
AbSciCon
2019

1
00:00:00,790 --> 00:00:07,320
[Music]

2
00:00:11,490 --> 00:00:08,700
[Applause]

3
00:00:14,040 --> 00:00:11,500
I work at the University of Washington

4
00:00:17,400 --> 00:00:14,050
with a interdisciplinary team and we are

5
00:00:20,480 --> 00:00:17,410
studying the bio signatures cellular and

6
00:00:23,429 --> 00:00:20,490
proteomic of extremophiles subject to

7
00:00:24,720 --> 00:00:23,439
hold and highly saline conditions and

8
00:00:28,170 --> 00:00:24,730
I'm going to be showing some of our

9
00:00:29,940 --> 00:00:28,180
first results in this ongoing project so

10
00:00:31,950 --> 00:00:29,950
first you want to we want to think that

11
00:00:33,930 --> 00:00:31,960
most of the moons and planets of

12
00:00:36,660 --> 00:00:33,940
astrobiological interest in the solar

13
00:00:39,390 --> 00:00:36,670

system have surfaces with temperatures

14
00:00:42,270 --> 00:00:39,400
well below the limits of life and even

15
00:00:44,880 --> 00:00:42,280
though it's possible that organisms may

16
00:00:49,560 --> 00:00:44,890
be living below in deeper warmer

17
00:00:52,920 --> 00:00:49,570
environments these organisms may be

18
00:00:55,139 --> 00:00:52,930
transported towers the surface which is

19
00:00:56,639 --> 00:00:55,149
where we are going to be looking for the

20
00:00:58,410 --> 00:00:56,649
bio signatures so this raises the

21
00:01:01,160 --> 00:00:58,420
question of what happens to an organism

22
00:01:04,049 --> 00:01:01,170
when you take it away from its habitable

23
00:01:06,420 --> 00:01:04,059
region and remove it in colder and very

24
00:01:09,090 --> 00:01:06,430
likely South air conditions and to

25
00:01:12,450 --> 00:01:09,100
answer this question we took a psycho

26
00:01:15,060 --> 00:01:12,460
philic organism and we incubated it into

27
00:01:17,039 --> 00:01:15,070
salinity conditions far from its growth

28
00:01:19,530 --> 00:01:17,049
range so what you are seeing here in

29
00:01:21,270 --> 00:01:19,540
this temperature salinity graph you have

30
00:01:23,730 --> 00:01:21,280
the temperature on the vertical axis

31
00:01:26,340 --> 00:01:23,740
South concentration on the recentl axis

32
00:01:28,740 --> 00:01:26,350
and this Square this rectangle is

33
00:01:31,410 --> 00:01:28,750
showing you the limits at which our

34
00:01:33,450 --> 00:01:31,420
organism can grow so you can see it has

35
00:01:35,730 --> 00:01:33,460
a nice range of temperatures going down

36
00:01:38,609 --> 00:01:35,740
to negative 12 but a rather limited

37
00:01:40,710 --> 00:01:38,619
range in salinity so what we did is we

38
00:01:43,620 --> 00:01:40,720

incubated it at temperatures in the

39
00:01:46,469 --> 00:01:43,630
lower range of its temperature growth

40
00:01:49,710 --> 00:01:46,479
range and saline it is a couple of

41
00:01:52,410 --> 00:01:49,720
salinities both optimal salinities and

42
00:01:55,020 --> 00:01:52,420
higher salinities that than what we know

43
00:01:57,050 --> 00:01:55,030
it can tolerate and after incubating it

44
00:02:00,210 --> 00:01:57,060
we measured the activity by

45
00:02:02,999 --> 00:02:00,220
incorporation of a radioactively-labeled

46
00:02:04,859 --> 00:02:03,009
amino acid we measure the viability that

47
00:02:06,929 --> 00:02:04,869
is we took the organisms after the

48
00:02:09,180 --> 00:02:06,939
incubation and we return them to their

49
00:02:10,560 --> 00:02:09,190
optimal conditions to see estimate the

50
00:02:12,660 --> 00:02:10,570
number of viable cells that were

51
00:02:14,640 --> 00:02:12,670
remaining we observe the cells at the

52
00:02:18,030 --> 00:02:14,650
microscope with that stain and we did

53
00:02:19,890 --> 00:02:18,040
proteomics with tandem mass spectrometry

54
