
NASA

1
00:00:03,970 --> 00:00:09,750
>> And here with us today, we have
Scott Smith who is a NASA nutritionist.

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00:00:09,750 --> 00:00:13,710
He's here to talk with us a
little about, not one but two,

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00:00:13,710 --> 00:00:16,940
experiments that are currently
undergoing on the--

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00:00:16,940 --> 00:00:19,770
aboard the International Space
Station with the crew members there.

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00:00:19,770 --> 00:00:25,580
One of those experiments is known as nutrition
that actually looks at how our body changes

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00:00:25,580 --> 00:00:29,900
in a microgravity of space and
also Pro-K that looks at diet

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00:00:29,900 --> 00:00:33,140
and how that diet can actually
mitigate bone loss.

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00:00:33,140 --> 00:00:33,920
Welcome Scott.

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00:00:33,920 --> 00:00:34,920
Thanks for coming.

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00:00:34,920 --> 00:00:35,230
>> Thanks.

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00:00:35,230 --> 00:00:36,130
It's great to be here.

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00:00:36,130 --> 00:00:40,020
>> So let's start now just
talking about nutrition first.

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00:00:40,020 --> 00:00:44,500
I understand that nutrition is actually
been one of the studies that's been going

14
00:00:44,500 --> 00:00:47,720
on for now quite a while since Expedition 14?

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00:00:47,720 --> 00:00:48,200
>>That's correct.

16
00:00:48,200 --> 00:00:52,350
We started back in late 2006 on Expedition 14.

17
00:00:52,350 --> 00:00:55,110
>> Okay. And so just walk me through.

18
00:00:55,110 --> 00:00:58,200
What exactly is a nutrition and
what are we doing with that?

19
00:00:58,200 --> 00:01:00,750
>> Well the premise behind
in nutrition experiment was

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00:01:00,750 --> 00:01:04,440
that when we'd launched equipment
aboard the Space Station,

21
00:01:04,440 --> 00:01:09,500
allowed us to collect biological samples that
is we needed a centrifuge, spin the samples

22
00:01:09,500 --> 00:01:14,890
and process them, then we need a freezer to

store the samples for long periods of time.

23
00:01:14,890 --> 00:01:17,690
The question then became, "What would you do?"

24
00:01:17,690 --> 00:01:19,750
And what we first set out to do was

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00:01:19,750 --> 00:01:24,650
to better understand how nutrition
changes over the course of space flight.

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00:01:24,650 --> 00:01:27,920
We had collected a lot of
samples before and after flight.

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00:01:27,920 --> 00:01:32,790
But with samples collected before and after
flight, you don't know how you got there.

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00:01:32,790 --> 00:01:37,220
So if you see a significant drop in the
measurement of something after flight,

29
00:01:37,220 --> 00:01:40,140
you don't know what that change look
like over the course of six months.

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00:01:40,140 --> 00:01:42,030
>> Okay, so we start with something--

31
00:01:42,030 --> 00:01:44,030
a baseline first, before flight and then

32
00:01:44,030 --> 00:01:46,770
that way we can measure the
differences in the space as well.

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00:01:46,770 --> 00:01:47,220

>> That's correct.

34
00:01:47,220 --> 00:01:50,000
>> So explain to me what are we measuring?

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00:01:50,000 --> 00:01:54,410
>> What we do is we collect blood sample and
urine samples before, during and after flight,

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00:01:54,410 --> 00:01:58,900
then we measure probably 40 to 50
different things in those samples.

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00:01:58,900 --> 00:02:03,180
We look at our nutritional markers,
things like vitamins and minerals.

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00:02:03,180 --> 00:02:07,650
We also look at the number of
hormones and regulatory factors.

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00:02:07,650 --> 00:02:10,780
We're also looking at things like bone
markers that tell us about what's going

40
00:02:10,780 --> 00:02:13,720
on with bone and muscle and other systems.

41
00:02:13,720 --> 00:02:17,170
>> Okay. And so when you're talking
about-- you said blood and urine,

42
00:02:17,170 --> 00:02:19,290
do we do any body mass measurement?

43
00:02:19,290 --> 00:02:20,740
I do see some of that.

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00:02:20,740 --> 00:02:23,630

I don't know if that's involved
in this study at all.

45
00:02:23,630 --> 00:02:25,120
>> We do indeed share this data.

