
PAO

1
00:00:05,030 --> 00:00:03,750
a large portion of the experiments on

2
00:00:07,110 --> 00:00:05,040
the international space station are

3
00:00:09,430 --> 00:00:07,120
designed to find out how that alien

4
00:00:11,509 --> 00:00:09,440
environment impacts the human beings we

5
00:00:13,030 --> 00:00:11,519
send there commander steve swanson and

6
00:00:14,709 --> 00:00:13,040
flight engineer reid wiseman are

7
00:00:17,349 --> 00:00:14,719
scheduled to gather data for one of

8
00:00:18,790 --> 00:00:17,359
those experiments known as cardio ox and

9
00:00:20,710 --> 00:00:18,800
it's looking into whether or not

10
00:00:22,870 --> 00:00:20,720
elevated stress is related to an

11
00:00:25,750 --> 00:00:22,880
increased risk of atherosclerosis in

12
00:00:27,830 --> 00:00:25,760
astronauts during or after space flight

13
00:00:29,910 --> 00:00:27,840

the principal investigator is dr steven

14
00:00:32,389 --> 00:00:29,920
platts of the biomedical research and

15
00:00:34,549 --> 00:00:32,399
environmental sciences division here at

16
00:00:36,709 --> 00:00:34,559
nasa's johnson space center

17
00:00:38,549 --> 00:00:36,719
i spoke to him recently about this

18
00:00:40,950 --> 00:00:38,559
research into the cardiovascular health

19
00:00:42,869 --> 00:00:40,960
risk of long-duration space flight and

20
00:00:46,389 --> 00:00:42,879
asked if we know for a medical fact that

21
00:00:48,310 --> 00:00:46,399
space flight causes stress in astronauts

22
00:00:49,510 --> 00:00:48,320
we don't know for sure and that's always

23
00:00:51,270 --> 00:00:49,520
something with science you know it's

24
00:00:53,189 --> 00:00:51,280
hard to tell anything for sure but there

25
00:00:55,270 --> 00:00:53,199
have been several experiments

26
00:00:57,189 --> 00:00:55,280
over the past few years that have shown

27
00:00:59,270 --> 00:00:57,199
an increase in the biomarkers that are

28
00:01:01,590 --> 00:00:59,280
shown with oxidative stress and most

29
00:01:03,590 --> 00:01:01,600
recently at a meeting in canada

30
00:01:05,670 --> 00:01:03,600
several groups presented data showing

31
00:01:07,910 --> 00:01:05,680
that there were increases in oxidative

32
00:01:09,750 --> 00:01:07,920
stress and increases in

33
00:01:11,990 --> 00:01:09,760
the way that the blood vessels change

34
00:01:14,550 --> 00:01:12,000
during space flight so we're seeing more

35
00:01:16,950 --> 00:01:14,560
changes than we had previously

36
00:01:18,870 --> 00:01:16,960
anticipated so it fits very well with

37
00:01:21,190 --> 00:01:18,880
our experiment so we are collecting data

38
00:01:23,030 --> 00:01:21,200

that that is helping us determine

39
00:01:24,789 --> 00:01:23,040
whether or not that is a cause at all

40
00:01:26,310 --> 00:01:24,799
now um can you tell me a little about

41
00:01:28,070 --> 00:01:26,320
the difference if there's what are the

42
00:01:29,510 --> 00:01:28,080
difference between oxidative versus the

43
00:01:31,429 --> 00:01:29,520
inflammatory stress sure so the

44
00:01:33,270 --> 00:01:31,439
oxidative stress is what's caused

45
00:01:35,590 --> 00:01:33,280
basically by everyday function every

46
00:01:38,310 --> 00:01:35,600
cell in your body when it burns atp

47
00:01:39,990 --> 00:01:38,320
produces a free radical that's what we

48
00:01:42,310 --> 00:01:40,000
used to call it but a reactive oxygen

49
00:01:43,990 --> 00:01:42,320
species or a reactive nitrogen species

50
00:01:45,749 --> 00:01:44,000
so these are the things that they're in

51
00:01:48,230 --> 00:01:45,759
your body naturally it's part of the

52
00:01:50,789 --> 00:01:48,240
normal process and then you also produce

53
00:01:52,950 --> 00:01:50,799
antioxidants so things that clean these

54
00:01:54,630 --> 00:01:52,960
up and you need them in your body that's

55
00:01:57,270 --> 00:01:54,640
one of the primary ways that your white

56
00:01:58,469 --> 00:01:57,280
blood cells fight infection is um with

57
00:02:00,550 --> 00:01:58,479
these compounds so if you don't have

58
00:02:02,550 --> 00:02:00,560
them it's bad and you hear on tv all the

