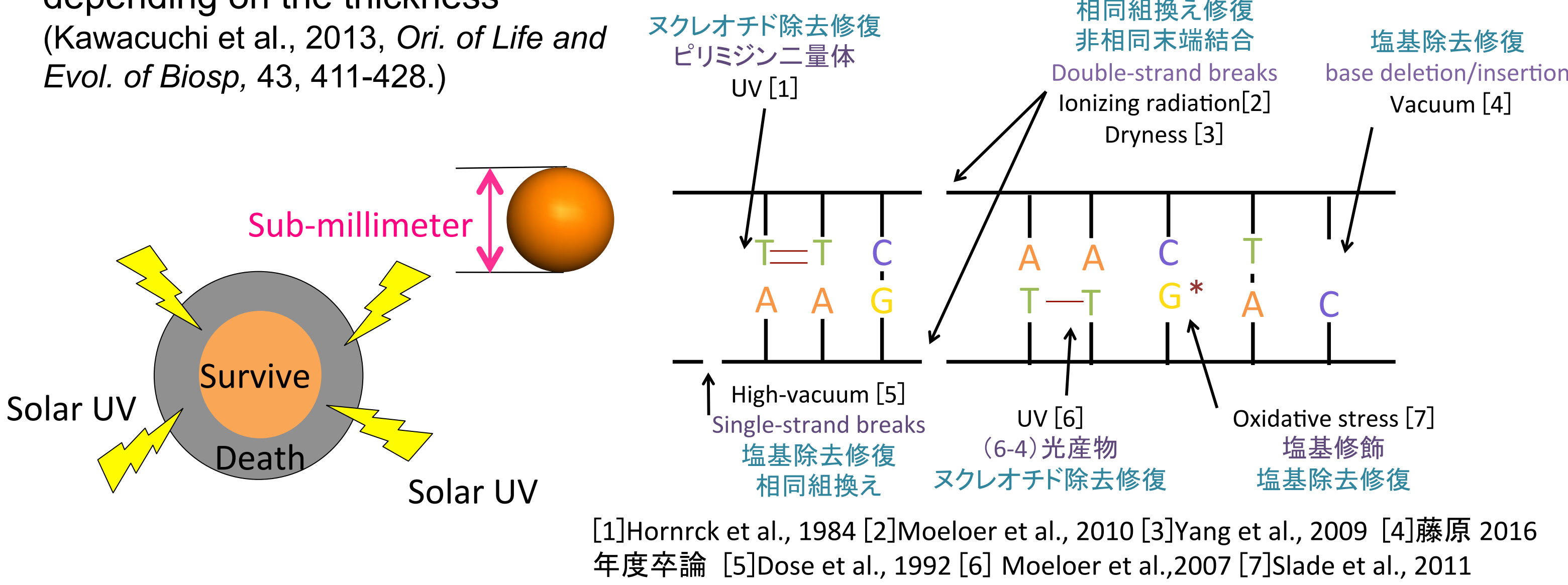


Sample plates with microbial cells are placed in the exposure unit shown in the blue rectangle (Kawaguchi et al, 2016, *Astrobiology*).

