
PAO

1
00:00:05,190 --> 00:00:03,429
the expedition 40 astronauts going to be

2
00:00:06,789 --> 00:00:05,200
doing a multitude of experiments during

3
00:00:08,950 --> 00:00:06,799
their time on board the international

4
00:00:10,310 --> 00:00:08,960
space station here to talk about some of

5
00:00:12,310 --> 00:00:10,320
the experiments that they're going to be

6
00:00:14,470 --> 00:00:12,320
doing is related to biological studies i

7
00:00:16,390 --> 00:00:14,480
have dr scott smith he's the manager of

8
00:00:19,029 --> 00:00:16,400
nutritional biochemistry here at johnson

9
00:00:21,670 --> 00:00:19,039
space center so dr smith first off

10
00:00:24,310 --> 00:00:21,680
thanks for joining me today now may is

11
00:00:26,630 --> 00:00:24,320
osteoporosis awareness month so i want

12
00:00:28,470 --> 00:00:26,640
to focus on bones today now

13
00:00:30,150 --> 00:00:28,480

we all know that our bodies you know

14
00:00:31,669 --> 00:00:30,160
they're very great at adapting to new

15
00:00:33,110 --> 00:00:31,679
environments and they change quite a bit

16
00:00:34,790 --> 00:00:33,120
in space what are some of the

17
00:00:37,510 --> 00:00:34,800
experiments that you guys are doing

18
00:00:39,110 --> 00:00:37,520
related to bone study okay well first of

19
00:00:40,310 --> 00:00:39,120
all thanks for having me here it's it's

20
00:00:41,110 --> 00:00:40,320
great to get to talk about some of the

21
00:00:43,510 --> 00:00:41,120
stuff

22
00:00:45,029 --> 00:00:43,520
that we're doing back in the lab

23
00:00:46,229 --> 00:00:45,039
we actually have

24
00:00:48,150 --> 00:00:46,239
we have a few experiments going on

25
00:00:50,470 --> 00:00:48,160
onboard station these days

26
00:00:51,990 --> 00:00:50,480
one of them that is is active right now

27
00:00:53,110 --> 00:00:52,000
is what we call the biochemical profile

28
00:00:54,229 --> 00:00:53,120
experiment

29
00:00:57,430 --> 00:00:54,239
and

30
00:01:00,470 --> 00:00:57,440
that involves the crew collecting

31
00:01:01,910 --> 00:01:00,480
biological samples that allow us to see

32
00:01:02,950 --> 00:01:01,920
how their bones are adapting to space

33
00:01:04,710 --> 00:01:02,960
flight

34
00:01:06,710 --> 00:01:04,720
now we you know everybody's used to

35
00:01:09,670 --> 00:01:06,720
x-rays that you can take and obviously

36
00:01:11,190 --> 00:01:09,680
we don't have an x-ray machine on orbit

37
00:01:13,350 --> 00:01:11,200
and what these samples allow us to do is

38
00:01:14,789 --> 00:01:13,360

to see what's happening with bone

39
00:01:17,350 --> 00:01:14,799
during flight

40
00:01:20,070 --> 00:01:17,360
and one of the more striking findings

41
00:01:22,710 --> 00:01:20,080
that we've we've come across recently

42
00:01:24,550 --> 00:01:22,720
is that you know we've known for for

43
00:01:26,950 --> 00:01:24,560
some time now that astronauts lose bone

44
00:01:29,510 --> 00:01:26,960
during flight

45
00:01:30,950 --> 00:01:29,520
with the resistive exercise protocols

46
00:01:32,390 --> 00:01:30,960
essentially the weight lifting if you

47
00:01:35,670 --> 00:01:32,400
will protocols

48
00:01:37,270 --> 00:01:35,680
that the crew members perform on orbit

49
00:01:40,069 --> 00:01:37,280
what we've shown recently is that those

50
00:01:42,630 --> 00:01:40,079
protocols in crew members that are

51
00:01:44,550 --> 00:01:42,640
eating well getting enough calories

52
00:01:46,310 --> 00:01:44,560
have good vitamin d status

53
00:01:47,990 --> 00:01:46,320
that when they exercise hard that we can

54
00:01:49,990 --> 00:01:48,000
actually help maintain

55
00:01:51,590 --> 00:01:50,000
the density of their bones uh during

56
00:01:52,950 --> 00:01:51,600
spaceflight so really one of the

57
00:01:54,630 --> 00:01:52,960
countermeasures that we've really

58
00:01:56,950 --> 00:01:54,640
focused on in these past few years has

59
00:01:58,230 --> 00:01:56,960
been exercise and nutrition that's

60
00:02:00,870 --> 00:01:58,240
correct it's a combination that's

61
00:02:02,230 --> 00:02:00,880
correct and and it it really does take

62
