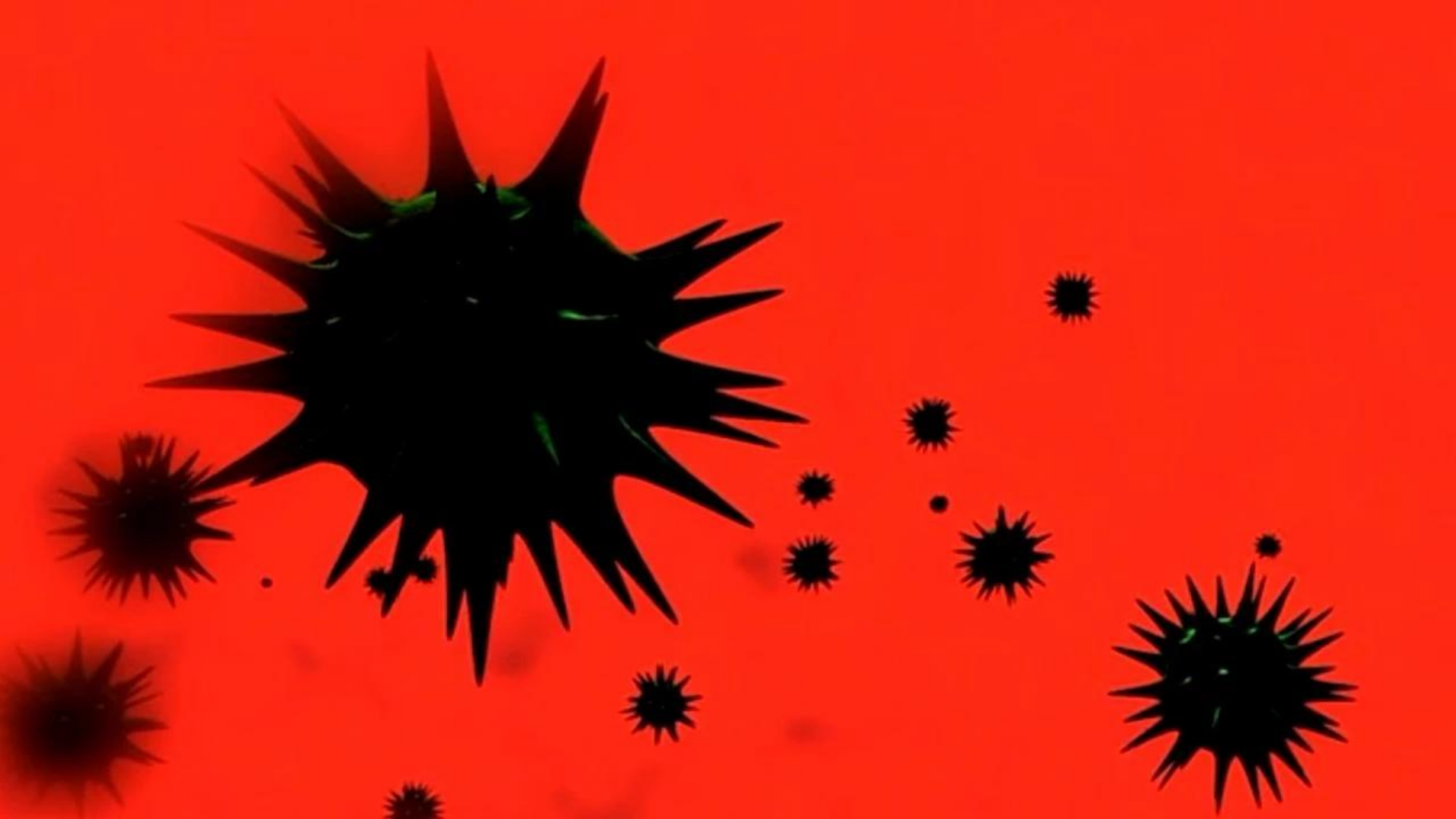

1
00:00:09,600 --> 00:00:06,660
one of the studies the crew has been

2
00:00:11,489 --> 00:00:09,610
working on over the past few weeks takes

3
00:00:14,579 --> 00:00:11,499
a look at the microbes that live inside

4
00:00:18,030 --> 00:00:14,589
and outside our bodies commonly referred

5
00:00:19,710 --> 00:00:18,040
to as microbiome a lengthy study on the

6
00:00:21,990 --> 00:00:19,720
space station continues to gather data

7
00:00:24,570 --> 00:00:22,000
on the types of organisms that are

8
00:00:27,120 --> 00:00:24,580
associated directly with what's on the

9
00:00:29,340 --> 00:00:27,130
crewmember skin and in their GI tracts

10
00:00:31,800 --> 00:00:29,350
and how that may affect their immune

11
00:00:34,500 --> 00:00:31,810
system and what they're learning could

12
00:00:37,770 --> 00:00:34,510
have an impact on long-duration missions

13
00:00:39,989 --> 00:00:37,780

as well on earth Lori Meggs is at the

14
00:00:42,450 --> 00:00:39,999
payload operations and integration

15
00:00:45,779 --> 00:00:42,460
center at NASA's Marshall Space Flight

16
00:00:47,340 --> 00:00:45,789
Center with more Lori well what

17
00:00:48,750 --> 00:00:47,350
researchers are really looking for in

18
00:00:50,399 --> 00:00:48,760
the microbiome experiment are the

19
00:00:53,279 --> 00:00:50,409
changes that occur in those

20
00:00:55,049 --> 00:00:53,289
microorganisms that grow in and on crew

21
00:00:56,700 --> 00:00:55,059
members and how it may affect their

22
00:00:59,040 --> 00:00:56,710
health and whether or not spaceflight

23
00:01:01,379 --> 00:00:59,050
makes them more susceptible to disease I

24
00:01:03,299 --> 00:01:01,389
spoke with Alexander Voorhees he's a

25
00:01:05,580 --> 00:01:03,309
genetics researcher at the j craig

26
00:01:08,850 --> 00:01:05,590
Venter Institute is known for pioneering

27
00:01:11,039 --> 00:01:08,860
genomics research to learn more a lot of

28
00:01:12,300 --> 00:01:11,049
research has been done lately looking at

29
00:01:13,590 --> 00:01:12,310
the human microbiome and all the

30
00:01:15,749 --> 00:01:13,600
microbes that are associated with the

31
00:01:18,029 --> 00:01:15,759
human body and how when they're in a

32
00:01:20,279 --> 00:01:18,039
good positive state they can really help

33
00:01:22,350 --> 00:01:20,289
human health they can bolster our immune

34
00:01:24,120 --> 00:01:22,360
system and they can help us digest food

35
00:01:26,340 --> 00:01:24,130
in a way that gives us just the amount

36
00:01:28,380 --> 00:01:26,350
that we need and not access on the other

37
00:01:30,480 --> 00:01:28,390
hand when it's perturbed and when it's

38
00:01:32,520 --> 00:01:30,490

disturbed like when you take antibiotics

39
00:01:34,980 --> 00:01:32,530
suddenly you don't have any of those

40
