
PAO

1
00:00:06,950 --> 00:00:04,550
hi and welcome to mission control where

2
00:00:08,390 --> 00:00:06,960
we have scott smith a doctor that's with

3
00:00:11,270 --> 00:00:08,400
us to talk about

4
00:00:13,749 --> 00:00:11,280
the effect of microgravity on humans

5
00:00:14,950 --> 00:00:13,759
when they're in space and uh not only

6
00:00:16,790 --> 00:00:14,960
how it affects them while they're in

7
00:00:18,710 --> 00:00:16,800
space but also how it affects them when

8
00:00:21,189 --> 00:00:18,720
they come back home to earth welcome in

9
00:00:23,349 --> 00:00:21,199
scott thank you it's good to be here

10
00:00:24,950 --> 00:00:23,359
so you are the principal investigator

11
00:00:26,630 --> 00:00:24,960
for a couple of different experiments on

12
00:00:28,790 --> 00:00:26,640
board the space station one that's

13
00:00:31,269 --> 00:00:28,800

called pro k another one that's called a

14
00:00:33,910 --> 00:00:31,279
nutrition and you recently published a

15
00:00:35,030 --> 00:00:33,920
paper about vision changes in astronauts

16
00:00:36,549 --> 00:00:35,040
in space

17
00:00:37,670 --> 00:00:36,559
can you take a minute and discuss the

18
00:00:39,590 --> 00:00:37,680
two experiments that you're the

19
00:00:41,590 --> 00:00:39,600
principal investigator on and any others

20
00:00:44,310 --> 00:00:41,600
you're working on for that matter

21
00:00:46,389 --> 00:00:44,320
and and give us a an overview of those

22
00:00:47,750 --> 00:00:46,399
okay we'll do well the

23
00:00:48,950 --> 00:00:47,760
two experiments as you mentioned one is

24
00:00:51,029 --> 00:00:48,960
called pro k

25
00:00:54,069 --> 00:00:51,039
and that's one where we're looking to

26
00:00:55,510 --> 00:00:54,079
use diet as a way to mitigate the bone

27
00:00:57,350 --> 00:00:55,520
changes that we see during spaceflight

28
00:00:59,029 --> 00:00:57,360
we're trying to modify the diet to

29
00:01:00,470 --> 00:00:59,039
lessen the bone loss that astronauts

30
00:01:02,630 --> 00:01:00,480
have during flight

31
00:01:04,710 --> 00:01:02,640
and what we do is we're it's called pro

32
00:01:07,590 --> 00:01:04,720
k because what we're looking at is the

33
00:01:09,510 --> 00:01:07,600
ratio of animal protein to potassium

34
00:01:11,350 --> 00:01:09,520
which is abbreviated k

35
00:01:12,390 --> 00:01:11,360
in the diet and what we believe is that

36
00:01:14,469 --> 00:01:12,400
by lowering

37
00:01:16,789 --> 00:01:14,479
the amount of animal protein or red meat

38
00:01:18,710 --> 00:01:16,799

if you will in the diet or increasing

39
00:01:21,109 --> 00:01:18,720
the amount of potassium in your diet

40
00:01:23,990 --> 00:01:21,119
mainly in fruits and vegetables that

41
00:01:25,429 --> 00:01:24,000
that ratio can affect bone

42
00:01:28,310 --> 00:01:25,439
so what we're doing is we have crews

43
00:01:30,710 --> 00:01:28,320
consume a controlled diet for four days

44
00:01:32,310 --> 00:01:30,720
where they eat a menu that's either high

45
00:01:33,749 --> 00:01:32,320
in that animal protein to potassium

46
00:01:35,109 --> 00:01:33,759
ratio or low

47
00:01:38,069 --> 00:01:35,119
and at the end of that we collect blood

48
00:01:39,429 --> 00:01:38,079
and urine to look at at bone metabolism

49
00:01:41,030 --> 00:01:39,439
and this is an exciting week for us

50