00:02:22,110 --> 00:02:19,900
so I'm going to walk you through the

55
00:02:24,119 --> 00:02:22,120
rationale of what temperature

56
00:02:26,220 --> 00:02:24,129
salinities did we choose moving into the

57
00:02:28,860 --> 00:02:26,230
metals and some of the results so you

58
00:02:30,930 --> 00:02:28,870
see here a simplified diagram of the

59
00:02:33,390 --> 00:02:30,940
phases of seawater when it's freezing

60
00:02:34,800 --> 00:02:33,400
you have again temperature and cell

61
00:02:36,930 --> 00:02:34,810
concentration on the bottom and

62
00:02:39,420 --> 00:02:36,940
basically this diagram is telling you

63
00:02:41,100 --> 00:02:39,430

what phases are going to be stable at

64
00:02:43,130 --> 00:02:41,110
which temperatures and salinity so you

65
00:02:45,660 --> 00:02:43,140
have liquid water in the warmer areas

66
00:02:48,330 --> 00:02:45,670
frozen eyes in the cold and salt at

67
00:02:49,680 --> 00:02:48,340
higher salt concentrations I also want

68
00:02:51,720 --> 00:02:49,690
to know that sometimes you can get

69
00:02:53,940 --> 00:02:51,730
solutions out of equilibrium so you can

70
00:02:56,670 --> 00:02:53,950
get supercool solutions which are common

71
00:03:00,150 --> 00:02:56,680
for all of us studying in the laboratory

72
00:03:02,009 --> 00:03:00,160
this type of systems so you have liquid

73
00:03:04,710 --> 00:03:02,019
water at lower temperatures when it

74
00:03:10,289 --> 00:03:04,720
should be frozen and an important thing

75
00:03:12,479 --> 00:03:10,299
in this diagram is the I want to the I

76
00:03:14,880 --> 00:03:12,489
want to signal you to the brine

77
00:03:17,819 --> 00:03:14,890
equilibrium line so here what you are

78
00:03:20,610 --> 00:03:17,829
going to be saying is as this ice is

79
00:03:22,199 --> 00:03:20,620
freezing the liquid inclusions we seen

80
00:03:24,240 --> 00:03:22,209
the ice are going to have a salinity

81
00:03:25,530 --> 00:03:24,250
that is dictated by these lines for

82
00:03:28,740 --> 00:03:25,540
instance if you are having ice at

83
00:03:30,300 --> 00:03:28,750
negative 10 the brine inside the ice is

84
00:03:32,160 --> 00:03:30,310
going to have a salinity or a South

85
00:03:35,009 --> 00:03:32,170
concentration with an ionic strength of

86
00:03:36,900 --> 00:03:35,019
3.2 approximately and this is important

87
00:03:39,449 --> 00:03:36,910
because if you are an organism living

88
00:03:40,740 --> 00:03:39,459

within the ice this means that as you

89
00:03:42,839 --> 00:03:40,750
lower the temperature you are

90
00:03:44,849 --> 00:03:42,849
simultaneously increasing the salinity

91
00:03:47,160 --> 00:03:44,859
so the organisms it's in the ice

92
00:03:51,300 --> 00:03:47,170
experiencing are experiencing these two

93
00:03:53,640 --> 00:03:51,310
stressors at at the same time so here it

94
00:03:56,729 --> 00:03:53,650
is in the phase diagram you have here

95
00:03:58,800 --> 00:03:56,739
located the square with the rectangle

96
00:04:00,720 --> 00:03:58,810
with the growth conditions of our model

97
00:04:03,690 --> 00:04:00,730
organism which you may have heard in

98
00:04:06,120 --> 00:04:03,700
other talks coil a secretary at 9:34 H

99
00:04:07,289 --> 00:04:06,130
and when we so here you can see the

100
00:04:09,750 --> 00:04:07,299
conditions that we used in the

101
00:04:11,610 --> 00:04:09,760
experiment so we chose two temperatures

102
00:04:13,830 --> 00:04:11,620
both in the growth range of Corellia

103
00:04:16,949 --> 00:04:13,840
negative 5 and negative 10 and we choose

104
00:04:20,129 --> 00:04:16,959
the following salinities we chose a

105
00:04:23,550 --> 00:04:20,139
seawater supercooled seawater and we

106
00:04:26,460 --> 00:04:23,560
chose the brine salinity expected at the

