To A
To HAB
EXIT

1
00:00:08,749 --> 00:00:05,900
many experiments on the International

2
00:00:10,280 --> 00:00:08,759
Space Station are intended to learn what

3
00:00:11,720 --> 00:00:10,290
we can about the conditions of long-term

4
00:00:13,669 --> 00:00:11,730
space flight as a part of the

5
00:00:15,589 --> 00:00:13,679
preparations for future missions out

6
00:00:17,420 --> 00:00:15,599
into the solar system that includes

7
00:00:19,790 --> 00:00:17,430
experiments that use the human crew

8
00:00:21,950 --> 00:00:19,800
members as test subjects and those that

9
00:00:23,839 --> 00:00:21,960
focus on the millions of other living

10
00:00:25,910 --> 00:00:23,849
things on the station that microbes

11
00:00:28,009 --> 00:00:25,920
which share the station environment with

12
00:00:29,689 --> 00:00:28,019
the human crew commander Terry Virts

13
00:00:31,669 --> 00:00:29,699

will be taking samples for the

14
00:00:33,920 --> 00:00:31,679
experiment microbial Observatory

15
00:00:36,920 --> 00:00:33,930
tomorrow and today were joined by the

16
00:00:39,440 --> 00:00:36,930
principal investigator dr. Koster E van

17
00:00:41,650 --> 00:00:39,450
Casa Juan of the California Institute of

18
00:00:44,060 --> 00:00:41,660
Technology and the Jet Propulsion

19
00:00:46,820 --> 00:00:44,070
Laboratory in Pasadena California to

20
00:00:48,400 --> 00:00:46,830
learn more about it hi dr. VIN qotsa

21
00:00:51,410 --> 00:00:48,410
Juan thank you for joining us today

22
00:00:52,220 --> 00:00:51,420
hi how are you thank you for having us

23
00:00:54,170 --> 00:00:52,230
under there

24
00:00:56,110 --> 00:00:54,180
thank you we really appreciate you

25
00:00:57,770 --> 00:00:56,120
joining us to talk about some about this

26
00:01:01,130 --> 00:00:57,780
experiment that they're going to be

27
00:01:02,300 --> 00:01:01,140
working on I know today Terry is

28
00:01:04,039 --> 00:01:02,310
actually reviewing some of the

29
00:01:06,590 --> 00:01:04,049
procedures for that and now he'll begin

30
00:01:08,780 --> 00:01:06,600
doing some of the samples tomorrow so

31
00:01:10,070 --> 00:01:08,790
let's suppose just talk about where do

32
00:01:13,070 --> 00:01:10,080
the microbes on the space station

33
00:01:15,490 --> 00:01:13,080
where are they um they're everywhere

34
00:01:18,410 --> 00:01:15,500
like you know we breathe and then we

35
00:01:22,100 --> 00:01:18,420
inhale and exhale microbes every day I

36
00:01:24,230 --> 00:01:22,110
like you know so International Space

37
00:01:25,460 --> 00:01:24,240
Station is not a in our different

38
00:01:29,020 --> 00:01:25,470

environment a that other than

39
00:01:31,880 --> 00:01:29,030
microgravity so so they are everywhere

40
00:01:33,970 --> 00:01:31,890
we have to look for it and where did

41
00:01:37,730 --> 00:01:33,980
that come from

42
00:01:39,500 --> 00:01:37,740
yeah that's a great question so normally

43
00:01:40,820 --> 00:01:39,510
people say that it comes you know when

44
00:01:43,580 --> 00:01:40,830
you are living in your house the

45
00:01:45,260 --> 00:01:43,590
microbes comes from outside but in the

46
00:01:46,940 --> 00:01:45,270
case of the International Space Station

47
00:01:49,610 --> 00:01:46,950
you don't have a football outside

48
00:01:52,190 --> 00:01:49,620
football field so the dad comes in and

49
00:01:55,610 --> 00:01:52,200
now but actually the human are the

50
00:01:58,310 --> 00:01:55,620
walking fermenters so they hold say 10

51
00:01:59,920 --> 00:01:58,320
to the 14 cells microbial cells when

52
00:02:03,010 --> 00:01:59,930
compared to their