00:01:43,510 --> 00:01:41,040
because joe acaba is doing his first

51
00:01:45,590 --> 00:01:43,520
session uh for us so he's consuming that

52
00:01:46,630 --> 00:01:45,600
many of these these uh these days right

53
00:01:47,990 --> 00:01:46,640
now

54
00:01:50,310 --> 00:01:48,000
and on friday morning we'll collect his

55
00:01:51,910 --> 00:01:50,320
first blood and urine samples uh onboard

56
00:01:53,270 --> 00:01:51,920
station

57
00:01:55,270 --> 00:01:53,280
that's great so that's the pro k what

58
00:01:56,789 --> 00:01:55,280
about nutrition the nutrition experiment

59
00:01:58,870 --> 00:01:56,799
uh has been going on a little bit longer

60
00:02:00,870 --> 00:01:58,880
and it in some ways looks the same and

61
00:02:03,030 --> 00:02:00,880
that what we're doing is collecting

62
00:02:04,789 --> 00:02:03,040
blood and urine samples from the crew

63
00:02:06,069 --> 00:02:04,799

over the course of a six-month mission

64
00:02:07,510 --> 00:02:06,079
to look at

65
00:02:09,910 --> 00:02:07,520
nutritional changes and other

66
00:02:11,270 --> 00:02:09,920
biochemical changes that we can see in

67
00:02:12,790 --> 00:02:11,280
blood and urine

68
00:02:13,830 --> 00:02:12,800
and one of the striking things and you

69
00:02:15,270 --> 00:02:13,840
mentioned the paper that we just

70
00:02:17,510 --> 00:02:15,280
recently published

71
00:02:19,030 --> 00:02:17,520
is when we realized that there were

72
00:02:21,589 --> 00:02:19,040
astronauts that were coming back from

73
00:02:23,670 --> 00:02:21,599
space with vision changes

74
00:02:24,630 --> 00:02:23,680
we started to look at our data to see if

75
00:02:27,350 --> 00:02:24,640
there was anything in our data that

76
00:02:28,949 --> 00:02:27,360
would help explain or help understand

77
00:02:30,710 --> 00:02:28,959
why some crew members had vision issues

78
00:02:32,630 --> 00:02:30,720
and some crews did not

79
00:02:34,630 --> 00:02:32,640
okay and when we started looking at the

80
00:02:35,589 --> 00:02:34,640
data what we quickly found

81
00:02:37,990 --> 00:02:35,599
was

82
00:02:39,509 --> 00:02:38,000
what we would call differences between

83
00:02:40,630 --> 00:02:39,519
folks that had vision changes and folks

84
00:02:41,509 --> 00:02:40,640
that did not

85
00:02:45,509 --> 00:02:41,519
in

86
00:02:46,630 --> 00:02:45,519
carbon metabolism pathway which is a

87
00:02:48,390 --> 00:02:46,640
mouthful

88
00:02:49,589 --> 00:02:48,400

what this is and the way i like to think

89
00:02:51,430 --> 00:02:49,599
of this is if you think of the human

90
00:02:53,190 --> 00:02:51,440
body as a factory

91
00:02:55,350 --> 00:02:53,200
that within the body there are a number

92
00:02:57,270 --> 00:02:55,360
of assembly lines that do different

93
00:02:59,270 --> 00:02:57,280
things they either make things they move

94
00:03:01,190 --> 00:02:59,280
things uh sometimes they break down

95
00:03:03,830 --> 00:03:01,200
things okay the one carbon metabolism

96
00:03:04,710 --> 00:03:03,840
pathway is one of those assembly lines

97
00:03:06,630 --> 00:03:04,720
okay

98
00:03:08,470 --> 00:03:06,640
and on an assembly line the way i like

99
00:03:09,830 --> 00:03:08,480
to think about this is that

100
00:03:12,070 --> 00:03:09,840
if you're working on an assembly line

101
00:03:13,750 --> 00:03:12,080