46
00:02:25,120 --> 00:02:28,970
The body mass data, obviously an important
picture of what's going of nutrition overall,

47
00:02:28,970 --> 00:02:34,190
But clearly the goal of this experiment,
if you will, is the blood and the urine.

48
00:02:34,190 --> 00:02:37,890
>> Okay. And is there are any--
so I know again we're talking

49
00:02:37,890 --> 00:02:39,470
about blood samples and urine samples.

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00:02:39,470 --> 00:02:42,610
Are there any other variables that
we're looking at that may help--

51
00:02:42,610 --> 00:02:45,630
give us more information
for this particular study?

52
00:02:45,630 --> 00:02:48,490
>> The other thing we're trying with
this experiment is dietary intake

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00:02:48,490 --> 00:02:54,580
and the crews fill out-- nominally they fill
out a food frequency questionnaire once a week

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00:02:54,580 --> 00:02:57,930
that allows us to track dietary
intake of key nutrients.

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00:02:57,930 --> 00:03:02,810
That's what we call an operational protocol
where we report back to the flight surgeon,

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00:03:02,810 --> 00:03:07,000
usually that same week of-- look someone
is not eating enough or not drinking enough

57
00:03:07,000 --> 00:03:09,140
so that we can make those changes realtime.

58
00:03:09,140 --> 00:03:09,640
>> Okay.

59
00:03:09,640 --> 00:03:14,790
>> And then looking at those data become
very important in terms of understanding--

60
00:03:14,790 --> 00:03:18,250
we know what the diet-- what the dietary
intake was but we also need to look

61
00:03:18,250 --> 00:03:20,900
at how the bodies is haling those nutrients.

62
00:03:20,900 --> 00:03:23,750
>> And what do we hoping to
accomplish from the study?

63
00:03:23,750 --> 00:03:25,570
>> Well there're a lot of things.

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00:03:25,570 --> 00:03:29,940
In short, we're trying to
understand the nutritional needs

65
00:03:29,940 --> 00:03:31,590
of the body during space fight.

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00:03:31,590 --> 00:03:35,330
Long duration space fight is a challenge.

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00:03:35,330 --> 00:03:44,040
And just like-- let's go back to the
sailing missions when we first left Europe.

68
00:03:44,040 --> 00:03:47,910
When you're on a ship for a long
period of time, you have to make sure

69
00:03:47,910 --> 00:03:50,320
that you have the nutrition exactly right.

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00:03:50,320 --> 00:03:55,210
Scurvy is a great example of a disease that
occurs when you don't get enough vitamin C.

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00:03:55,210 --> 00:04:01,080
And if you look back, again, through
history that ravaged crews and what we need

72
00:04:01,080 --> 00:04:06,580
to make sure is when we send crews off the
planet for six months that we set them up there

73
00:04:06,580 --> 00:04:08,550
as healthy as can be and we keep them there.

74
00:04:08,550 --> 00:04:14,640
But even more important when we look to send
folks off to other points of exploration,

75
00:04:14,640 --> 00:04:19,120
making sure that we know what their body needs,
that food has the right things in it is going

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00:04:19,120 --> 00:04:20,670

to be very, very critical to make sure

77
00:04:20,670 --> 00:04:24,910
that we keep the crews healthy
and bring them home healthy.

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00:04:24,910 --> 00:04:29,620
>> It sounds to me like I need to go to space
because I'll probably would come back healthier.

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00:04:29,620 --> 00:04:33,030
>> Well it's funny you should mention
that because there're many crews

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00:04:33,030 --> 00:04:38,100
with the exercise protocol we have on board
right now and with good dietary intake,

81
00:04:38,100 --> 00:04:39,420
we have seen a new number of crew members

82
00:04:39,420 --> 00:04:42,520
who literally have come back
and better shape than they went.

83
00:04:42,520 --> 00:04:44,790
So this is not easy.

84
00:04:44,790 --> 00:04:46,080
It's not easy, but it can be done.

85
00:04:46,080 --> 00:04:48,040
>> Well, you know, they say
you are what you eat.

86
00:04:48,040 --> 00:04:49,790
So we're going to move on to Pro-K, you know.

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00:04:49,790 --> 00:04:56,390

So basically we're looking at a big bowl
of K, so, and a piece of chocolate cake.

88
00:04:56,390 --> 00:05:00,100
No. But in all seriousness, the
Pro-K is actually looking at how diet

89
00:05:00,100 --> 00:05:03,400
and what we eat can actually
help mitigate bone loss.

