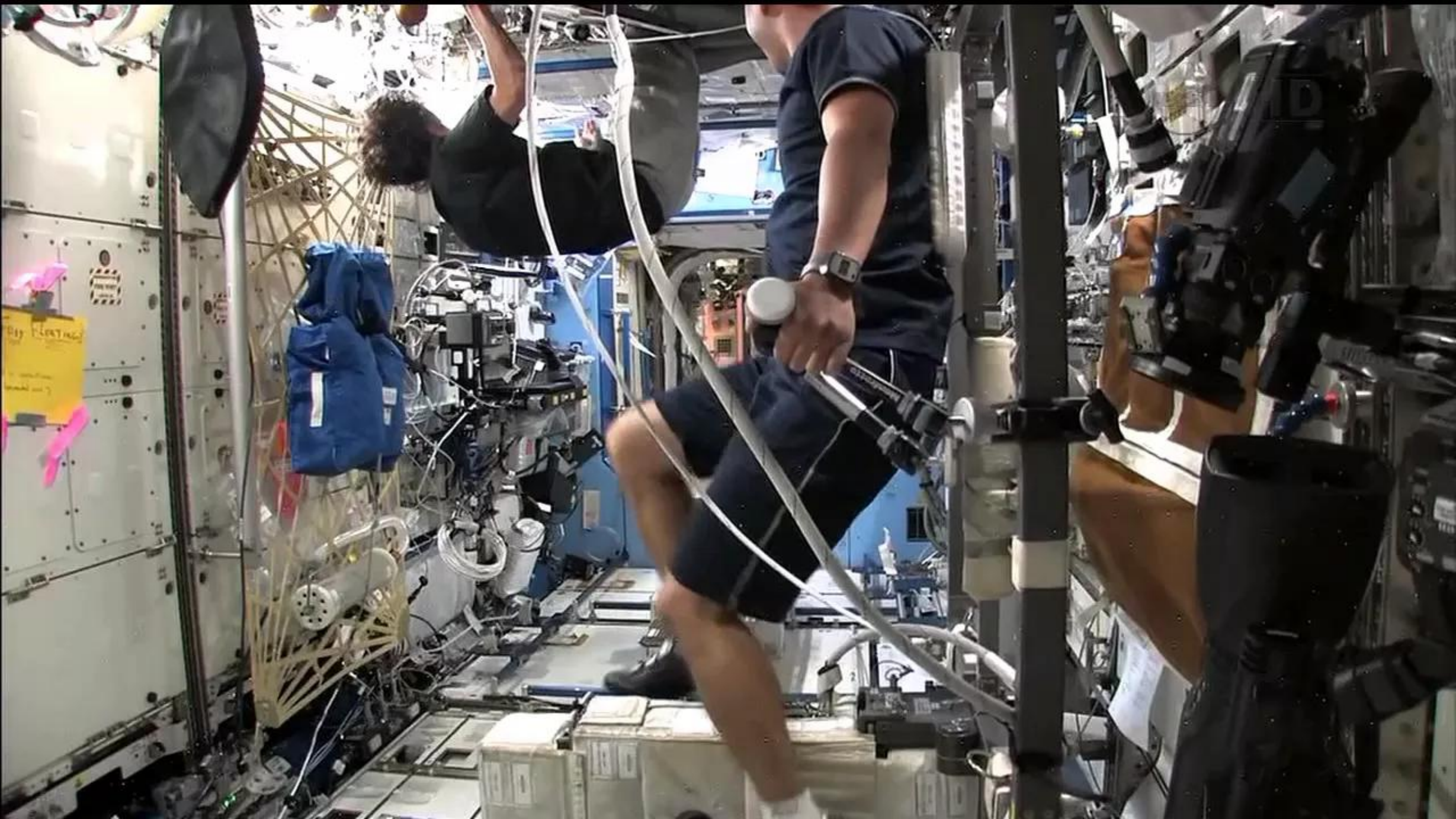

1
00:00:10,150 --> 00:00:08,070
a cardiovascular disease is uh all too

2
00:00:12,629 --> 00:00:10,160
common here on earth claiming more than

3
00:00:14,230 --> 00:00:12,639
six hundred thousand limes a year but on

4
00:00:16,390 --> 00:00:14,240
board the international space station

5
00:00:18,150 --> 00:00:16,400
there's an experiment underway studying

6
00:00:20,630 --> 00:00:18,160
the cardiovascular systems of the

7
00:00:23,429 --> 00:00:20,640
station crew members this experiment is

8
00:00:25,429 --> 00:00:23,439
called cardio ox and could lead to

9
00:00:27,830 --> 00:00:25,439
important information that will benefit

10
00:00:29,509 --> 00:00:27,840
future long-duration space travelers as

11
00:00:30,470 --> 00:00:29,519
well as people who never leave the

12
00:00:32,069 --> 00:00:30,480
planet

13
00:00:34,470 --> 00:00:32,079

from the marshall space flight center in

14
00:00:36,389 --> 00:00:34,480
huntsville alabama my colleague lori

15
00:00:38,709 --> 00:00:36,399
meigs reports on a recent trip to the

16
00:00:43,590 --> 00:00:38,719
cardiovascular lab here at jsc in

17
00:00:46,549 --> 00:00:45,190
it doesn't sound pretty but stewart lee

18
00:00:47,910 --> 00:00:46,559
tells me it's something that we really

19
00:00:50,229 --> 00:00:47,920
need to investigate tell us what we're

20
00:00:51,510 --> 00:00:50,239
studying so our objective to understand

21
00:00:52,950 --> 00:00:51,520
the effects of space flight on the

22
00:00:55,590 --> 00:00:52,960
cardiovascular system and in this

23
00:00:57,990 --> 00:00:55,600
particular case we're interested in the

24
00:01:01,430 --> 00:00:58,000
effects of space flight on cardiac

25
00:01:03,189 --> 00:01:01,440
health and specifically in the arteries

26
00:01:05,429 --> 00:01:03,199
that supply our heart and the rest of

27
00:01:07,750 --> 00:01:05,439
our body so do the

28
00:01:09,429 --> 00:01:07,760
the does a space flight environment

29
00:01:12,390 --> 00:01:09,439
promote a

30
00:01:14,230 --> 00:01:12,400
environment within the body which might

31
00:01:16,310 --> 00:01:14,240
you know increase the progression of

32
00:01:18,469 --> 00:01:16,320
atherosclerosis have we done this before

33
00:01:19,990 --> 00:01:18,479
and what is atherosclerosis i don't know

34
00:01:21,990 --> 00:01:20,000
that i can even say it right so

35
00:01:23,830 --> 00:01:22,000
atherosclerosis is what most people

36
00:01:25,510 --> 00:01:23,840
refer to as hardening the arteries so

37
00:01:28,390 --> 00:01:25,520
it's it's the normal progression that

38
00:01:30,469 --> 00:01:28,400

the body goes through of a

39
00:01:31,429 --> 00:01:30,479
uh essentially

40
00:01:34,469 --> 00:01:31,439
moving

41
00:01:36,469 --> 00:01:34,479
lipids into the into the the walls of

