

Cultivation and Characterization of Microorganisms in Antarctic Lakes

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INTRODUCTION

Antarctic Lakes harbor pristine biotopes and include freshwater and saline systems that are subject to long periods of ice and snow-cover, low temperatures and low levels of photosynthetically active radiation. Unfortunately, the recovery of cultivable organisms from Antarctica is very difficult, and the development of new methods to resuscitation and cultivability of Antarctic microorganisms is very important. In order to understand the diversity, survival, and activity of microorganisms in Antarctic zone, we cultivated and characterized bacterial isolates from Antarctic lakes.

Sampling site

Water samples were collected from Antarctic Lakes in Skavrvsnes near Syowa Station area (A-6 Ike 0m, Jan.19, 2005; A-7 Ike 0m, Jan.29, 2005; B-1 Ike 0m, Jan.21, 2005; B-3 Ike 0m, Jan.21, 2005; Hunazoko Ike 4m, Jan.22, 2005; Tokkuri Ike 4m, Jan.22, 2005; Suribati Ike 10m, Jan.24, 2005 in Fig.1).

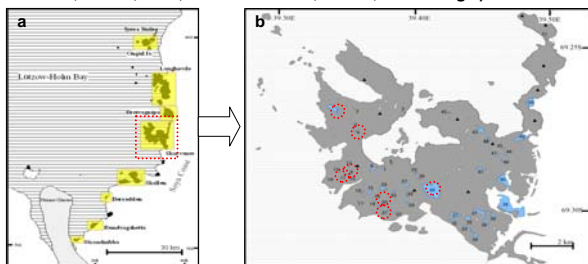


Fig.1. a. The location of Skavrvsnes; b. Lakes in Skavrvsnes. 1. Hunazoko, 4. Tokkuri, 9.B1,11.B3, 20. A6, 21. A7, 30. Suribati.

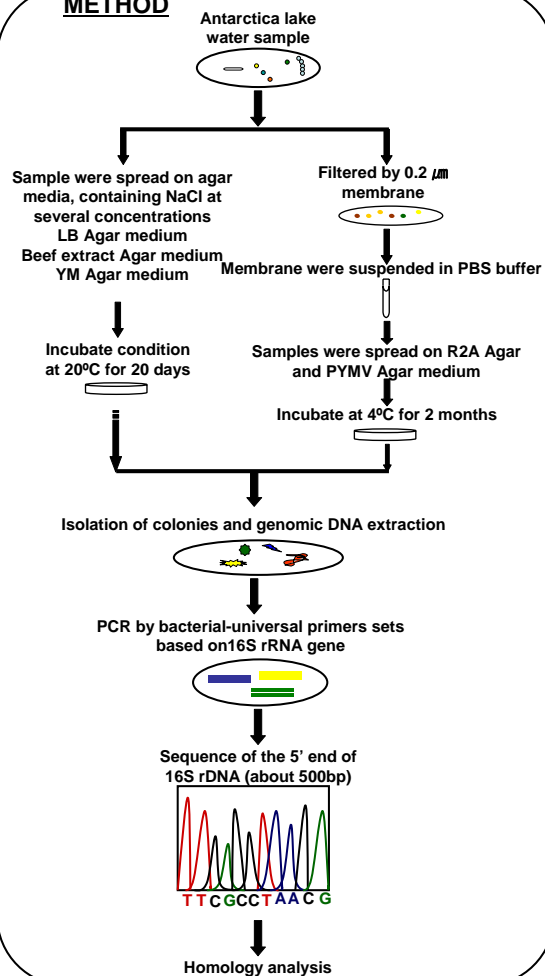
RESULT AND DISCUSSION

The results of the homology analysis of 16s rRNA gene sequences showed that the isolates represented a wide diversity of both gram-positive and gram-negative heterotrophic bacteria belonging to five major classes: *Gamma-proteobacteria*, *Actinobacteria*, *Alpha-proteobacteria*, *Bacilli*, *Flavobacteria* class. Isolates related to *Flavobacteria* formed the largest cluster in terms of diversity, with 9 phylogenetically distinct organisms.

Table.1. Homology analysis of isolates from Antarctica A-6 Ike, A-7 Ike, B-1 Ike, B-3 Ike, Suribati Ike, Tokkuri Ike, and Hunazoko Ike.