90
00:05:03,400 --> 00:05:07,390
It's not only the exercise on board the
station, but it's also what we're eating.

91
00:05:07,390 --> 00:05:12,740
And I originally would think, you
know, calcium when I think bone loss.

92
00:05:12,740 --> 00:05:14,840
But that's not really what this is, is it?

93
00:05:14,840 --> 00:05:16,320
>> That's correct.

94
00:05:16,320 --> 00:05:21,640
And folks have looked at calcium and as
I would say the easy answers didn't work

95
00:05:21,640 --> 00:05:25,520
that providing extra calcium
won't fix bone loss during flight.

96
00:05:25,520 --> 00:05:29,460
We do make sure the crews get enough
calcium because calcium is important.

97
00:05:29,460 --> 00:05:30,810
But that's not the only trigger.

98
00:05:30,810 --> 00:05:35,970
And what we found in ground-based studies
is that the ratio of different nutrients

99
00:05:35,970 --> 00:05:41,690
in the diet can affect your bone response and
what we're testing with Pro-K is just that.

100
00:05:41,690 --> 00:05:47,670
And what we're looking at is the ratio
of animal protein in the diet to their--

101
00:05:47,670 --> 00:05:49,650
the amount of potassium in the diet.

102
00:05:49,650 --> 00:05:54,950
And what happens is that ratio affects
the acid-based balance in your diet.

103
00:05:54,950 --> 00:05:59,760
That is more animal protein, more
red meat will lead to more acid

104
00:05:59,760 --> 00:06:01,530
when it's broken down in your body.

105
00:06:01,530 --> 00:06:06,580
And that acid, the way your body protects
yourself from that acid is to break down bone.

106
00:06:06,580 --> 00:06:09,010
And there's a couple of ways
you can counteract that.

107
00:06:09,010 --> 00:06:13,790
One is by consuming less of
those acid-producing components.

108
00:06:13,790 --> 00:06:17,510

The other is to consume more
base-producing components,

109
00:06:17,510 --> 00:06:21,260
and those are things we find
in like fruits and vegetables.

110
00:06:21,260 --> 00:06:24,800
And those are fruits that rich in
potassium which is what we use potassium

111
00:06:24,800 --> 00:06:25,970
as the other half of that equation.

112
00:06:25,970 --> 00:06:29,130
>> Okay. So, protein, potassium, Pro-K?

113
00:06:29,130 --> 00:06:29,570
>> Absolutely.

114
00:06:29,570 --> 00:06:30,220
>> Got it.

115
00:06:30,220 --> 00:06:34,640
Okay. So, in this-- are there any
supplements involved like vitamins or anything

116
00:06:34,640 --> 00:06:36,080
like that or is this strictly diet?

117
00:06:36,080 --> 00:06:36,950
>> This is strictly diet.

118
00:06:36,950 --> 00:06:41,870
And what we're doing with the Pro-K
experiment is for four-day sessions.

119
00:06:41,870 --> 00:06:45,060
We worked with the crews ahead of

time to plan out a four-day menu.

120
00:06:45,060 --> 00:06:49,290
It is either high animal protein,
the potassium ratio; or low.

121
00:06:49,290 --> 00:06:52,030
And they'll consume that diet for four
days and at the end of those four days,

122
00:06:52,030 --> 00:06:54,950
they'll collect blood and collect
urine samples that we will then look

123
00:06:54,950 --> 00:06:57,380
at to see how those makers going to affect it.

124
00:06:57,380 --> 00:06:58,810
>> I think we have a couple of photos.

125
00:06:58,810 --> 00:07:00,110
We can throw this up here now.

126
00:07:00,110 --> 00:07:05,670
Actually, Don Pettit who have
been participating in the Pro-K

127
00:07:05,670 --> 00:07:07,860
and the nutrition, there he is here.

128
00:07:07,860 --> 00:07:10,470
And he is actually working.

129
00:07:10,470 --> 00:07:13,110
It looks like he's got a couple of
samples in his hand and he's putting it

130
00:07:13,110 --> 00:07:16,370
into the minus 80 degree laboratory freezer.

131
00:07:16,370 --> 00:07:17,360
>> That's correct.

132
00:07:17,360 --> 00:07:22,320
And, yes. And his left-hand there, he's got
gloves on because that freezer is very cold.

133
00:07:22,320 --> 00:07:27,450
It sits at about minus 96 degrees C even
though we call it a minus 80 freezer.