3. Purpose of the exposure experiment of microbes

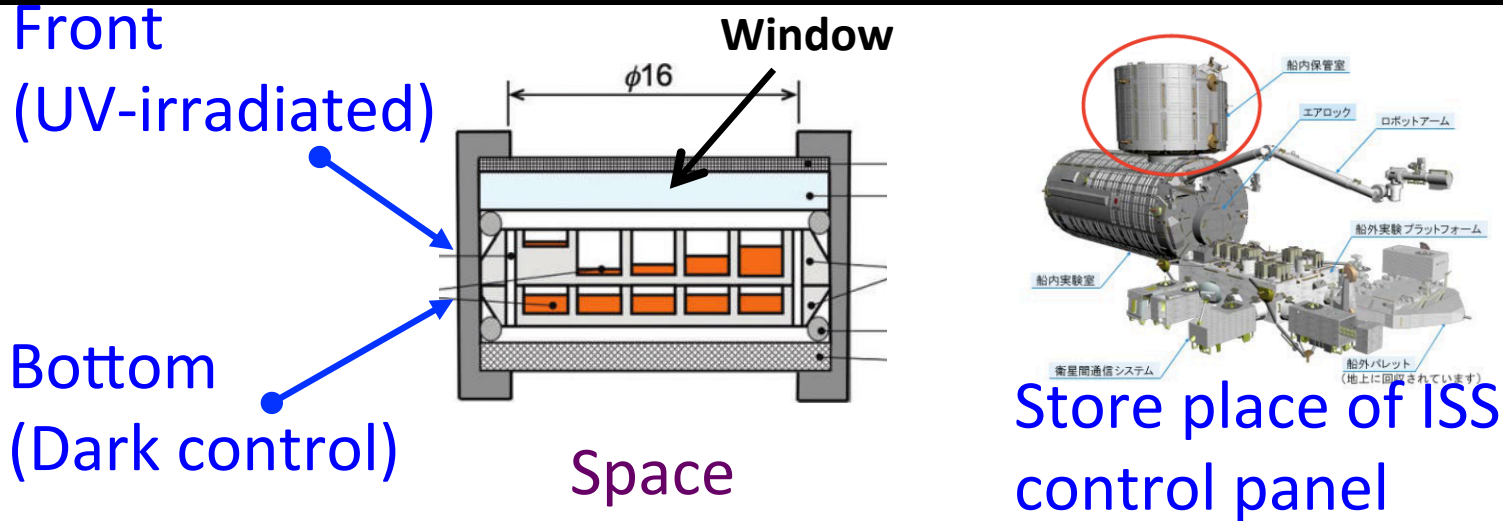
- Survivability of microbes depending on the thickness (Kawacuchi et al., 2013, *Ori. of Life and Evol. of Biosp*, 43, 411-428.)

- DNA damage arisen in space



4. Exposure conditions of environmental factors

	UV (kJ/m ²) MgF ₂ : 110-315nm SiO ₂ : 170-315nm	Radiation (mGy)	Vacuum	Temperture (°C)	Humidity (%)
Front (UV-irradiated) Bottom (dark cont.)	3.4 x 10 ³ 3.1 x 10 ³	250-298	10 ⁻⁴ ~10 ⁻⁶	23.9±5 ~ -12.5±5 ~	0
ISS (cont.)	—	97-106	—	19~25	45~55
Ground (cont.)	—	1.4	—	20	29~45



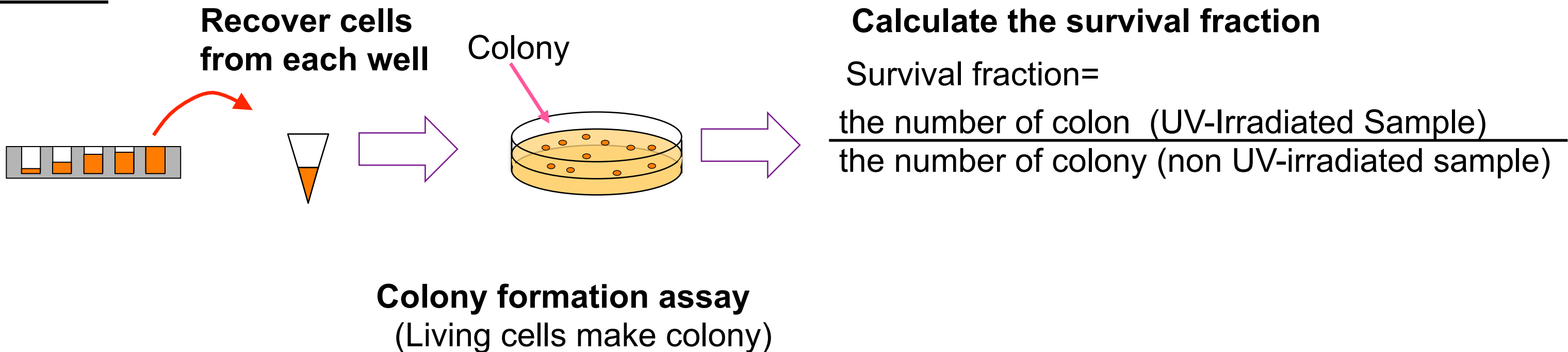
D. radiodurans
(Nicholson. 2009)
Bar= 1 μm

5. Materials and Methods

Model organism: The radiation resistance of *Deinococcus* spp.

<i>D. radiodurans</i>	Isolated from a canned meat after gamma ray irradiation. Extreme resistance to the UV, gamma ray and desiccation.	
Mutants		DNA repair pathway
<i>D. radiodurans</i> UVS78	$\Delta mtcA$, $\Delta uvsE$	Nucleotide excision
rec30	$\Delta recA$	Homologous recombination
KH311	$\Delta pprA$	The non-homologous end joining

Method



6. Survivability of *Deinococcus* spp. depending on the thickness of cells

7. DNA damage depending on thickness