107
00:04:27,750 --> 00:04:26,470
negative 5 temperature and for negative

108
00:04:30,540 --> 00:04:27,760
10 we did the same thing

109
00:04:35,010 --> 00:04:30,550
seawater supercooled and we chose the

110
00:04:35,580 --> 00:04:35,020
negative 10 Brian salinity so the ionic

111
00:04:37,890 --> 00:04:35,590
strength of

112
00:04:40,590 --> 00:04:37,900
those solutions would be 0.74 the

113
00:04:43,230 --> 00:04:40,600

sea-water 1.8 for the brine equilibrium

114
00:04:44,940 --> 00:04:43,240
at negative five and three point two for

115
00:04:47,700 --> 00:04:44,950
the brine et Librium at negative ten and

116
00:04:50,640 --> 00:04:47,710
I have their concentrations in parts per

117
00:04:52,320 --> 00:04:50,650
thousand for comparison so let's take a

118
00:04:54,420 --> 00:04:52,330
look at what we did with the organisms

119
00:04:56,310 --> 00:04:54,430
themselves we grill them in their

120
00:04:59,190 --> 00:04:56,320
optimal media at zero degrees and then

121
00:05:02,430 --> 00:04:59,200
wash the cells transfer them to the high

122
00:05:04,880 --> 00:05:02,440
salinity media the solutions were

123
00:05:07,770 --> 00:05:04,890
prepared following the expected

124
00:05:11,040 --> 00:05:07,780
concentrations for seawater ions at any

125
00:05:13,200 --> 00:05:11,050
given temperature and then we amended

126
00:05:15,870 --> 00:05:13,210
the solutions with either a high or a

127
00:05:18,540 --> 00:05:15,880
low concentration of nutrients we

128
00:05:21,600 --> 00:05:18,550
distributed these resuspended cells in

129
00:05:23,220 --> 00:05:21,610
two vials to be into two sets of buyers

130
00:05:26,220 --> 00:05:23,230
one of them for the activity

131
00:05:27,540 --> 00:05:26,230
measurements and another one for at the

132
00:05:30,050 --> 00:05:27,550
same time we took measurements for

133
00:05:32,910 --> 00:05:30,060
viability cell number and proteomics

134
00:05:35,720 --> 00:05:32,920
because we wanted to do a study of how

135
00:05:38,430 --> 00:05:35,730
this evolved through time we took

136
00:05:42,420 --> 00:05:38,440
triplicate samples for the activity in a

137
00:05:45,480 --> 00:05:42,430
shorter time frame from 2 hours 12 12 24

138
00:05:48,030 --> 00:05:45,490

hours and 1 month and we took samples

139
00:05:51,270 --> 00:05:48,040
for cell numbers and viability at 1

140
00:05:53,460 --> 00:05:51,280
month and 4th month at after 4 months we

141
00:05:55,350 --> 00:05:53,470
wanted to see how the organisms had been

142
00:05:56,970 --> 00:05:55,360
evolving their proteome after being

143
00:06:01,800 --> 00:05:56,980
subject to these different conditions of

144
00:06:03,930 --> 00:06:01,810
temperature salinity and nutrients so

145
00:06:06,900 --> 00:06:03,940
let's take a look at what the organisms

146
00:06:08,940 --> 00:06:06,910
were doing starting with the activity so

147
00:06:12,300 --> 00:06:08,950
this graph here you can see the activity

148
00:06:15,590 --> 00:06:12,310
in the vertical axis and time from 0 to

149
00:06:18,900 --> 00:06:15,600
24 hours after the incubation the

150
00:06:23,100 --> 00:06:18,910
vertical lines show you the activity for

151
00:06:25,410 --> 00:06:23,110
the 42 supercooled solutions in green

152
00:06:29,910 --> 00:06:25,420
the negative 5 in orange the negative 10

153
00:06:32,010 --> 00:06:29,920
and you can see that the brine activity

154
00:06:34,230 --> 00:06:32,020
incorporation of the radioactively label

155
00:06:36,540 --> 00:06:34,240
amino acid is basically here in the

156
00:06:38,640 --> 00:06:36,550
bottom you can barely see it above the

157
00:06:40,860 --> 00:06:38,650
activity of the kill controls so as soon

158
00:06:42,960 --> 00:06:40,870
as this organism experience a higher