134
00:07:27,450 --> 00:07:33,600
In that mesh bag there has syringes that
have small amounts of urine that he took

135
00:07:33,600 --> 00:07:37,810
from his-- from his last urine collection.

136
00:07:37,810 --> 00:07:42,890
>> And then here's just another
image of some more sample.

137
00:07:42,890 --> 00:07:43,320
>> That's correct.

138
00:07:43,320 --> 00:07:45,680
I think that one is actually a step before

139
00:07:45,680 --> 00:07:48,930
and you see him putting the
syringes into that mesh bag.

140
00:07:48,930 --> 00:07:49,460
>> Oh, I see.

141
00:07:49,460 --> 00:07:53,170
>> You can see in the bottom left corner,
there the door to the MELFI is open

142
00:07:53,170 --> 00:07:56,400
and what he'll do is pull out one of those,
what they called doers from the drawers

143
00:07:56,400 --> 00:08:00,450
in that freezer and the samples will go in
there and wait until they bring him home.

144
00:08:00,450 --> 00:08:04,850
>> Okay. And again, the MELFI is the minus
80 degree-laboratory freezer that is used

145
00:08:04,850 --> 00:08:07,320
to store biological samples such as what?

146
00:08:07,320 --> 00:08:11,260
He is doing for the study to
that required refrigeration

147
00:08:11,260 --> 00:08:14,060
for returning to Earth for later analysis.

148
00:08:14,060 --> 00:08:17,200
When they are returned to Earth those
sample, they are actually brought back here

149
00:08:17,200 --> 00:08:18,710
to Johnson Space Center, is that correct?

150
00:08:18,710 --> 00:08:19,160
>> That's correct.

151
00:08:19,160 --> 00:08:20,390
Ultimately, they're analyzed.

152
00:08:20,390 --> 00:08:25,030
Most of the analyses are done in our lab in the
Nutritional Biochemistry Lab here in Houston.

153
00:08:25,030 --> 00:08:25,420
>> Okay.

154
00:08:25,420 --> 00:08:29,300
>> And we-- up until now, we brought
all our samples home in the shuttle.

155
00:08:29,300 --> 00:08:32,260
So we've sent folks-- the
team out to the landing sites,

156
00:08:32,260 --> 00:08:36,650
retrieve them when they're demanifested
from the shell after the crew

157
00:08:36,650 --> 00:08:40,110
and then we bring it back
here as quick as we can.

158
00:08:40,110 --> 00:08:42,640
>> Okay. And so talk to me a little about what--

159
00:08:42,640 --> 00:08:45,440
what can you tell me about the
findings from either one of these.

160
00:08:45,440 --> 00:08:50,110
And I know that there is also a blog and
we can put that out here for you as well.

161
00:08:50,110 --> 00:08:54,030
Go to blog.nasa.gov and you can check out the--

162
00:08:54,030 --> 00:08:57,730
a blog that this here is When Finding
Nothing Means Discovering Something

163
00:08:57,730 --> 00:08:59,350

with a blog about some of the findings.

164
00:08:59,350 --> 00:09:03,230
I think this is the most recent entry
that was made about these studies.

165
00:09:03,230 --> 00:09:07,640
But go ahead and talk to us a little about
some of the findings that you guys are--

166
00:09:07,640 --> 00:09:10,640
>> Well, the Pro-K experiment,
first, is a little bit newer.

167
00:09:10,640 --> 00:09:16,730
So we don't have any published
findings from that just yet.

168
00:09:16,730 --> 00:09:21,500
The nutrition experiment as you said, we've been
doing that for several years and we've had--

169
00:09:21,500 --> 00:09:24,190
we've had a number of key findings so far.

170
00:09:24,190 --> 00:09:28,600
The blog you pointed out there talks about
two things we found that didn't changed.

171
00:09:28,600 --> 00:09:28,850
>> Okay.

172
00:09:28,850 --> 00:09:38,000
>> One of those-- One of the things that
we found that didn't change is vitamin K

173
00:09:38,000 --> 00:09:40,880
and the other thing that we found
that didn't change is testosterone.

174
00:09:40,880 --> 00:09:44,010
And the reason both those findings
are important is that earlier studies

175
00:09:44,010 --> 00:09:49,580
and earlier related studies had suggested
that both of those things might serve

176
00:09:49,580 --> 00:09:52,580
as viable countermeasures for
bone loss during space flight.