59
00:02:04,310 --> 00:02:02,560
time well you should eat blueberries and

60
00:02:05,749 --> 00:02:04,320
eat dark chocolate and drink red wine

61
00:02:08,469 --> 00:02:05,759
because they have antioxidants right

62
00:02:10,550 --> 00:02:08,479
yeah i know i do too but those are

63
00:02:11,750 --> 00:02:10,560

because they're antioxidants so you want

64
00:02:14,790 --> 00:02:11,760
to be careful you don't want to take

65
00:02:17,190 --> 00:02:14,800
antioxidants unless you need them but

66
00:02:19,830 --> 00:02:17,200
recent research has shown that many

67
00:02:22,070 --> 00:02:19,840
disease processes involve oxidative

68
00:02:24,150 --> 00:02:22,080
stress and that's what happens when that

69
00:02:26,070 --> 00:02:24,160
balance is skewed in your body so either

70
00:02:28,710 --> 00:02:26,080
you're producing too many

71
00:02:30,710 --> 00:02:28,720
oxidants or you're not

72
00:02:32,790 --> 00:02:30,720
getting rid of them enough so there's

73
00:02:35,670 --> 00:02:32,800
this equation of fine balance and that's

74
00:02:37,509 --> 00:02:35,680
disrupted so you're tilting towards a

75
00:02:39,990 --> 00:02:37,519
more oxidative environment and that's

76
00:02:41,589 --> 00:02:40,000
when you can get damage to

77
00:02:43,190 --> 00:02:41,599
dna or

78
00:02:44,229 --> 00:02:43,200
protein changes

79
00:02:45,910 --> 00:02:44,239
or

80
00:02:47,589 --> 00:02:45,920
changes in the vascular wall which is

81
00:02:49,350 --> 00:02:47,599
what we're looking at how those things

82
00:02:50,710 --> 00:02:49,360
occur and those are precursors to

83
00:02:53,430 --> 00:02:50,720
inflammatory

84
00:02:55,990 --> 00:02:53,440
stresses so it's oxidative stress occurs

85
00:02:57,509 --> 00:02:56,000
that creates an inflammatory environment

86
00:02:59,670 --> 00:02:57,519
and then that inflammation really can

87
00:03:01,910 --> 00:02:59,680
damage the tissue and lead to a

88
00:03:03,670 --> 00:03:01,920

pathological state like atherosclerosis

89
00:03:05,830 --> 00:03:03,680
great thanks for that well so i can only

90
00:03:08,390 --> 00:03:05,840
imagine but can you tell me briefly what

91
00:03:09,830 --> 00:03:08,400
causes the stress for the astronauts

92
00:03:11,509 --> 00:03:09,840
there are quite a few things so again

93
00:03:13,990 --> 00:03:11,519
here on earth we're extrapolating a lot

94
00:03:16,550 --> 00:03:14,000
of this up into space but we know that

95
00:03:18,630 --> 00:03:16,560
radiation causes oxidative stress we

96
00:03:20,309 --> 00:03:18,640
know that certain types of diet can

97
00:03:22,790 --> 00:03:20,319
cause it

98
00:03:24,869 --> 00:03:22,800
physical activity both too much and too

99
00:03:26,949 --> 00:03:24,879
little can increase your oxidative

100
00:03:29,270 --> 00:03:26,959
stress even something like psychological

101
00:03:31,910 --> 00:03:29,280
stress just the confinement of being up

102
00:03:34,149 --> 00:03:31,920
in space increases the oxidative stress

103
00:03:36,630 --> 00:03:34,159
and again a recent study that was uh

104
00:03:38,710 --> 00:03:36,640
presented up in canada showed that just

105
00:03:40,949 --> 00:03:38,720
confinement alone the psychological

106
00:03:43,110 --> 00:03:40,959
stress that occurs with that

107
00:03:44,949 --> 00:03:43,120
changes the vascular wall and how that

108
00:03:46,949 --> 00:03:44,959
blood vessel then functions

109
00:03:48,869 --> 00:03:46,959
okay let's talk about this thing from

110
00:03:51,509 --> 00:03:48,879
here today can you tell me about how we

111
00:03:52,949 --> 00:03:51,519
are going about collecting the data

112
00:03:55,190 --> 00:03:52,959
there are two main ways we collect data

113
00:03:57,509 --> 00:03:55,200

the first is the the biomarkers so we

114
00:03:59,750 --> 00:03:57,519
want to look at blood and urine and see

115
00:04:01,830 --> 00:03:59,760
which markers of oxidative stress or

116
00:04:03,670 --> 00:04:01,840
inflammation are elevated but the

117
00:04:05,750 --> 00:04:03,680
primary way we collect physiological

118
00:04:07,670 --> 00:04:05,760