you have two conveyor belts bringing you

102
00:03:15,030 --> 00:03:13,760
parts and your job is to put those two

103
00:03:16,470 --> 00:03:15,040
parts together

104
00:03:17,509 --> 00:03:16,480
if one of those conveyor belts slows

105
00:03:18,949 --> 00:03:17,519
down

106
00:03:20,710 --> 00:03:18,959
the other conveyor belt will start to

107
00:03:21,830 --> 00:03:20,720
back up that is you'll have extra of

108
00:03:22,790 --> 00:03:21,840
those parts

109
00:03:24,949 --> 00:03:22,800
okay

110
00:03:27,910 --> 00:03:24,959
and that is what happens in the body

111
00:03:29,110 --> 00:03:27,920
that if if one pathway slows down

112
00:03:30,309 --> 00:03:29,120
some of the things in that pathway will

113
00:03:32,630 --> 00:03:30,319

build up

114
00:03:34,630 --> 00:03:32,640
and what we found when we started

115
00:03:37,750 --> 00:03:34,640
looking at the blood of astronauts that

116
00:03:40,630 --> 00:03:37,760
had vision issues is we found elevations

117
00:03:42,550 --> 00:03:40,640
in four of the compounds in this

118
00:03:44,789 --> 00:03:42,560
specific pathway

119
00:03:46,789 --> 00:03:44,799
and what that led us to believe is that

120
00:03:48,789 --> 00:03:46,799
well first it led us to think that there

121
00:03:51,030 --> 00:03:48,799
was something going on with one carbon

122
00:03:52,550 --> 00:03:51,040
metabolism pathway okay

123
00:03:53,990 --> 00:03:52,560
the next thing you do the reason we're

124
00:03:56,789 --> 00:03:54,000
looking at this pathway to begin with is

125
00:03:58,789 --> 00:03:56,799
that it's very nutrition rich there's at

126
00:04:02,070 --> 00:03:58,799
least four vitamins that are involved in

127
00:04:04,229 --> 00:04:02,080
this pathway vitamin b6 vitamin b12

128
00:04:05,110 --> 00:04:04,239
folate biotin

129
00:04:06,390 --> 00:04:05,120
and

130
00:04:08,869 --> 00:04:06,400
the first thing you need to do is rule

131
00:04:10,229 --> 00:04:08,879
out deficiency of those vitamins because

132
00:04:11,589 --> 00:04:10,239
if you're deficient in folate for

133
00:04:13,350 --> 00:04:11,599
example

134
00:04:16,310 --> 00:04:13,360
these pathways will be altered as well

135
00:04:18,789 --> 00:04:16,320
so that was our first concern we went in

136
00:04:20,949 --> 00:04:18,799
long story short we verified that

137
00:04:22,469 --> 00:04:20,959
we did not have we did not have any crew

138
00:04:24,230 --> 00:04:22,479

members who are deficient

139
00:04:25,110 --> 00:04:24,240
in any of those vitamins

140
00:04:27,030 --> 00:04:25,120
okay

141
00:04:28,629 --> 00:04:27,040
so what we then started doing was

142
00:04:30,070 --> 00:04:28,639
looking at

143
00:04:32,550 --> 00:04:30,080
this pathway and trying to understand it

144
00:04:34,790 --> 00:04:32,560
better ourselves and we came to the

145
00:04:37,270 --> 00:04:34,800
realization that what happens oftentimes

146
00:04:39,830 --> 00:04:37,280
is that there are enzymes there are

147
00:04:42,310 --> 00:04:39,840
enzymes in these pathways that help to

148
00:04:43,590 --> 00:04:42,320
work okay so the enzyme in this case is

149
00:04:45,189 --> 00:04:43,600
the person putting those two things

150
00:04:46,150 --> 00:04:45,199
together on the assembly line

151
00:04:48,390 --> 00:04:46,160
okay

152
00:04:49,670 --> 00:04:48,400
and what we realized is that there are