53
00:02:06,550 --> 00:02:03,020
on a career Accel's they are about

54
00:02:09,249 --> 00:02:06,560
thousand times more and it might come

55
00:02:12,160 --> 00:02:09,259
from the earth through the cargo and the

56
00:02:15,340 --> 00:02:12,170
human who are traveling between them so

57
00:02:18,040 --> 00:02:15,350
the main sores are human as well as the

58
00:02:22,030 --> 00:02:18,050
cut the stuff comes from the earth as a

59
00:02:24,090 --> 00:02:22,040
cargo okay thank you so if we can't

60
00:02:27,340 --> 00:02:24,100
control the microbes that are present

61
00:02:31,690 --> 00:02:27,350
why is it important that we identify and

62
00:02:35,260 --> 00:02:31,700
monitor the microbes it is not it is not

63
00:02:37,960 --> 00:02:35,270

that we cannot control the thing is it

64
00:02:39,699 --> 00:02:37,970
is different from what we are seeing in

65
00:02:42,880 --> 00:02:39,709
the earth compared to what is in a

66
00:02:45,699 --> 00:02:42,890
closed environment because NASA has

67
00:02:49,210 --> 00:02:45,709
taken at most care to have appropriate

68
00:02:51,510 --> 00:02:49,220
and air environmental system of a closed

69
00:02:55,390 --> 00:02:51,520
system like in space stations to see

70
00:02:57,760 --> 00:02:55,400
what can be there in the air in the air

71
00:02:59,530 --> 00:02:57,770
of the space station which is a very

72
00:03:01,780 --> 00:02:59,540
closed system where you know a lot of

73
00:03:05,080 --> 00:03:01,790
things are being inhale inhale and

74
00:03:08,080 --> 00:03:05,090
exhale by the human present in there so

75
00:03:10,930 --> 00:03:08,090
it is not that you cannot control but

76
00:03:14,259 --> 00:03:10,940
you need to know what is in there

77
00:03:16,750 --> 00:03:14,269
so that for a long period of human

78
00:03:19,479 --> 00:03:16,760
habitation in a closed system you can

79
00:03:22,780 --> 00:03:19,489
learn from there and a wide there kind

80
00:03:25,030 --> 00:03:22,790
of prevention so that if you monitor

81
00:03:27,910 --> 00:03:25,040
what is in there you can prevent easily

82
00:03:30,310 --> 00:03:27,920
and we should not forget the microbes

83
00:03:32,050 --> 00:03:30,320
are integral part of the human so there

84
00:03:35,199 --> 00:03:32,060
are a lot of beneficial microbes out

85
00:03:37,600 --> 00:03:35,209
there that helps us also we are not

86
00:03:39,820 --> 00:03:37,610
living in a sterile and ramen okay we

87
00:03:42,550 --> 00:03:39,830
are not transgenic human what that means

88
00:03:44,560 --> 00:03:42,560

is we are not made up of one single

89
00:03:48,910 --> 00:03:44,570
thing we are made up of multiple things

90
00:03:51,340 --> 00:03:48,920
so human knows how to live with things

91
00:03:52,990 --> 00:03:51,350
together a kind of immune system they

92
00:03:56,680 --> 00:03:53,000
are developed so that you know for some

93
00:03:59,710 --> 00:03:56,690
other unwanted thing they can fight the

94
00:04:02,130 --> 00:03:59,720
microbes out there can fight from other

95
00:04:06,670 --> 00:04:02,140
bad microbes also so basically

96
00:04:10,390 --> 00:04:06,680
maintenance is a key part to live and

97
00:04:11,960 --> 00:04:10,400
have a better living conditions in a

98
00:04:13,970 --> 00:04:11,970
closed system

99
00:04:16,580 --> 00:04:13,980
okay thank you so much for that

100
00:04:18,229 --> 00:04:16,590
information so I know Terry is gonna be

101
00:04:20,360 --> 00:04:18,239
gathering samples tomorrow can you

102
00:04:23,240 --> 00:04:20,370
describe for me the on-orbit part of

103
00:04:24,650 --> 00:04:23,250
this this experiment how and where are