159
00:06:44,580 --> 00:06:42,970
salinity there is a drastic drop in

160
00:06:48,150 --> 00:06:44,590
their activity in their metabolic

161
00:06:49,260 --> 00:06:48,160
activity and after one month if you

162
00:06:51,450 --> 00:06:49,270
compare the activity

163
00:06:53,130 --> 00:06:51,460

here in the vertical access with the

164
00:06:56,490 --> 00:06:53,140
viability of the cells in a logarithmic

165
00:06:58,860 --> 00:06:56,500
scale in the horizontal axis you can see

166
00:07:01,500 --> 00:06:58,870
that the populations radically diverge

167
00:07:03,810 --> 00:07:01,510
so you still have higher activity after

168
00:07:07,230 --> 00:07:03,820
one month in the supercool samples lower

169
00:07:08,970 --> 00:07:07,240
activity in the primes and what is

170
00:07:11,640 --> 00:07:08,980
interesting is the changes in viability

171
00:07:13,350 --> 00:07:11,650
so for the negative 5 degrees you have a

172
00:07:14,970 --> 00:07:13,360
higher viability so these cells are

173
00:07:16,530 --> 00:07:14,980
really happy they are active and they

174
00:07:19,530 --> 00:07:16,540
are viable when you increase the

175
00:07:20,970 --> 00:07:19,540
salinity at negative 5 the activity

176
00:07:23,490 --> 00:07:20,980
drops but the viability is still

177
00:07:25,680 --> 00:07:23,500
relatively high but for the supercooled

178
00:07:27,540 --> 00:07:25,690
negative 10 seawater the viability has

179
00:07:29,490 --> 00:07:27,550
dropped so after amount of incubation

180
00:07:31,980 --> 00:07:29,500
even though they were picking up the

181
00:07:34,170 --> 00:07:31,990
amino acid at some point they lost the

182
00:07:35,550 --> 00:07:34,180
ability to reproduce and the cells that

183
00:07:38,790 --> 00:07:35,560
were in the negative 10 brine

184
00:07:41,280 --> 00:07:38,800
they have no recognisable activity or

185
00:07:43,170 --> 00:07:41,290
viability after one month so this is

186
00:07:44,880 --> 00:07:43,180
really stressful for them and you can

187
00:07:46,440 --> 00:07:44,890
see that the salt is driving the

188
00:07:47,820 --> 00:07:46,450

difference in the activity and the

189
00:07:50,580 --> 00:07:47,830
temperature the difference in the

190
00:07:53,220 --> 00:07:50,590
viability of the organism so you have

191
00:07:55,230 --> 00:07:53,230
here in this area growing cells here

192
00:07:57,330 --> 00:07:55,240
cells that are with low activity but

193
00:07:59,220 --> 00:07:57,340
still viable cells that are active but

194
00:08:01,320 --> 00:07:59,230
not viable and here in this condition

195
00:08:03,990 --> 00:08:01,330
which is when most of them are non

196
00:08:07,140 --> 00:08:04,000
viable and non active so let's take at

197
00:08:08,550 --> 00:08:07,150
cell numbers here you have the cells and

198
00:08:11,040 --> 00:08:08,560
the viability and I'm going to be

199
00:08:12,960 --> 00:08:11,050
showing two treatments the light colors

200
00:08:14,940 --> 00:08:12,970
are going to be without nutrients and

201
00:08:16,380 --> 00:08:14,950
the dark colors with nutrients and these

202
00:08:18,720 --> 00:08:16,390
triangles he'll show you the initial

203
00:08:20,640 --> 00:08:18,730
conditions so these were the cells how

204
00:08:23,940 --> 00:08:20,650
the state of the cells when we started

205
00:08:27,090 --> 00:08:23,950
incubation and after one month in the

206
00:08:29,190 --> 00:08:27,100
negative 5 supercooled and seawater most

207
00:08:31,050 --> 00:08:29,200
cells are similar to how they started

208
00:08:33,090 --> 00:08:31,060
except that if they don't have very many

209
00:08:35,250 --> 00:08:33,100
nutrients the number of cells decreases

210
00:08:37,800 --> 00:08:35,260
and this outlier here is interesting