00:01:36,330 --> 00:01:34,990
organisms helping you out and so those

41
00:01:39,510 --> 00:01:36,340
are usually associated with disease

42
00:01:41,490 --> 00:01:39,520
states and when a diverse community of

43
00:01:43,169 --> 00:01:41,500
microbes is usually associated with

44
00:01:45,870 --> 00:01:43,179
being a healthy community and when you

45
00:01:47,819 --> 00:01:45,880
lose microbes due to whatever sort of

46
00:01:49,469 --> 00:01:47,829
disease state what ends up happening is

47
00:01:50,910 --> 00:01:49,479
you lose diversity and so what we're

48
00:01:53,730 --> 00:01:50,920
really looking interested in looking at

49
00:01:55,740 --> 00:01:53,740
is these astronauts that are up in orbit

50
00:01:57,630 --> 00:01:55,750
they're in a stressed state their immune

51
00:01:59,700 --> 00:01:57,640
system is compromised and it's likely

52
00:02:01,739 --> 00:01:59,710
that there's changes in the diversity of

53
00:02:04,859 --> 00:02:01,749
their microbial communities and that may

54
00:02:07,410 --> 00:02:04,869
have direct impacts on their health so

55
00:02:09,779 --> 00:02:07,420
how do you study that so in order to do

56
00:02:12,360 --> 00:02:09,789
that we start by using a marker gene

57
00:02:13,650 --> 00:02:12,370
called the 16s ribosomal RNA it's a

58
00:02:15,210 --> 00:02:13,660
small subunit of the ride

59
00:02:17,610 --> 00:02:15,220
the ribosome is the protein that's

60
00:02:19,530 --> 00:02:17,620
responsible for making proteins in the

61
00:02:21,960 --> 00:02:19,540
human body every organism on the planet

62
00:02:23,850 --> 00:02:21,970
has one and so we can make a tree of

63
00:02:26,610 --> 00:02:23,860

life that shows the phylogenetic

64
00:02:29,760 --> 00:02:26,620
relationships of organisms so we can

65
00:02:32,340 --> 00:02:29,770
study this gene in very very complex

66
00:02:34,800 --> 00:02:32,350
detail over a large quantities of

67
00:02:36,600 --> 00:02:34,810
quantity of samples and what we expect

68
00:02:38,970 --> 00:02:36,610
is that being under stressful conditions

69
00:02:41,040 --> 00:02:38,980
that compromise the astronauts immune

70
00:02:43,470 --> 00:02:41,050
system will change the microbial

71
00:02:45,570 --> 00:02:43,480
communities both in their guts and on

72
00:02:48,000 --> 00:02:45,580
their skin while they're in orbit and

73
00:02:50,190 --> 00:02:48,010
that once they return we'll see a shift

74
00:02:51,720 --> 00:02:50,200
back towards the resting state of the

75
00:02:54,360 --> 00:02:51,730
community that we observed before they

76
00:02:56,430 --> 00:02:54,370
left and what we observe with people on

77
00:02:58,740 --> 00:02:56,440
the planet is that when they undergo

78
00:03:01,020 --> 00:02:58,750
periods of stress or periods of disease

79
00:03:04,290 --> 00:03:01,030
the communities associated with them