00:02:04,069 --> 00:02:02,240
both of those things

63
00:02:05,590 --> 00:02:04,079

um and i would say we focused on

64
00:02:06,789 --> 00:02:05,600
exercise for a long time i mean if you

65
00:02:08,710 --> 00:02:06,799
go back to

66
00:02:10,070 --> 00:02:08,720
skylab those crews had some exercise

67
00:02:11,830 --> 00:02:10,080
available

68
00:02:14,150 --> 00:02:11,840
it was only recently though that we flew

69
00:02:15,750 --> 00:02:14,160
a device that we call the a red

70
00:02:17,910 --> 00:02:15,760
which is the advanced resistive exercise

71
00:02:20,229 --> 00:02:17,920
device which allows crews

72
00:02:21,190 --> 00:02:20,239
to to essentially again lift enough

73
00:02:23,270 --> 00:02:21,200
weight

74
00:02:25,190 --> 00:02:23,280
um to

75
00:02:26,229 --> 00:02:25,200
signal the bones that they need to be

76
00:02:27,670 --> 00:02:26,239
there

77
00:02:28,790 --> 00:02:27,680
otherwise what happens in flight is the

78
00:02:30,630 --> 00:02:28,800
body

79
00:02:33,030 --> 00:02:30,640
realizes that

80
00:02:34,470 --> 00:02:33,040
you're not using your bones and

81
00:02:36,869 --> 00:02:34,480
you know i always say your body does

82
00:02:38,150 --> 00:02:36,879
what you pay it for so if you're not

83
00:02:40,869 --> 00:02:38,160
walking around if you're not carrying

84
00:02:42,630 --> 00:02:40,879
things if you don't have that mass

85
00:02:43,830 --> 00:02:42,640
pushing on the body your bone says your

86
00:02:45,830 --> 00:02:43,840
body says well i don't need this

87
00:02:48,229 --> 00:02:45,840
skeleton let's make a lighter one that

88
00:02:50,309 --> 00:02:48,239

we can use up here and that can be a

89
00:02:51,509 --> 00:02:50,319
bit of trouble once you get back exactly

90
00:02:52,710 --> 00:02:51,519
it works great while you're up there but

91
00:02:55,589 --> 00:02:52,720
if you want to come home it tends to

92
00:02:57,270 --> 00:02:55,599
cause problems okay now and just real

93
00:02:59,190 --> 00:02:57,280
quick you mentioned that um the crews

94
00:03:00,869 --> 00:02:59,200
are taking various samples

95
00:03:02,149 --> 00:03:00,879
during their time on the international

96
00:03:03,589 --> 00:03:02,159
space station what are some of those

97
00:03:06,070 --> 00:03:03,599
samples that they're taking and how are

98
00:03:07,270 --> 00:03:06,080
you guys using them well you know again

99
00:03:09,750 --> 00:03:07,280
i lead what's called the nutritional

100
00:03:11,830 --> 00:03:09,760
biochemistry lab and what we do is

101
00:03:13,830 --> 00:03:11,840
look at at biochemicals things in the

102
00:03:15,270 --> 00:03:13,840
blood things in the urine

103
00:03:17,910 --> 00:03:15,280
that tell us about what's going on in

104
00:03:19,509 --> 00:03:17,920
the bone okay so it it works in concert

105
00:03:21,030 --> 00:03:19,519
with the x-ray studies that are done

106
00:03:22,470 --> 00:03:21,040
before and after flight

107
00:03:24,710 --> 00:03:22,480
um but

108
00:03:26,309 --> 00:03:24,720
our our magic is is in the blood and

109
00:03:28,550 --> 00:03:26,319
urine and crews

110
00:03:30,309 --> 00:03:28,560
um up to five times during flight will

111
00:03:32,470 --> 00:03:30,319
collect blood samples for us

112
00:03:34,070 --> 00:03:32,480
um they'll collect urines over the

113
00:03:35,509 --> 00:03:34,080

course of 24 hours they'll collect all

114
00:03:37,270 --> 00:03:35,519
their urine for us

115
00:03:39,830 --> 00:03:37,280
no samples are processed that is the

116
00:03:41,589 --> 00:03:39,840
blood samples are centrifuged

117
00:03:43,589 --> 00:03:41,599
and then both the blood and the urine go

118
00:03:46,470 --> 00:03:43,599
into a freezer onboard station what we

119
00:03:48,630 --> 00:03:46,480
call the melfi which is a minus 80

120
00:03:50,149 --> 00:03:48,640
um it's the minus 80 laboratory freezer

121
00:03:51,750 --> 00:03:50,159
on rss

122
00:03:54,390 --> 00:03:51,760
those samples are frozen

123
00:03:57,030 --> 00:03:54,400
um until until we can get them back from

124
00:03:58,710 --> 00:03:57,040
from station and we just recently got