42
00:01:38,310 --> 00:01:36,479
the of the vessels

43
00:01:40,550 --> 00:01:38,320
which in some cases in extreme cases

44
00:01:42,550 --> 00:01:40,560
would lead to a heart attack and can you

45
00:01:44,069 --> 00:01:42,560
show me how it works i i think i want to

46
00:01:45,590 --> 00:01:44,079
be a test subject yeah this is a great

47
00:01:46,950 --> 00:01:45,600
opportunity for you to see a little bit

48
00:01:49,270 --> 00:01:46,960
about what we do in the laboratory and

49
00:01:51,429 --> 00:01:49,280
experience it for yourself

50
00:01:53,270 --> 00:01:51,439
so i feel like i'm giving blood steward

51
00:01:54,389 --> 00:01:53,280
what's happening now so you're not

52
00:01:56,389 --> 00:01:54,399
actually giving blood but we're going to

53
00:01:58,310 --> 00:01:56,399
measure the blood flow in your arm

54
00:02:00,310 --> 00:01:58,320
and so the

55
00:02:02,389 --> 00:02:00,320
uh some of the effects of of

56
00:02:04,709 --> 00:02:02,399
cardiovascular disease is it changes the

57
00:02:05,749 --> 00:02:04,719
way your blood vessels react to changes

58
00:02:07,749 --> 00:02:05,759
in flow

59
00:02:09,190 --> 00:02:07,759
as as you need to increase flow in

60
00:02:11,270 --> 00:02:09,200
different parts your body you want your

61
00:02:12,710 --> 00:02:11,280
blood vessels to be able to dilate and

62
00:02:13,750 --> 00:02:12,720
so that's what this experiment is all

63
00:02:14,949 --> 00:02:13,760

about

64
00:02:15,990 --> 00:02:14,959
what we're doing is we're going to

65
00:02:18,070 --> 00:02:16,000
measure

66
00:02:20,390 --> 00:02:18,080
the blood flow in your arm

67
00:02:22,229 --> 00:02:20,400
at rest so what it would normally be

68
00:02:23,350 --> 00:02:22,239
just when you're when you're laying here

69
00:02:25,350 --> 00:02:23,360
then we're going to include the blood

70
00:02:27,030 --> 00:02:25,360
flow on the bottom part of your arm

71
00:02:28,309 --> 00:02:27,040
what that does is it creates a metabolic

72
00:02:30,630 --> 00:02:28,319
stress on the bottom part of your arm so

73
00:02:33,030 --> 00:02:30,640
your your body wants to get blood flowed

74
00:02:34,830 --> 00:02:33,040
to that part of your your arm so we

75
00:02:37,830 --> 00:02:34,840
normally leave that cuff on for five

76
00:02:39,589 --> 00:02:37,840
minutes and then we release the cuff

77
00:02:41,990 --> 00:02:39,599
and that causes that rush of blood into

78
00:02:43,910 --> 00:02:42,000
the lower part of your arm and so your

79
00:02:46,070 --> 00:02:43,920
as i mentioned the artery in your arm

80
00:02:46,869 --> 00:02:46,080
measuring the brachial artery right now

81
00:02:50,390 --> 00:02:46,879
should

82
00:02:52,390 --> 00:02:50,400
extra blood

83
00:02:54,150 --> 00:02:52,400
if there's problems with the function of