80
00:03:05,970 --> 00:03:04,300
shifts either they get more organisms or

81
00:03:08,790 --> 00:03:05,980
though or the number of organisms

82
00:03:10,920 --> 00:03:08,800
contracts and they have less and so what

83
00:03:12,810 --> 00:03:10,930
we want to know is this is a high-stress

84
00:03:14,340 --> 00:03:12,820
situation when we send somebody they

85
00:03:16,410 --> 00:03:14,350
leave the planet and they go up into

86
00:03:18,000 --> 00:03:16,420
orbit what happens to those microbial

87
00:03:19,890 --> 00:03:18,010
communities with these people who are

88
00:03:21,030 --> 00:03:19,900

highly trained they're trained to deal

89
00:03:23,640 --> 00:03:21,040
with stress and they're in great

90
00:03:25,410 --> 00:03:23,650
physical shape and what sorts of changes

91
00:03:27,240 --> 00:03:25,420
will we notice in them and how can we

92
00:03:29,160 --> 00:03:27,250
apply that both two people going on

93
00:03:30,960 --> 00:03:29,170
longer missions to Mars where it's going

94
00:03:33,090 --> 00:03:30,970
to become very important to monitor a

95
00:03:35,490 --> 00:03:33,100
microbial community over that time and

96
00:03:37,590 --> 00:03:35,500
also what can we do to help bolster

97
00:03:40,590 --> 00:03:37,600
their immune system can we have them eat

98
00:03:42,870 --> 00:03:40,600
certain foods can we give them microbes

99
00:03:44,130 --> 00:03:42,880
in order to bolster their immune system

100
00:03:45,810 --> 00:03:44,140
and keep them in better health

101
00:03:47,160 --> 00:03:45,820
throughout the mission so that they can

102
00:03:48,960 --> 00:03:47,170
focus on doing the things that an

103
00:03:51,630 --> 00:03:48,970
astronaut needs to do and not the fact

104
00:03:53,729 --> 00:03:51,640
that they feel sick so the unique thing

105
00:03:56,760 --> 00:03:53,739
about this experiment number one is that

106
00:03:59,010 --> 00:03:56,770
it's really a lengthy investigation it

107
00:04:01,110 --> 00:03:59,020
really is it's a five-year project in

108
00:04:03,390 --> 00:04:01,120
total six of our crew members have

109
00:04:06,479 --> 00:04:03,400
already completed sampling for more in

110
00:04:08,610 --> 00:04:06,489
the process of sampling and what is more

111
00:04:11,070 --> 00:04:08,620
than just the fact that it's a long time

112
00:04:13,530 --> 00:04:11,080
period we sample it ten different time

113
00:04:16,320 --> 00:04:13,540

points both pre-flight in flight and

114
00:04:18,300 --> 00:04:16,330
post-flight we also sample at a number

115
00:04:20,130 --> 00:04:18,310
of different body sites so we'll be

116
00:04:22,860 --> 00:04:20,140
looking at six different body sites and

117
00:04:26,370 --> 00:04:22,870
then also correlating that two levels of

118
00:04:28,060 --> 00:04:26,380
stress and two immune function as