125
00:04:00,789 --> 00:03:58,720
some of those back spacex's dragon

126
00:04:02,070 --> 00:04:00,799
vehicle returning to earth back on may

127
00:04:04,070 --> 00:04:02,080
18th

128
00:04:05,110 --> 00:04:04,080
so we now have this return capability

129
00:04:07,110 --> 00:04:05,120
again

130
00:04:08,789 --> 00:04:07,120
how much real quick how much did spacex

131
00:04:10,789 --> 00:04:08,799
bring back for you guys and how quickly

132
00:04:12,789 --> 00:04:10,799
were you able to get your hands on it

133
00:04:15,830 --> 00:04:12,799
well for our experiments uh spacex

134
00:04:18,550 --> 00:04:15,840
brought home just about uh 700 samples

135
00:04:20,390 --> 00:04:18,560
wow uh tubes of blood and urine

136
00:04:22,870 --> 00:04:20,400
um so we were very excited about this

137
00:04:24,550 --> 00:04:22,880
and we're big fans of spacex because

138
00:04:27,189 --> 00:04:24,560

spacex right now is the only way we can

139
00:04:29,430 --> 00:04:27,199
bring those samples home

140
00:04:32,550 --> 00:04:29,440
so that works out very well the spacex

141
00:04:34,310 --> 00:04:32,560
splashed down a week ago sunday

142
00:04:36,710 --> 00:04:34,320
last wednesday was when the samples made

143
00:04:38,469 --> 00:04:36,720
their way back to houston um and and my

144
00:04:40,150 --> 00:04:38,479
team was there we inventoried samples

145
00:04:41,749 --> 00:04:40,160
that morning

146
00:04:43,749 --> 00:04:41,759
brought them all back over to our lab

147
00:04:45,189 --> 00:04:43,759
and the folks have already started

148
00:04:47,030 --> 00:04:45,199
processing those and getting them ready

149
00:04:48,469 --> 00:04:47,040
for analysis so

150
00:04:50,150 --> 00:04:48,479
the process is a little slow it'll take

151
00:04:52,629 --> 00:04:50,160
us a few months to get all the work out

152
00:04:54,870 --> 00:04:52,639
of them but we've already started okay

153
00:04:56,870 --> 00:04:54,880
well we've been studying bone loss among

154
00:04:58,550 --> 00:04:56,880
other things for years and years on

155
00:05:00,469 --> 00:04:58,560
station what are just some of the things

156
00:05:01,670 --> 00:05:00,479
you know we know that we're losing bone

157
00:05:04,150 --> 00:05:01,680
what are some of the other things that

158
00:05:07,189 --> 00:05:04,160
we've really learned and how is that so

159
00:05:09,830 --> 00:05:07,199
important to space flight in the future

160
00:05:11,830 --> 00:05:09,840
well again the the exercise the

161
00:05:13,189 --> 00:05:11,840
exercises and nutrition protocols we've

162
00:05:15,430 --> 00:05:13,199
we've impacted

163
00:05:17,189 --> 00:05:15,440

um have managed i would say for the

164
00:05:20,070 --> 00:05:17,199
first time in 50 years

165
00:05:21,510 --> 00:05:20,080
uh of flying humans in space we've seen

166
00:05:23,029 --> 00:05:21,520
folks come home with the same amount of

167
00:05:24,870 --> 00:05:23,039
bone that they left with which is which

168
00:05:26,870 --> 00:05:24,880
is a great thing there are still some

169
00:05:27,909 --> 00:05:26,880
questions out there though because what

170
00:05:29,110 --> 00:05:27,919
what happens is the crews are

171
00:05:30,550 --> 00:05:29,120
maintaining

172
00:05:33,270 --> 00:05:30,560
density of the bone but we don't know if

173
00:05:35,189 --> 00:05:33,280
the bones are as strong as they were

174
00:05:37,110 --> 00:05:35,199
when when they left so we're doing some

175
00:05:38,629 --> 00:05:37,120
follow-on studies there

176
00:05:40,550 --> 00:05:38,639
we're also looking we're doing some

177
00:05:42,710 --> 00:05:40,560
follow-on studies

178
00:05:45,029 --> 00:05:42,720
looking at dietary effects on bone and

179
00:05:46,629 --> 00:05:45,039
and we've got a study called pro-k

180
00:05:48,629 --> 00:05:46,639
that is looking at

181
00:05:50,070 --> 00:05:48,639
the ability to modify the amount of

182
00:05:51,909 --> 00:05:50,080
protein in the diet or the type of

183
00:05:53,830 --> 00:05:51,919
protein in the diet and the amount of

184
00:05:55,590 --> 00:05:53,840
potassium in the diet but potassium