84
00:02:56,949 --> 00:02:54,160
in the artery we won't see that

85
00:03:00,630 --> 00:02:56,959
expansion and that lack of expansion or

86
00:03:01,350 --> 00:03:00,640
dilation of the vessel is indicative of

87
00:03:06,149 --> 00:03:01,360
of

88
00:03:07,910 --> 00:03:06,159

to atherosclerosis

89
00:03:10,309 --> 00:03:07,920
this is a surrogate essentially because

90
00:03:12,470 --> 00:03:10,319
we we can't do this in your heart

91
00:03:15,110 --> 00:03:12,480
it's not not very much fun

92
00:03:16,949 --> 00:03:15,120
they do do it clinically but we wanted

93
00:03:18,470 --> 00:03:16,959
to do it non-invasively so we're using

94
00:03:20,550 --> 00:03:18,480
the brachial artery as a surrogate for

95
00:03:23,190 --> 00:03:20,560
the for the coronary arteries in your

96
00:03:23,990 --> 00:03:23,200
heart so what are we learning from this

97
00:03:26,390 --> 00:03:24,000
so

98
00:03:27,830 --> 00:03:26,400
the idea is we're trying to understand

99
00:03:29,430 --> 00:03:27,840
whether our crew members whether we're

100
00:03:31,030 --> 00:03:29,440
putting that an increased risk for

101
00:03:33,430 --> 00:03:31,040
cardiovascular disease specifically

102
00:03:35,030 --> 00:03:33,440
atherosclerosis as a the result of the

103
00:03:37,350 --> 00:03:35,040
space flight environment

104
00:03:39,030 --> 00:03:37,360
then that when they go into on orbit

105
00:03:41,030 --> 00:03:39,040
i mean they're older individuals so

106
00:03:43,190 --> 00:03:41,040
they're in the 40 to 50 year old range

107
00:03:45,190 --> 00:03:43,200
so they're already starting to show

108
00:03:48,070 --> 00:03:45,200
signs in a normal population they would

109
00:03:50,149 --> 00:03:48,080
be showing signs of atherosclerosis

110
00:03:52,470 --> 00:03:50,159
but you know are we are we accelerating

111
00:03:55,750 --> 00:03:52,480
that process by exposing them to

112
00:03:59,030 --> 00:03:55,760
radiation changes in their diet

113
00:04:00,789 --> 00:03:59,040

additional psychological stress

114
00:04:03,589 --> 00:04:00,799
anything like that which we would

115
00:04:05,110 --> 00:04:03,599
normally associate as a risk factor

116
00:04:07,110 --> 00:04:05,120
on the ground for development of

117
00:04:08,470 --> 00:04:07,120
cardiovascular disease question is does

118
00:04:09,670 --> 00:04:08,480
the space flight environment make that

119
00:04:12,470 --> 00:04:09,680
worse

120
00:04:14,550 --> 00:04:12,480
do you think there are stresses uh more

121
00:04:16,949 --> 00:04:14,560
with space flight that that could lead

122
00:04:18,710 --> 00:04:16,959
to cardiovascular disease so we don't

123
00:04:20,150 --> 00:04:18,720
think there's anything that happens in

124
00:04:21,430 --> 00:04:20,160
flight like we're not expecting a crew

125
00:04:23,030 --> 00:04:21,440