119
00:04:30,190 --> 00:04:28,070
measured by cortisol

120
00:04:33,190 --> 00:04:30,200
the blood I'm sorry cortisol and saliva

121
00:04:34,480 --> 00:04:33,200
or cytokines in the blood so what kind

122
00:04:37,330 --> 00:04:34,490
of samples are we talking about that we

123
00:04:39,040 --> 00:04:37,340
take from the crew so the first sample

124
00:04:41,350 --> 00:04:39,050
that we have them take is just an air

125
00:04:42,760 --> 00:04:41,360
swamp they take the swab and they wipe

126
00:04:44,410 --> 00:04:42,770
back and forth in the air and it's

127
00:04:46,060 --> 00:04:44,420
really a negative control to make sure

128
00:04:47,950 --> 00:04:46,070
that we're not contaminating it with

129
00:04:49,480 --> 00:04:47,960
organisms from Earth along the way

130
00:04:52,060 --> 00:04:49,490
through our sampling process and

131
00:04:55,390 --> 00:04:52,070
sequencing process we then take a look

132
00:04:58,000 --> 00:04:55,400
at the forearms the forehead the nasal

133
00:04:59,500 --> 00:04:58,010
cavity the tongue and stool samples to

134
00:05:01,900 --> 00:04:59,510
get an idea of what's going on in the GI

135
00:05:04,810 --> 00:05:01,910
tract over this time you said you've had

136
00:05:07,300 --> 00:05:04,820
six complete this already what have you

137
00:05:09,910 --> 00:05:07,310
learned so far so far what we're finding

138
00:05:11,860 --> 00:05:09,920

and we only have preliminary results so

139
00:05:14,080 --> 00:05:11,870
far we're expecting to have more soon

140
00:05:16,180 --> 00:05:14,090
but what we're finding so far is that we

141
00:05:17,980 --> 00:05:16,190
are noticing a shift a measurable shift

142
00:05:20,050 --> 00:05:17,990
in the microbial communities while

143
00:05:21,910 --> 00:05:20,060
they're in orbit and it will become very

144
00:05:24,040 --> 00:05:21,920
powerful when we can average the results

145
00:05:26,080 --> 00:05:24,050
of multiple crew members to really pick

146
00:05:27,730 --> 00:05:26,090
out is this chemistry specific to an

147
00:05:29,260 --> 00:05:27,740
individual crew member or is this a

148
00:05:31,300 --> 00:05:29,270
trend that all people experience when

149
00:05:34,600 --> 00:05:31,310
they go up into space so why should I

150
00:05:36,190 --> 00:05:34,610
care here on earth well because being

151
00:05:37,960 --> 00:05:36,200
healthy in space is very similar to

152
00:05:39,580 --> 00:05:37,970
being healthy on earth the things that

153
00:05:41,980 --> 00:05:39,590
we discover will directly relate to

154
00:05:43,870 --> 00:05:41,990
every human and it may relate to being

155
00:05:45,820 --> 00:05:43,880
in a stressful situation or it may

156
00:05:47,170 --> 00:05:45,830
inform our knowledge about what happens

157
00:05:48,400 --> 00:05:47,180
to the average human in their microbiome