data is with the ultrasound machine here

119
00:04:09,670 --> 00:04:07,680
and this is our portable ultrasound it's

120
00:04:11,429 --> 00:04:09,680
exactly the same as ultrasound that's on

121
00:04:13,190 --> 00:04:11,439
station up there it's called the

122
00:04:14,630 --> 00:04:13,200
ultrasound two it's the second unit

123
00:04:16,710 --> 00:04:14,640
they've had up there we have it

124
00:04:18,789 --> 00:04:16,720
configured exactly the same as they do

125
00:04:20,629 --> 00:04:18,799
on station again so that we can talk

126
00:04:22,710 --> 00:04:20,639
them through their data collections uh

127
00:04:25,270 --> 00:04:22,720
in the minimal amount of time possible

128
00:04:27,189 --> 00:04:25,280
here you'll you see a carotid artery and

129
00:04:29,110 --> 00:04:27,199
this is one of the primary arteries that

130
00:04:31,670 --> 00:04:29,120
we're looking at for this experiment

131
00:04:34,230 --> 00:04:31,680
over here is a black and white image and

132
00:04:36,070 --> 00:04:34,240
if you blow up this area you can see a

133
00:04:37,749 --> 00:04:36,080
larger view and this is doppler

134
00:04:40,469 --> 00:04:37,759
ultrasound so this is much like a

135
00:04:42,469 --> 00:04:40,479
weather map where they're showing

136
00:04:45,110 --> 00:04:42,479
the rain moving we're showing blood

137
00:04:48,070 --> 00:04:45,120
flowing and so we will use these data to

138
00:04:50,310 --> 00:04:48,080

help us calculate what the blood flow is

139
00:04:51,590 --> 00:04:50,320
in that artery we also use diameter

140
00:04:53,590 --> 00:04:51,600
measurements and one of the most

141
00:04:56,550 --> 00:04:53,600
important things we do is measure the

142
00:04:58,230 --> 00:04:56,560
thickness of this wall and for our study

143
00:05:00,390 --> 00:04:58,240
the thickness of the wall is a critical

144
00:05:02,150 --> 00:05:00,400
component that thickness has been shown

145
00:05:03,990 --> 00:05:02,160
to relate to a long-term risk of

146
00:05:06,150 --> 00:05:04,000
atherosclerosis so that's one of our

147
00:05:08,790 --> 00:05:06,160
primary outcomes is how thick does that

148
00:05:11,189 --> 00:05:08,800
wall get and then does that relate or

149
00:05:12,310 --> 00:05:11,199
correlate to a change in the biomarkers

150
00:05:14,310 --> 00:05:12,320
that we're getting in the other part of

151
00:05:15,830 --> 00:05:14,320
the experiment and the astronaut is

152
00:05:17,270 --> 00:05:15,840
using you have

153
00:05:18,710 --> 00:05:17,280
yes we have a

154
00:05:20,870 --> 00:05:18,720
ultrasound probe here so when they're

155
00:05:23,510 --> 00:05:20,880
doing a collection like this

156
00:05:25,510 --> 00:05:23,520
they will take the probe and hold it and

157
00:05:27,830 --> 00:05:25,520
like the carotid artery would be right

158
00:05:29,110 --> 00:05:27,840
about here and they would manipulate it

159
00:05:30,950 --> 00:05:29,120
and from the ground would be telling

160
00:05:32,950 --> 00:05:30,960
them okay move it to the left move it to

161
00:05:35,270 --> 00:05:32,960
the right rotate it this way and they

162
00:05:37,909 --> 00:05:35,280
can do these types of things we also do

163
00:05:39,590 --> 00:05:37,919

some cardiac measurements and you can do

164
00:05:41,189 --> 00:05:39,600
that like this and then the brachial

165
00:05:43,670 --> 00:05:41,199
artery in the arm is what we're using as

166
00:05:45,430 --> 00:05:43,680
our control vessel so that vessel is at

167
00:05:47,189 --> 00:05:45,440
the same level as the heart shouldn't

168
00:05:48,230 --> 00:05:47,199
change much if you're looking at

169
00:05:50,469 --> 00:05:48,240
pressures

170
00:05:52,390 --> 00:05:50,479
and we're using that to look at function

171
00:05:54,070 --> 00:05:52,400
as well as structure so we can do other

172
00:05:56,309 --> 00:05:54,080
types of experiments where we see how

173
00:05:58,629 --> 00:05:56,319
that blood vessel functions we can see

174
00:06:00,870 --> 00:05:58,639
it get bigger and get smaller

175
00:06:02,950 --> 00:06:00,880
when we do different perturbations to it

176