member to have a heart attack just

126
00:04:25,030 --> 00:04:23,040
because they go into space

127
00:04:26,870 --> 00:04:25,040
but we're concerned is the long-term

128
00:04:28,390 --> 00:04:26,880
health effects you know the occupational

129
00:04:29,670 --> 00:04:28,400
health outcomes

130
00:04:31,590 --> 00:04:29,680
and so

131
00:04:33,909 --> 00:04:31,600
you know one of the big issues um that

132
00:04:35,350 --> 00:04:33,919
we're anticipating is based on some

133
00:04:37,510 --> 00:04:35,360
pilot data that was collected in another

134
00:04:40,230 --> 00:04:37,520
laboratory that the

135
00:04:42,230 --> 00:04:40,240
amount of oxidative stress

136
00:04:43,909 --> 00:04:42,240
and inflammation appears to increase

137
00:04:46,230 --> 00:04:43,919
with space flight and those are the

138
00:04:48,230 --> 00:04:46,240

precursors to atherosclerosis those are

139
00:04:50,390 --> 00:04:48,240
usually the first steps to the

140
00:04:52,629 --> 00:04:50,400
development of of changes in what we

141
00:04:54,550 --> 00:04:52,639
call hardening of the arteries or

142
00:04:56,390 --> 00:04:54,560
or plaque development but those are

143
00:04:58,070 --> 00:04:56,400
usually over short you know long periods

144
00:05:00,550 --> 00:04:58,080
of time where we're looking at

145
00:05:01,990 --> 00:05:00,560
a snapshot during space flight

146
00:05:03,909 --> 00:05:02,000
but we're also then following the crew

147
00:05:05,909 --> 00:05:03,919
members for five years after they come

148
00:05:07,990 --> 00:05:05,919
back so we get a you know a more

149
00:05:09,749 --> 00:05:08,000
long-term picture of of their

150
00:05:12,310 --> 00:05:09,759
cardiovascular health

151
00:05:14,070 --> 00:05:12,320
so is this strictly for space flight or

152
00:05:15,990 --> 00:05:14,080
will this have earth applications what

153
00:05:17,909 --> 00:05:16,000
we learn so the the procedures that

154
00:05:20,950 --> 00:05:17,919
we're using in this experiment actually

155
00:05:22,950 --> 00:05:20,960
are used clinically to to track the

156
00:05:25,029 --> 00:05:22,960
progression of atherosclerosis in some

157
00:05:26,629 --> 00:05:25,039
individuals it's used in multiple

158
00:05:29,029 --> 00:05:26,639
studies

159
00:05:29,990 --> 00:05:29,039
looking at you know population-wide

160
00:05:30,790 --> 00:05:30,000
changes

161
00:05:32,790 --> 00:05:30,800
uh

162
00:05:35,510 --> 00:05:32,800
the effectiveness of different

163
00:05:38,150 --> 00:05:35,520

interventions to prevent atherosclerosis

164
00:05:39,909 --> 00:05:38,160
and so it's it's not something that

165
00:05:41,029 --> 00:05:39,919
we're actually doing at the opposite

166
00:05:43,430 --> 00:05:41,039
we're taking

167
00:05:45,029 --> 00:05:43,440
a a technology that's normally used on