104
00:04:28,910 --> 00:04:24,660
they going to be gathering or where will

105
00:04:30,170 --> 00:04:28,920
he be gathering the samples I think you

106
00:04:33,100 --> 00:04:30,180
might have shown some of the places

107
00:04:36,290 --> 00:04:33,110
where we are collecting samples so we

108
00:04:39,560 --> 00:04:36,300
have ordered this experiment through

109
00:04:41,780 --> 00:04:39,570
NASA space biology program to use the

110
00:04:45,470 --> 00:04:41,790
state-of-the-art molecular techniques to

111
00:04:49,570 --> 00:04:45,480
see how the microbes are you know

112
00:04:52,640 --> 00:04:49,580
they're in setup locations for example

113
00:04:55,280 --> 00:04:52,650

astronauts are using the exercise

114
00:04:57,890 --> 00:04:55,290
platform so they sweat a lot so that

115
00:05:00,770 --> 00:04:57,900
means they also you know shed a lot of

116
00:05:03,920 --> 00:05:00,780
microbes so that kind of places where a

117
00:05:07,280 --> 00:05:03,930
lot of activity is going on are the main

118
00:05:09,130 --> 00:05:07,290
target does have and also day-to-day

119
00:05:11,840 --> 00:05:09,140
they have to eat so there are certain

120
00:05:14,510 --> 00:05:11,850
specified area where they can eat and

121
00:05:17,510 --> 00:05:14,520
then you know chat so that is the other

122
00:05:20,690 --> 00:05:17,520
place where people can you know shed

123
00:05:22,850 --> 00:05:20,700
stuff so a dining table and this

124
00:05:25,730 --> 00:05:22,860
particular experiment is on the es side

125
00:05:28,850 --> 00:05:25,740
only so we are having the nodes 1 & 2 &

126
00:05:31,070 --> 00:05:28,860
3 are covered of the aside as well as

127
00:05:34,040 --> 00:05:31,080
some of the exercise place and we also

128
00:05:36,920 --> 00:05:34,050
have other experiments which around the

129
00:05:39,170 --> 00:05:36,930
way to collaborate with the European and

130
00:05:44,060 --> 00:05:39,180
Japanese people to measure the microbial

131
00:05:49,080 --> 00:05:44,070
diversity of there's you know section of

132
00:05:55,210 --> 00:05:53,140
okay so so now we know where and I think

133
00:05:57,550 --> 00:05:55,220
you've also described also you know why

134
00:05:59,490 --> 00:05:57,560
you chose these locations the samples

135
00:06:01,450 --> 00:05:59,500
are being returned on Dragon will you be

136
00:06:06,130 --> 00:06:01,460
analyzing these or how do you analyze

137
00:06:09,970 --> 00:06:06,140
the samples yeah so for the past two

138
00:06:12,220 --> 00:06:09,980

10-15 years NASA is monitoring based on

139
00:06:14,440 --> 00:06:12,230
the traditional culture based analysis

140
00:06:16,930 --> 00:06:14,450
so we all know that you know you can get

141
00:06:18,150 --> 00:06:16,940
only one to ten percent of information

142
00:06:21,160 --> 00:06:18,160
if you are using the traditional

143
00:06:23,770 --> 00:06:21,170
microbiological methods so this state of

144
00:06:26,410 --> 00:06:23,780
the art has evolved from traditional

145
00:06:29,860 --> 00:06:26,420
microbiology using the genomic analysis

146
00:06:31,870 --> 00:06:29,870
so we are using the gene based system to

147
00:06:34,270 --> 00:06:31,880
get the genetic fingerprinting of these

148
00:06:37,570 --> 00:06:34,280
things so that would help us to see

149
00:06:39,520 --> 00:06:37,580
whether any particular cargo is taking a

150
00:06:41,860 --> 00:06:39,530
particular kind of microbes all the time

151
00:06:44,650 --> 00:06:41,870
so you have to repeat again and again

152
00:06:47,860 --> 00:06:44,660
the same sort of method methods so that