211
00:08:39,390 --> 00:08:37,810
because this sample was frozen so the

212
00:08:41,580 --> 00:08:39,400
organisms here were actually

213
00:08:44,490 --> 00:08:41,590

experiencing not the seawater salinity

214
00:08:46,410 --> 00:08:44,500
but the brine salinity at the negative 5

215
00:08:48,630 --> 00:08:46,420
temperature and that had an effort in

216
00:08:50,790 --> 00:08:48,640
the viability so let's take a look at

217
00:08:52,920 --> 00:08:50,800
the brine samples how do they do the

218
00:08:56,790 --> 00:08:52,930
brain samples effectively with the brine

219
00:08:58,440 --> 00:08:56,800
the viability decreased and it was more

220
00:09:01,020 --> 00:08:58,450
drastic effect when there were no

221
00:09:02,910 --> 00:09:01,030
nutrients available for the organism at

222
00:09:05,970 --> 00:09:02,920
negative 10 there was a bigger loss

223
00:09:07,710 --> 00:09:05,980
in the in the viability and the effect

224
00:09:09,990 --> 00:09:07,720
of the nutrients was ever ha even higher

225
00:09:11,449 --> 00:09:10,000
so cells really need the presence of

226
00:09:12,600 --> 00:09:11,459
nutrients to be able to survive

227
00:09:15,240 --> 00:09:12,610
incubations

228
00:09:17,160 --> 00:09:15,250
in these more extreme conditions here

229
00:09:20,220 --> 00:09:17,170
there were we had a lot of frozen

230
00:09:21,840 --> 00:09:20,230
samples which we think were driving even

231
00:09:23,879 --> 00:09:21,850
further down the viability of the

232
00:09:25,949 --> 00:09:23,889
organisms because these samples were

233
00:09:27,960 --> 00:09:25,959
experiencing the brine conditions at

234
00:09:30,300 --> 00:09:27,970
negative 10 and those were really

235
00:09:32,610 --> 00:09:30,310
extreme for the organism at negative 10

236
00:09:34,199 --> 00:09:32,620
divided will be had dropped to 0 but

237
00:09:36,360 --> 00:09:34,209
what is interesting for us is that the

238
00:09:38,250 --> 00:09:36,370

number of cells was preserved so these

239
00:09:40,350 --> 00:09:38,260
cells that were suddenly exposed to a

240
00:09:42,420 --> 00:09:40,360
very high salinity they couldn't

241
00:09:44,850 --> 00:09:42,430
maintain their activity near their

242
00:09:46,530 --> 00:09:44,860
viability but the cells remained and we

243
00:09:48,629 --> 00:09:46,540
think that this may be important when

244
00:09:51,329 --> 00:09:48,639
you think in the context of finding bio

245
00:09:52,860 --> 00:09:51,339
signatures somewhere else so what were

246
00:09:54,389 --> 00:09:52,870
these cells doing for that we're going

247
00:09:57,000 --> 00:09:54,399
to be looking at the proteome of these

248
00:09:59,790 --> 00:09:57,010
cells I'm going to be showing two plots

249
00:10:01,439 --> 00:09:59,800
the first one is anime and in MDS plot

250
00:10:04,170 --> 00:10:01,449
in which each one of the dots is

251
00:10:05,670 --> 00:10:04,180
comparing the proteome of that sample

252
00:10:07,949 --> 00:10:05,680
with a proteome of all of the other

253
00:10:10,110 --> 00:10:07,959
samples the second type of plots I will

254
00:10:12,090 --> 00:10:10,120
be showing our string networks in which

255
00:10:13,769 --> 00:10:12,100
each one of the dots is a protein and

256
00:10:15,630 --> 00:10:13,779
what you are going to be seeing is how

257
00:10:19,860 --> 00:10:15,640
the proteins are related to other

258
00:10:21,870 --> 00:10:19,870
proteins where they are and how are they

259
00:10:23,579 --> 00:10:21,880
related related in the metabolic

260
00:10:25,500 --> 00:10:23,589
pathways so when you look at the

261
00:10:27,810 --> 00:10:25,510
proteome is nice because the treatments

262
00:10:29,850 --> 00:10:27,820
are separating we have here the negative

263
00:10:33,329 --> 00:10:29,860