153
00:04:51,909 --> 00:04:49,680
differences

154
00:04:53,270 --> 00:04:51,919
in different groups of the population in

155
00:04:54,150 --> 00:04:53,280
these enzymes

156
00:04:56,870 --> 00:04:54,160
okay

157
00:04:58,390 --> 00:04:56,880
and the differences exist

158
00:05:00,390 --> 00:04:58,400
uh in large percentages of the

159
00:05:02,070 --> 00:05:00,400
population so for instance one specific

160
00:05:03,749 --> 00:05:02,080
enzyme we looked at

161
00:05:05,909 --> 00:05:03,759
about half the population has one form

162
00:05:08,390 --> 00:05:05,919
about a third has another form about 15

163
00:05:09,270 --> 00:05:08,400

20 percent has the third form and when

164
00:05:10,390 --> 00:05:09,280
you're talking about the population

165
00:05:12,629 --> 00:05:10,400
you're talking about the entire human

166
00:05:15,029 --> 00:05:12,639
entire human population that's right and

167
00:05:18,469 --> 00:05:15,039
so what we're talking about is is 15

168
00:05:20,710 --> 00:05:18,479
roughly 15 out of every 100 humans

169
00:05:24,070 --> 00:05:20,720
has this particular enzyme that causes

170
00:05:25,029 --> 00:05:24,080
this pathway to work slower

171
00:05:28,390 --> 00:05:25,039
and

172
00:05:29,830 --> 00:05:28,400
occurrences or one in a million type

173
00:05:31,590 --> 00:05:29,840
things this is

174
00:05:32,390 --> 00:05:31,600
a lot of people

175
00:05:36,230 --> 00:05:32,400
when

176
00:05:38,390 --> 00:05:36,240
these differences in the astronauts

177
00:05:40,550 --> 00:05:38,400
in the astronauts that had vision issues

178
00:05:41,830 --> 00:05:40,560
specifically what we found is that not

179
00:05:43,110 --> 00:05:41,840
only were there differences between

180
00:05:44,310 --> 00:05:43,120
those that had vision issues and those

181
00:05:47,110 --> 00:05:44,320
that did not

182
00:05:48,710 --> 00:05:47,120
we found those differences before flight

183
00:05:50,070 --> 00:05:48,720
so we realized this

184
00:05:51,430 --> 00:05:50,080
likely had nothing to do with space

185
00:05:53,830 --> 00:05:51,440
flight itself but that this may have

186
00:05:56,230 --> 00:05:53,840
been related to something that was was

187
00:05:57,830 --> 00:05:56,240
different about those individuals before

188
00:05:59,830 --> 00:05:57,840

they even flew

189
00:06:01,670 --> 00:05:59,840
so this was obviously

190
00:06:03,749 --> 00:06:01,680
a very exciting find

191
00:06:05,909 --> 00:06:03,759
and what we're now trying to do is we're

192
00:06:08,870 --> 00:06:05,919
going back and doing a follow-on study

193
00:06:11,990 --> 00:06:08,880
that will allow us to go in and look at

194
00:06:13,749 --> 00:06:12,000
those specific enzymes to see which type

195
00:06:15,350 --> 00:06:13,759
of enzyme these individuals have to see

196
00:06:17,270 --> 00:06:15,360
if this is right

197
00:06:18,469 --> 00:06:17,280
because as we you know

198
00:06:19,990 --> 00:06:18,479
there is the possibility that this is

199
00:06:21,749 --> 00:06:20,000
still a fluke that we found a difference

200
00:06:23,590 --> 00:06:21,759
but that it has nothing to do with the

201
00:06:25,749 --> 00:06:23,600
actual vision changes so

202
00:06:27,590 --> 00:06:25,759
we're we've we wrote a proposal we got

203
00:06:29,189 --> 00:06:27,600
approved to go do this follow-on study