168
00:05:46,790 --> 00:05:45,039
the ground we're taking it to space to

169
00:05:48,710 --> 00:05:46,800
study our astronauts

170
00:05:51,510 --> 00:05:48,720
and you're also part of the twin study

171
00:05:54,150 --> 00:05:51,520
too right exactly right so we're we're

172
00:05:56,390 --> 00:05:54,160
we're afforded a very unique

173
00:05:58,150 --> 00:05:56,400
opportunity to study the twins

174
00:05:59,510 --> 00:05:58,160
um the advantage of obviously studying

175
00:06:02,309 --> 00:05:59,520
twins is you're essentially studying the

176
00:06:05,189 --> 00:06:02,319
same person on the ground and on orbit

177
00:06:07,189 --> 00:06:05,199
and so now we can see you know in this

178
00:06:09,350 --> 00:06:07,199
particular case to scott react

179
00:06:11,430 --> 00:06:09,360
differently than mark as a result of

180
00:06:12,870 --> 00:06:11,440
being in space for a year

181
00:06:15,670 --> 00:06:12,880
do you mean that they laid here and went

182
00:06:17,029 --> 00:06:15,680
through this like i have too oh yes

183
00:06:18,070 --> 00:06:17,039
they've both been in here for this

184
00:06:20,629 --> 00:06:18,080
experiment

185
00:06:22,629 --> 00:06:20,639
they're very excited to see our our

186
00:06:23,990 --> 00:06:22,639
results uh it learns they learn

187
00:06:25,830 --> 00:06:24,000
something about themselves in the

188
00:06:28,230 --> 00:06:25,840

process and of course the other part of

189
00:06:29,270 --> 00:06:28,240
the the twin study is that we're teaming

190
00:06:31,749 --> 00:06:29,280
up with group

191
00:06:33,830 --> 00:06:31,759
specifically in our area with uh for

192
00:06:35,909 --> 00:06:33,840
group from uc san diego and we're

193
00:06:38,070 --> 00:06:35,919
looking at the genetic profiling and how

194
00:06:39,990 --> 00:06:38,080
the changes in space flight or how

195
00:06:42,309 --> 00:06:40,000
spaceflight might change the way that

196
00:06:43,110 --> 00:06:42,319
our genes are expressed and then how

197
00:06:46,629 --> 00:06:43,120
that

198
00:06:48,790 --> 00:06:46,639
in turn results or might be related to

199
00:06:50,870 --> 00:06:48,800
changes in the way your body responds to

200
00:06:52,309 --> 00:06:50,880
to stresses like this

201
00:06:53,510 --> 00:06:52,319
so that's it what am i going to learn

202
00:06:55,430 --> 00:06:53,520
from this

203
00:06:56,790 --> 00:06:55,440
well we learn a little bit about the

204
00:06:58,629 --> 00:06:56,800
atherosclerosis and we're going to learn

205
00:07:00,550 --> 00:06:58,639
a little bit about how not just how it

206
00:07:03,430 --> 00:07:00,560
applies to our astronauts but also how

207
00:07:05,990 --> 00:07:03,440
it might be indicative of changes in our

208
00:07:07,830 --> 00:07:06,000
you know the normal population on earth