5 with and without nutrients the

264
00:10:36,030 --> 00:10:33,339
super-cold this is the brain here up you

265
00:10:38,340 --> 00:10:36,040
have the supercool negative 10 and here

266
00:10:41,150 --> 00:10:38,350
are all the negative 10 brain cells that

267
00:10:43,560 --> 00:10:41,160
were not doing very well so let's see

268
00:10:44,960 --> 00:10:43,570
what do these cells do when you increase

269
00:10:48,360 --> 00:10:44,970
the salinity when you go from

270
00:10:50,340 --> 00:10:48,370
supercooled sea water to the increased

271
00:10:52,259 --> 00:10:50,350
salinity the supercooled sea water cells

272
00:10:54,120 --> 00:10:52,269
are doing the normal metabolic paths of

273
00:10:55,980 --> 00:10:54,130
the cell but when you increase the

274
00:10:59,309 --> 00:10:55,990
salinity they start pressing all of

275
00:11:02,910 --> 00:10:59,319
their stress response they become motile

276
00:11:05,670 --> 00:11:02,920
they start assembling clusters of iron

277
00:11:08,579 --> 00:11:05,680
which we think can help with the stress

278
00:11:10,379 --> 00:11:08,589
of the oxidative stress and they start

279
00:11:12,569 --> 00:11:10,389
repairing their DNA so they are stressed

280
00:11:15,150 --> 00:11:12,579
and they are responding to it these two

281
00:11:16,430 --> 00:11:15,160
treatments had nutrients in the absence

282
00:11:20,060 --> 00:11:16,440
of nutrients what are these

283
00:11:22,550 --> 00:11:20,070
doing so they are looking for metals we

284
00:11:24,080 --> 00:11:22,560
think a specifically iron and they start

285
00:11:25,610 --> 00:11:24,090
expressing an interesting protein which

286
00:11:27,320 --> 00:11:25,620
is called a connotates and we think is

287
00:11:29,420 --> 00:11:27,330
interesting because this protein has a

288
00:11:32,150 --> 00:11:29,430

remarkable stability at high salinities

289
00:11:33,770 --> 00:11:32,160
according to the literature and also can

290
00:11:36,110 --> 00:11:33,780
take a dual role depending on the

291
00:11:37,610 --> 00:11:36,120
presence or absence of iron so we see

292
00:11:39,110 --> 00:11:37,620
that the cells are looking for iron and

293
00:11:41,150 --> 00:11:39,120
that they are over expressing

294
00:11:43,700 --> 00:11:41,160
approaching that has something to do

295
00:11:45,230 --> 00:11:43,710
with or that uses iron and can have

296
00:11:47,540 --> 00:11:45,240
different roles depending on the

297
00:11:49,820 --> 00:11:47,550
presence of iron now let's see how the

298
00:11:51,920 --> 00:11:49,830
metabolic networks looked so here you

299
00:11:53,860 --> 00:11:51,930
have the negative 5 super cool brains

300
00:11:56,540 --> 00:11:53,870
and you will see how they compare with

301
00:11:58,670 --> 00:11:56,550
when the salinity is increased so here

302
00:12:00,560 --> 00:11:58,680
is super cool negative 5 and here is the

303
00:12:03,080 --> 00:12:00,570
increase in salinity as soon as the

304
00:12:05,240 --> 00:12:03,090
Cellini's increase a cell that initially

305
00:12:08,270 --> 00:12:05,250
had a lot of metabolic networks acting

306
00:12:11,090 --> 00:12:08,280
active and working simplifies its

307
00:12:13,430 --> 00:12:11,100
proteomic Network to just focus on

308
00:12:15,950 --> 00:12:13,440
finding metals and and become mobile

309
00:12:18,290 --> 00:12:15,960
when you do not have nutrients the

310
00:12:21,410 --> 00:12:18,300
networks are simpler and they are again

311
00:12:23,800 --> 00:12:21,420
focusing on achieving of acquiring iron

312
00:12:27,770 --> 00:12:23,810
and expressing their qualities protein

313
00:12:31,010 --> 00:12:27,780

when we compare these negative 5 brains

314
00:12:33,440 --> 00:12:31,020
with more extreme negative 10 brains we

315