153
00:06:50,440 --> 00:06:47,870
you understand where to Minar control

154
00:06:52,300 --> 00:06:50,450
and mitigate the plan so the

155
00:06:55,030 --> 00:06:52,310
state-of-the-art molecular technologies

156
00:06:57,430 --> 00:06:55,040
are very powerful and not time-consuming

157
00:06:59,440 --> 00:06:57,440
and also not laborious and also analyzed

158
00:07:03,100 --> 00:06:59,450
a lot more samples so we are using

159
00:07:05,430 --> 00:07:03,110
molecular techniques right and how do

160
00:07:08,680 --> 00:07:05,440
you anticipate on using the results of

161
00:07:14,440 --> 00:07:08,690
this study I mean on-orbit and also on

162
00:07:16,450 --> 00:07:14,450
earth correct so there are a couple of

163
00:07:18,040 --> 00:07:16,460

things that number one is you know if

164
00:07:21,130 --> 00:07:18,050
you know what are the things out there

165
00:07:24,730 --> 00:07:21,140
whether that is beneficial to humankind

166
00:07:26,500 --> 00:07:24,740
are the one that is not good and harmful

167
00:07:29,100 --> 00:07:26,510
and you know sometimes under

168
00:07:32,080 --> 00:07:29,110
microgravity some changes might happen

169
00:07:34,810 --> 00:07:32,090
if such kind of mutate mutation is

170
00:07:37,450 --> 00:07:34,820
happening then you will know what needs

171
00:07:40,240 --> 00:07:37,460
to be targeted and eradicated using

172
00:07:42,580 --> 00:07:40,250
appropriate cleaning regimes as well as

173
00:07:45,940 --> 00:07:42,590
some sort of mitigation plants can

174
00:07:49,030 --> 00:07:45,950
happen so this is the first step towards

175
00:07:51,850 --> 00:07:49,040
you know achieving that particular goal

176
00:07:53,590 --> 00:07:51,860
how to maintain a better living

177
00:07:55,870 --> 00:07:53,600
condition for the astronauts for a

178
00:07:58,870 --> 00:07:55,880
longer period of time so right now we

179
00:08:00,910 --> 00:07:58,880
are getting data for two to three years

180
00:08:05,280 --> 00:08:00,920
and that can be you

181
00:08:07,920 --> 00:08:05,290
to suggest NASA how to build appropriate

182
00:08:11,800 --> 00:08:07,930
Andromeda control system thereby

183
00:08:14,380 --> 00:08:11,810
containing certain microbial parameters

184
00:08:16,300 --> 00:08:14,390
and also as it said all the time there

185
00:08:19,510 --> 00:08:16,310
are certain many beneficial microbes out

186
00:08:22,450 --> 00:08:19,520
there that helps us to produce it for

187
00:08:23,980 --> 00:08:22,460
tomorrow's food processing for example

188
00:08:27,250 --> 00:08:23,990

if you are going to have a human

189
00:08:29,260 --> 00:08:27,260
presence in you know faraway planets you

190
00:08:31,960 --> 00:08:29,270
know the one of the biggest thing is how

191
00:08:33,670 --> 00:08:31,970
do you keep the food and replenish it so

192
00:08:36,820 --> 00:08:33,680
some of the beneficial microbes that

193
00:08:39,490 --> 00:08:36,830
you'll see there might be useful to the

194
00:08:41,710 --> 00:08:39,500
conditions that helps them to process

195
00:08:45,670 --> 00:08:41,720
such kind of things and then get

196
00:08:47,980 --> 00:08:45,680
benefited well thank you very much for

197
00:08:49,870 --> 00:08:47,990
joining me again dr. Pincus Juan it's

198
00:08:51,340 --> 00:08:49,880
very interesting research and we look

199
00:08:52,810 --> 00:08:51,350
forward to learning more about the

200
00:08:56,410 --> 00:08:52,820
findings that you have throughout this

201
00:08:58,780 --> 00:08:56,420
thank you very much you're very welcome

202
00:09:01,150 --> 00:08:58,790
and a special thanks to the commander of