204
00:06:31,110 --> 00:06:29,199
and earlier this month we actually

205
00:06:32,309 --> 00:06:31,120
started uh recruiting subjects to

206
00:06:34,550 --> 00:06:32,319
participate in that where we're actually

207
00:06:36,230 --> 00:06:34,560
going back to the astronauts talking

208
00:06:38,070 --> 00:06:36,240
about the experiment and asking them

209
00:06:39,590 --> 00:06:38,080
asking them if they'd be willing to

210
00:06:42,230 --> 00:06:39,600
allow us to collect blood to go in and

211
00:06:44,710 --> 00:06:42,240
look again at the exact specific enzymes

212
00:06:47,189 --> 00:06:44,720
so it's a it's a very exciting point in

213
00:06:48,710 --> 00:06:47,199

time and so if your hypothesis ends up

214
00:06:50,390 --> 00:06:48,720
being correct as you do your follow-on

215
00:06:51,990 --> 00:06:50,400
studies there are some important

216
00:06:53,510 --> 00:06:52,000
ramifications for a long-duration

217
00:06:55,350 --> 00:06:53,520
spaceflight aren't there

218
00:06:58,469 --> 00:06:55,360
well i would say two things one

219
00:06:59,589 --> 00:06:58,479
again if our hypothesis is right

220
00:07:01,110 --> 00:06:59,599
there could be some significant

221
00:07:02,469 --> 00:07:01,120
implications for long-duration space

222
00:07:04,790 --> 00:07:02,479
flight

223
00:07:06,550 --> 00:07:04,800
and you know nasa when we realized that

224
00:07:07,589 --> 00:07:06,560
there were vision changes in astronauts

225
00:07:09,110 --> 00:07:07,599
that is

226
00:07:11,430 --> 00:07:09,120
it's it's been described as the most

227
00:07:13,670 --> 00:07:11,440
significant clinical issue

228
00:07:15,350 --> 00:07:13,680
of human space flight to date okay so

229
00:07:17,189 --> 00:07:15,360
this is something that we need to fix

230
00:07:18,550 --> 00:07:17,199
before we go further and there's a lot

231
00:07:20,150 --> 00:07:18,560
of folks out working hard trying to

232
00:07:21,670 --> 00:07:20,160
better understand this trying to figure

233
00:07:23,110 --> 00:07:21,680
out ways to counteract it and protect

234
00:07:25,670 --> 00:07:23,120
against it

235
00:07:26,629 --> 00:07:25,680
if we're right we will we will help

236
00:07:28,309 --> 00:07:26,639
drive

237
00:07:29,670 --> 00:07:28,319
that pathway to better understand how to

238
00:07:31,189 --> 00:07:29,680

counteract it to better understand what

239
00:07:34,150 --> 00:07:31,199
the issues are

240
00:07:37,270 --> 00:07:34,160
if we're right beyond nasa

241
00:07:39,270 --> 00:07:37,280
this pathway affects again 15 20 out of

242
00:07:41,589 --> 00:07:39,280
every 100 people

243
00:07:43,189 --> 00:07:41,599
and the the implications for treatment

244
00:07:44,869 --> 00:07:43,199
of disease on earth or understanding of

245
00:07:47,029 --> 00:07:44,879
disease on earth

246
00:07:48,950 --> 00:07:47,039
could be significant

247
00:07:51,830 --> 00:07:48,960
great well that's so that's

248
00:07:54,070 --> 00:07:51,840
a really potentially big benefit to the

249
00:07:55,990 --> 00:07:54,080
human population based on research

250
00:07:59,670 --> 00:07:56,000
that's done on astronauts on orbit

251
00:08:01,189 --> 00:07:59,680
absolutely absolutely well

252
00:08:02,710 --> 00:08:01,199
can you tell us a little bit about how

253
00:08:04,629 --> 00:08:02,720
microgravity itself makes your