185
00:05:57,029 --> 00:05:55,600
tends to be rich in

186
00:05:59,029 --> 00:05:57,039
fruits and vegetables so essentially

187
00:06:01,350 --> 00:05:59,039
looking at the balance between

188
00:06:02,629 --> 00:06:01,360

animal protein or meat if you will and

189
00:06:03,749 --> 00:06:02,639
fruits and vegetables and what we

190
00:06:05,670 --> 00:06:03,759
believe

191
00:06:07,510 --> 00:06:05,680
is that by modifying that ratio by

192
00:06:09,670 --> 00:06:07,520
having more fruits and vegetables and

193
00:06:11,670 --> 00:06:09,680
perhaps a little less meat

194
00:06:13,430 --> 00:06:11,680
that we can help to to further mitigate

195
00:06:15,110 --> 00:06:13,440
the bone loss during space flight that

196
00:06:16,870 --> 00:06:15,120
will be real important as we send

197
00:06:19,029 --> 00:06:16,880
astronauts even further for longer

198
00:06:21,029 --> 00:06:19,039
durations of time absolutely this this

199
00:06:22,950 --> 00:06:21,039
could have significant impact on

200
00:06:25,510 --> 00:06:22,960
uh the food systems that we build for

201
00:06:27,670 --> 00:06:25,520
for exploration missions um and can help

202
00:06:28,469 --> 00:06:27,680
us better you know again counteract bone

203
00:06:30,790 --> 00:06:28,479
loss

204
00:06:32,230 --> 00:06:30,800
um on on those future missions so we're

205
00:06:33,350 --> 00:06:32,240
very excited about that that

206
00:06:34,950 --> 00:06:33,360
experiment's been going on for a few

207
00:06:37,110 --> 00:06:34,960
years and actually reid wiseman who just

208
00:06:39,189 --> 00:06:37,120
launched will be our last subject in

209
00:06:40,629 --> 00:06:39,199
that in that study so we're looking

210
00:06:41,909 --> 00:06:40,639
he's sort of the beginning of the end if

211
00:06:43,510 --> 00:06:41,919
you will and we're looking forward to

212
00:06:46,710 --> 00:06:43,520
wrapping that one up and finding out

213
00:06:48,230 --> 00:06:46,720

what we get gotcha and again so so much

214
00:06:50,309 --> 00:06:48,240
of what we do on the international space

215
00:06:52,629 --> 00:06:50,319
station not only for improving astronaut

216
00:06:54,950 --> 00:06:52,639
health and you know future exploration

217
00:06:56,629 --> 00:06:54,960
it also very often has benefits to life

218
00:06:58,629 --> 00:06:56,639
right down here on earth what are some

219
00:07:00,309 --> 00:06:58,639
of the things that we've learned that's

220
00:07:02,390 --> 00:07:00,319
going to help benefit people in a real

221
00:07:04,469 --> 00:07:02,400
way down here on earth that we're hoping

222
00:07:06,390 --> 00:07:04,479
will in the very near future

223
00:07:08,230 --> 00:07:06,400
well as you said you know there are a

224
00:07:10,629 --> 00:07:08,240
number of changes to the body during

225
00:07:12,950 --> 00:07:10,639
spaceflight and bone is unique in that

226
00:07:14,309 --> 00:07:12,960
we see very rapid bone loss so we see

227
00:07:17,749 --> 00:07:14,319
bone loss

228
00:07:19,510 --> 00:07:17,759
six months of space flight is what you'd

229
00:07:21,430 --> 00:07:19,520
see in a in a

230
00:07:24,150 --> 00:07:21,440
a post-menopausal woman in about five

231
00:07:25,510 --> 00:07:24,160
years wow so we can almost do what you

232
00:07:27,830 --> 00:07:25,520
would think of as like a time lapse

233
00:07:29,589 --> 00:07:27,840
photography type study

234
00:07:31,670 --> 00:07:29,599
where you know if we can find things

235
00:07:33,270 --> 00:07:31,680
that can impact bone health

236
00:07:35,029 --> 00:07:33,280
in six months

237
00:07:38,390 --> 00:07:35,039
to do that same type of study on earth

238
00:07:40,070 --> 00:07:38,400

would take you uh three four five years

239
00:07:41,749 --> 00:07:40,080
and the dietary study is a perfect

240
00:07:43,909 --> 00:07:41,759
example of

241
00:07:45,510 --> 00:07:43,919
if we can help better understand the

242
00:07:48,150 --> 00:07:45,520
role of nutrition

243
00:07:50,629 --> 00:07:48,160
the role of specific dietary components

244
00:07:52,070 --> 00:07:50,639
on bone loss during space flight