00:06:05,430 --> 00:06:02,960
and so i assume you take various data

177
00:06:10,150 --> 00:06:08,390
before during yes we do pre-flight post

178
00:06:12,870 --> 00:06:10,160
flight and then in flight

179
00:06:15,110 --> 00:06:12,880
tell me what what you hope to get from

180
00:06:17,670 --> 00:06:15,120
the results of this sure um one of the

181
00:06:19,830 --> 00:06:17,680
things we don't know is if space flight

182
00:06:22,309 --> 00:06:19,840
increases the long-term risk of an

183
00:06:23,510 --> 00:06:22,319
astronaut having a cardiovascular issue

184
00:06:25,749 --> 00:06:23,520
in the future

185
00:06:27,189 --> 00:06:25,759
we've done some work looking at what's

186
00:06:30,710 --> 00:06:27,199
happening in flight but we don't know

187
00:06:32,550 --> 00:06:30,720
long term so this study will help us to

188
00:06:34,790 --> 00:06:32,560

figure out if we have a long-term risk

189
00:06:36,710 --> 00:06:34,800
and a lot of that is

190
00:06:38,550 --> 00:06:36,720
we're recognizing that it's not a

191
00:06:39,990 --> 00:06:38,560
one-shot deal right you give a stress

192
00:06:41,670 --> 00:06:40,000
and you're not necessarily going to have

193
00:06:43,430 --> 00:06:41,680
a problem right then but 10 years down

194
00:06:45,670 --> 00:06:43,440
the road you may have increased their

195
00:06:46,710 --> 00:06:45,680
risk and so this study is one of the few

196
00:06:49,830 --> 00:06:46,720
studies

197
00:06:51,430 --> 00:06:49,840
that has a surveillance part to it so

198
00:06:54,070 --> 00:06:51,440
we're looking at these astronauts for

199
00:06:56,870 --> 00:06:54,080
five years after they return from space

200
00:06:59,029 --> 00:06:56,880
to see if there's any chronic changes or

201
00:07:00,150 --> 00:06:59,039
chronic inflammation that's going on and

202
00:07:01,830 --> 00:07:00,160
that's

203
00:07:04,230 --> 00:07:01,840
very important for clinical medicine

204
00:07:06,629 --> 00:07:04,240
here on earth they look at these types

205
00:07:09,189 --> 00:07:06,639
of markers and look at the risks that

206
00:07:11,270 --> 00:07:09,199
people have over time and there are some

207
00:07:12,950 --> 00:07:11,280
uh epidemiological studies that have

208
00:07:14,870 --> 00:07:12,960
been done the most famous being the

209
00:07:16,950 --> 00:07:14,880
framingham study and they create a

210
00:07:19,350 --> 00:07:16,960
number to give you your overall risk for

211
00:07:21,589 --> 00:07:19,360
having a heart disease in the future but

212
00:07:23,430 --> 00:07:21,599
a lot of these models are now adding in

213
00:07:25,430 --> 00:07:23,440

the vascular age

214
00:07:27,510 --> 00:07:25,440
and people probably seen that on tv now

215
00:07:29,350 --> 00:07:27,520
the vascular age oh i'm a 90 year old as

216
00:07:30,950 --> 00:07:29,360
far as my blood vessels are concerned

217
00:07:32,550 --> 00:07:30,960
but it's it's a real number and

218
00:07:35,110 --> 00:07:32,560
different people calculate it different

219
00:07:37,670 --> 00:07:35,120
ways but what leads up to that is how

220
00:07:39,270 --> 00:07:37,680
are your blood vessels functioning and

221
00:07:42,150 --> 00:07:39,280
we're hopefully going to be able to

222
00:07:43,990 --> 00:07:42,160
contribute to that to say okay if you

223
00:07:45,990 --> 00:07:44,000
have this much change in your blood

224
00:07:47,589 --> 00:07:46,000
vessel function or this much change in

225
00:07:49,670 --> 00:07:47,599
the structure how does that relate to

226
00:07:50,869 --> 00:07:49,680
your long-term risk of cardiovascular

227
00:07:53,029 --> 00:07:50,879
disease

228
00:07:54,629 --> 00:07:53,039
very very interesting and important work

229
00:07:56,150 --> 00:07:54,639
that you are doing you and your team i

230
00:07:58,230 --> 00:07:56,160
appreciate you coming out that's all the

231
00:08:00,150 --> 00:07:58,240
time we have and showing us all the work

232
00:08:02,150 --> 00:08:00,160
that you are doing and much continued

233
00:08:03,990 --> 00:08:02,160
success great and uh hope we get more

234
00:08:05,430 --> 00:08:04,000
answers to