254
00:08:06,869 --> 00:08:04,639
experiment possible what how does that

255
00:08:09,510 --> 00:08:06,879
change the the game

256
00:08:11,189 --> 00:08:09,520
well it depends on the on on what you're

257
00:08:13,830 --> 00:08:11,199
looking at for going back to the pro k

258
00:08:15,990 --> 00:08:13,840
experiment where we're looking at bone

259
00:08:18,390 --> 00:08:16,000
what spaceflight allows us to do from a

260
00:08:20,309 --> 00:08:18,400
bone perspective is to study

261
00:08:21,430 --> 00:08:20,319
very healthy individuals in a very

262
00:08:24,230 --> 00:08:21,440
unique environment that is

263
00:08:27,589 --> 00:08:24,240

weightlessness and what happens is the

264
00:08:30,309 --> 00:08:27,599
astronauts lose bone at about 10 times

265
00:08:31,029 --> 00:08:30,319
the rate of a woman with osteoporosis

266
00:08:32,949 --> 00:08:31,039
so

267
00:08:34,709 --> 00:08:32,959
what it allows us to do is narrow in and

268
00:08:36,389 --> 00:08:34,719
study people that that typically don't

269
00:08:38,070 --> 00:08:36,399
have other health issues

270
00:08:40,870 --> 00:08:38,080
and in a much shorter amount of time

271
00:08:42,709 --> 00:08:40,880
allows us to study how to counteract the

272
00:08:44,790 --> 00:08:42,719
bone loss that we see in space flight

273
00:08:46,710 --> 00:08:44,800
which again the potential implications

274
00:08:48,949 --> 00:08:46,720
of that for the general population

275
00:08:51,509 --> 00:08:48,959
are significant and we can do studies

276
00:08:54,710 --> 00:08:51,519
and learn things in a matter of months

277
00:08:57,509 --> 00:08:54,720
that would take five six ten years to do

278
00:09:00,389 --> 00:08:57,519
in a similar ground-based population

279
00:09:02,070 --> 00:09:00,399
okay it takes a while for those kinds of

280
00:09:03,670 --> 00:09:02,080
things to be manifested in normal

281
00:09:06,070 --> 00:09:03,680
medical treatments here on earth right

282
00:09:07,590 --> 00:09:06,080
absolutely and

283
00:09:10,230 --> 00:09:07,600
changes in human physiology tend to be

284
00:09:11,110 --> 00:09:10,240
rather slow which is a good thing for

285
00:09:13,269 --> 00:09:11,120
for us

286
00:09:15,509 --> 00:09:13,279
um but understanding them and and the

287
00:09:17,910 --> 00:09:15,519
research that it takes to

288
00:09:19,990 --> 00:09:17,920

better understand a disease process or a

289
00:09:21,110 --> 00:09:20,000
physiological change uh to better

290
00:09:22,790 --> 00:09:21,120
understand the process and figure out

291
00:09:26,389 --> 00:09:22,800
ways to counteract it

292
00:09:28,070 --> 00:09:26,399
is indeed a is a slow is a slow process

293
00:09:30,150 --> 00:09:28,080
okay where do you work here at the

294
00:09:31,910 --> 00:09:30,160
johnson space center i work in what's

295
00:09:33,110 --> 00:09:31,920
called the nutritional biochemistry lab

296
00:09:35,350 --> 00:09:33,120
within the space life sciences

297
00:09:37,350 --> 00:09:35,360
directorate here in houston and is that

298
00:09:39,990 --> 00:09:37,360
the traditional kind of laboratory that

299
00:09:41,350 --> 00:09:40,000
you'd expect to see in anybody that's

300
00:09:43,030 --> 00:09:41,360
studying nutrition

301
00:09:45,190 --> 00:09:43,040
um

302
00:09:47,110 --> 00:09:45,200
in a sense yes it is it's very similar