00:12:36,410 --> 00:12:33,450
see that the proteome has simplified

316
00:12:38,240 --> 00:12:36,420
into making proteins that are going to

317
00:12:39,890 --> 00:12:38,250
sterilize the DNA under extreme

318
00:12:41,750 --> 00:12:39,900
conditions so these cells are really

319
00:12:46,160 --> 00:12:41,760
stressed just looking to maintain their

320
00:12:48,500 --> 00:12:46,170
DNA so to conclude what do we see when

321
00:12:50,420 --> 00:12:48,510
we expose a cycler file to extreme cell

322
00:12:53,510 --> 00:12:50,430
conditions they decrease the activity

323
00:12:57,110 --> 00:12:53,520
they reduce the metabolic pathways focus

324
00:12:59,840 --> 00:12:57,120
on iron acquisition and motility in the

325
00:13:03,050 --> 00:12:59,850
negative 5 brine the nutrients help it

326
00:13:05,000 --> 00:13:03,060
be viable and in the negative 10 brine

327
00:13:07,640 --> 00:13:05,010
they lose all the viability and the

328
00:13:10,820 --> 00:13:07,650
proteome just simplifies to take care of

329
00:13:13,130 --> 00:13:10,830
the DNA and make it more stable from the

330
00:13:14,690 --> 00:13:13,140
if you think about the bio signatures we

331
00:13:16,730 --> 00:13:14,700
think that the Econo taste may be a good

332
00:13:19,490 --> 00:13:16,740
candidate because it's all regulated in

333
00:13:20,000 --> 00:13:19,500
these cells Express exposed to the

334
00:13:22,340 --> 00:13:20,010
brines

335
00:13:25,370 --> 00:13:22,350
and it's also very stable at high

336
00:13:27,200 --> 00:13:25,380
salinity and the other aspect that we

337
00:13:30,140 --> 00:13:27,210
found interesting is that the cells are

338
00:13:32,300 --> 00:13:30,150

preserving their their shape

339
00:13:34,280 --> 00:13:32,310
DNA even though they are exposed to very

340
00:13:37,340 --> 00:13:34,290
high salinity conditions and this is

341
00:13:38,870 --> 00:13:37,350
even after four months of incubation so

342
00:13:41,750 --> 00:13:38,880
I want to thank everybody in the team

343
00:13:43,520 --> 00:13:41,760
including me none damage that is just

344
00:13:45,740 --> 00:13:43,530
join our team two weeks ago to help us

345
00:13:56,540 --> 00:13:45,750
process all the proteomic data and our

346
00:14:04,340 --> 00:13:56,550
funding agencies thank you I do we have

347
00:14:06,560 --> 00:14:04,350
any very quick question Justin Lawrence

348
00:14:08,030 --> 00:14:06,570
just super interesting talk I'll say the

349
00:14:09,290 --> 00:14:08,040
second question which is much longer

350
00:14:11,240 --> 00:14:09,300
the first question one as you mentioned

351
00:14:13,640 --> 00:14:11,250
super cool brands how do you hold us a

352
00:14:16,880 --> 00:14:13,650
seawater salinity sample at negative

353
00:14:18,920 --> 00:14:16,890
five for a month how do we hold it

354
00:14:20,540 --> 00:14:18,930
liquid absolutely that's very common

355
00:14:22,940 --> 00:14:20,550
it's the opposite state is how do we

356
00:14:24,650 --> 00:14:22,950
make them freeze so because these are

357
00:14:27,350 --> 00:14:24,660
eppendorf tubes and we are used very

358
00:14:29,600 --> 00:14:27,360
clean water to make our samples the

359
00:14:30,920 --> 00:14:29,610
water juice is in supercooled state

360
00:14:32,870 --> 00:14:30,930
because it doesn't have anything that

361
00:14:37,880 --> 00:14:32,880
nucleates the ice so for us the problem

362
00:14:40,430 --> 00:14:37,890
is actually freezing the samples Kolia

363
00:14:42,320 --> 00:14:40,440

doesn't seem to nucleate the ice we saw

364
00:14:44,120 --> 00:14:42,330
it could help but it doesn't it doesn't

365
00:14:46,760 --> 00:14:44,130
have an effect the only thing we have

366
00:14:53,450 --> 00:14:46,770
found is scratching the tubes that does