Isolate	Lake	16s rRNA gene				Isolation temperature °C	Colony description
		Close representative Organisms/ group	Data bank Accession number	Similarity (%)	E-value		
15	Hunazoko Ike	<i>Gillisia limnaea</i> (R-8282)	AJ440991	93	0.0	20	Orange, slimy
20	B-1 Ike	<i>Gracilbacillus halotolerans</i> (NN)	AF036922	99	0.0	20	White
22	A-6 Ike	<i>Psychrobacter fozi</i> (S2-83)	AY771717	99	0.0	4	White
23	Tokkuri Ike	<i>Psychrobacter maritimus</i> (Pi2-20T)	AJ609272	99	0.0	4	White
24	B-3 Ike	<i>Psychrobacter alimentarius</i> (S3-15)	AY771725	99	0.0	4	White
25	Tokkuri Ike	<i>Flavobacterium frigidarium</i> (S3-9)	AY771722	99	0.0	4	Yellow
26	Tokkuri Ike	<i>Flavobacterium frigidarium</i> (S3-9)	AY771722	99	0.0	4	Yellow
27	A-7 Ike	<i>Flavobacterium aquatile</i> (DSM1132)	AM230485	97	0.0	4	Orange
28	A-7 Ike	<i>Flavobacterium aquatile</i> (DSM1132)	AM230485	97	0.0	4	Orange
29	B-3 Ike	<i>Psychrobacter cryohalolentis</i> (K5)	CP000323	99	0.0	4	White
30	B-3 Ike	<i>Psychrobacter alimentarius</i> (S3-15)	AY771725	99	0.0	4	White
31	B-1 Ike	<i>Methylobacterium adhaesivum</i> (AR27)	AM040156	99	0.0	4	Dark red
32	A-7 Ike	<i>Flavobacterium aquatile</i> (DSM1132)	AM230485	97	0.0	4	Orange
33	A-6 Ike	<i>Cryobacterium psychrophilum</i> (DSM4854)	AJ544063	99	0.0	4	Orange
35	Tokkuri Ike	<i>Psychrobacter maritimus</i> (Pi2-20)	AJ609272	99	0.0	4	White
36	Tokkuri Ike	<i>Flavobacterium frigidarium</i> (S3-9)	AY771722	99	0.0	4	Buff
37	Tokkuri Ike	<i>Psychrobacter maritimus</i> (Pi2-20)	AJ609272	99	0.0	4	White
41	Suribati Ike	<i>Psychroflexus torques</i> (BSI20642)	DQ007442	97	0.0	4	Orange, slimy
42	A-7 Ike	<i>Brevundimonas variabilis</i> (ATCC15255)	AJ227783	99	0.0	4	Nigger-brown
43	A-7 Ike	<i>Brevundimonas variabilis</i> (ATCC15255)	AJ227783	99	0.0	4	Sandy beige
44	A-7 Ike	<i>Flavobacterium aquatile</i> (DSM1132)	AM230485	97	0.0	4	Brown
45	A-7 Ike	<i>Blastomonas natatoria</i> (2.3.)	AJ250435	98	0.0	4	Puce

METHOD



Microorganism description

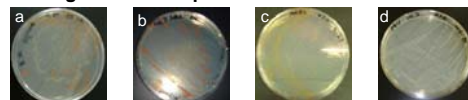


Fig.2. Photo of cultivated bacteria from Antarctica lake sample. a. Isolate 41; b. Isolate 15; c. Isolate 32; d. Isolate 23.

CONCLUSION

1. While there were only two strains isolated from incubation at 20°C by spreading the Antarctica lake samples directly onto agar-media plates, twenty strains were isolated at 4°C by filtration Antarctica lake samples. It was thought that microorganisms in Antarctica lakes had been subjected to low temperature and limiting nutrient for long time, and high incubation temperature and rich nutrient medium might be stressor for Antarctic microorganisms. Therefore, incubation at low temperature with media not containing rich nutrition were more suitable for Antarctica lake microorganisms because the isolated microorganisms were likely to be adapted to the oligotrophic conditions of many cold habitats.

2. 16S rDNA sequencing results suggested that three of the isolates might represent new species. Strain No. 15, 41, and 27 (28, 32, and 44) showed 93%, 97%, and 97% similarity with the GenBank database respectively. Strain No. 15, 41, and 27 (28, 32, and 44) are likely novel species in the genus *Gillisia*, *Psychroflexus*, and *Flavobacterium* which belong to the *Flavobacteria* group.