303
00:09:49,030 --> 00:09:47,120
to a nutritional biochemistry lab that

304
00:09:51,269 --> 00:09:49,040
you'd find at any university the

305
00:09:53,509 --> 00:09:51,279
difference is that we

306
00:09:56,470 --> 00:09:53,519
by the nature of what we do

307
00:09:57,750 --> 00:09:56,480
we cover a much broader area that is

308
00:09:58,949 --> 00:09:57,760
we're looking at not only nutritional

309
00:10:00,310 --> 00:09:58,959
assessment we're looking at dietary

310
00:10:01,910 --> 00:10:00,320
intake we're looking at vitamin status

311
00:10:04,550 --> 00:10:01,920
we're looking at minerals we're looking

312
00:10:06,550 --> 00:10:04,560
at bone we cover the gamut

313
00:10:08,310 --> 00:10:06,560

whereas if you were to go to a

314
00:10:10,949 --> 00:10:08,320
university and go into one lab you'll

315
00:10:13,110 --> 00:10:10,959
find somebody working on one enzyme in

316
00:10:14,470 --> 00:10:13,120
one pathway with one vitamin and they'll

317
00:10:15,670 --> 00:10:14,480
spend their career trying to understand

318
00:10:19,509 --> 00:10:15,680
that

319
00:10:20,630 --> 00:10:19,519
again we we try to cover as much ground

320
00:10:22,389 --> 00:10:20,640
as we can

321
00:10:23,750 --> 00:10:22,399
we typically will bring in

322
00:10:25,430 --> 00:10:23,760
individuals from the outside so we

323
00:10:27,430 --> 00:10:25,440
always work we always work with

324
00:10:29,269 --> 00:10:27,440
scientists at universities across the

325
00:10:31,030 --> 00:10:29,279
nation around the world

326
00:10:32,790 --> 00:10:31,040
to help us understand specific areas

327
00:10:34,150 --> 00:10:32,800
that we may not have the direct

328
00:10:35,030 --> 00:10:34,160
expertise in

329
00:10:37,269 --> 00:10:35,040
okay

330
00:10:38,310 --> 00:10:37,279
and since you mentioned universities uh

331
00:10:40,069 --> 00:10:38,320
what's your background where are you

332
00:10:43,509 --> 00:10:40,079
from where did you go to school

333
00:10:45,670 --> 00:10:43,519
i i did both my degrees at penn state

334
00:10:48,310 --> 00:10:45,680
my undergraduate degree was in biology

335
00:10:50,069 --> 00:10:48,320
and my phd was in nutrition

336
00:10:51,430 --> 00:10:50,079
what's your hometown

337
00:10:54,230 --> 00:10:51,440
right now it's houston i've spent more

338
00:10:55,990 --> 00:10:54,240

time here than anywhere so okay i grew

339
00:10:57,430 --> 00:10:56,000
up outside of philadelphia

340
00:10:59,030 --> 00:10:57,440
and spent a lot of time in pennsylvania

341
00:11:00,389 --> 00:10:59,040
but i've been here for a little over 20

342
00:11:03,030 --> 00:11:00,399
years now so

343
00:11:04,550 --> 00:11:03,040
it's home okay great well dr scott

344
00:11:06,310 --> 00:11:04,560
spence thank you so much for being with

345
00:11:08,230 --> 00:11:06,320
us today really interesting work that

346
00:11:10,790 --> 00:11:08,240
you're doing right now and it's got some

347
00:11:12,949 --> 00:11:10,800
potential impact for future of human

348
00:11:15,030 --> 00:11:12,959
space flight and for just everyday folks

349
00:11:16,949 --> 00:11:15,040
here on the ground uh with with that

350
00:11:18,150 --> 00:11:16,959
with their bodies and and uh treating

351
00:11:19,750 --> 00:11:18,160
disease

352
00:11:21,590 --> 00:11:19,760
absolutely and i thank you for the