177
00:09:52,580 --> 00:09:56,470
And what we found in more detailed
studies with more subjects,

178
00:09:56,470 --> 00:10:00,500
flying on long duration missions is
that neither of those things changed.

179
00:10:00,500 --> 00:10:05,680
Again what that tells us is that we don't
need to pursue giving vitamin K supplements

180
00:10:05,680 --> 00:10:08,920
to counteract bone loss for
example or injecting people

181
00:10:08,920 --> 00:10:12,290
with testosterone to stop
muscle loss for example.

182
00:10:12,290 --> 00:10:16,150
And what it tells us, it helps
us drive where to go next.

183
00:10:16,150 --> 00:10:20,210
So even though technically we didn't
find any change during flight,

184
00:10:20,210 --> 00:10:22,280
in this case that's very
important and very good news.

185
00:10:22,280 --> 00:10:22,960
>> Um-hmm.

186
00:10:22,960 --> 00:10:24,090
Well, that's very fascinating.

187
00:10:24,090 --> 00:10:28,270
And actually it seems to me-- I mean
I can't imagine how we can't get any

188
00:10:28,270 --> 00:10:31,570
of these finding wouldn't
actually apply to us here on earth.

189
00:10:31,570 --> 00:10:32,300
>> Absolutely.

190
00:10:32,300 --> 00:10:37,400
And which leads into one of the other
key findings that we've reported on is

191
00:10:37,400 --> 00:10:42,780
that we found a significant relationship between
the amount of fish people consume on orbit

192
00:10:42,780 --> 00:10:45,420
and the amount of bone that
they lost after flight.

193
00:10:45,420 --> 00:10:51,020
And what we found is that the crews
that ate more fish lost less bone.

194
00:10:51,020 --> 00:10:54,450
And the reason we think that is--

we think there're few things there.

195
00:10:54,450 --> 00:10:59,830
But primarily the fish are rich in omega-3
fatty acids and we've done other studies

196
00:10:59,830 --> 00:11:02,720
on the ground both bedrest studies with humans.

197
00:11:02,720 --> 00:11:05,180
We've done subculture studies to show

198
00:11:05,180 --> 00:11:09,030
that omega-3 fatty acids can
help to reduce bone breakdown.

199
00:11:09,030 --> 00:11:09,470
>> Yeah.

200
00:11:09,470 --> 00:11:13,120
>> And what we found in the
astronaut is that again

201
00:11:13,120 --> 00:11:17,940
if you eat more fish it will reduce bone loss
during flight and the implications for that

202
00:11:17,940 --> 00:11:22,680
for people, for everybody here
on earth are obvious so it--

203
00:11:22,680 --> 00:11:26,290
>> Well, for those who are not fish
eaters, can they take the supplement?

204
00:11:26,290 --> 00:11:28,870
>> That's the first questions I was getting.

205
00:11:28,870 --> 00:11:31,800

And the short answer is we don't know yet.

206
00:11:31,800 --> 00:11:36,060
And I think somewhere there's
got to be middle point.

207
00:11:36,060 --> 00:11:39,520
But it's important also to realize
that when you're eating fish,

208
00:11:39,520 --> 00:11:42,380
you're not eating something else,
which gets back to the red meat thing.

209
00:11:42,380 --> 00:11:43,290
>> Right.

210
00:11:43,290 --> 00:11:45,970
>> So, you know, as a nutritionist,

211
00:11:45,970 --> 00:11:50,260
we always push that if you can have
good diet, it's better for you.

212
00:11:50,260 --> 00:11:54,080
The idea that you can eat a bad diet and
take a pill and that'll fix it, well,

213
00:11:54,080 --> 00:11:58,970
that turns to be what most people would rather
do and the body doesn't work that easily.

214
00:11:58,970 --> 00:12:00,960
>> And so if I've taken the
pill and not exercising.

215
00:12:00,960 --> 00:12:02,170
>> Absolutely.

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00:12:02,170 --> 00:12:03,990
It's not easy as it sounds.

217
00:12:03,990 --> 00:12:05,220
>> Okay. Well thank you so much.

218
00:12:05,220 --> 00:12:06,780
I think that's all the time we have today.

219
00:12:06,780 --> 00:12:09,620
But I really appreciate you coming
over and talking with us again.

220
00:12:09,620 --> 00:12:12,680
That was-- This is Scott
Smith here with us today here

221
00:12:12,680 --> 00:12:16,190
in the International Space Station
Flight Control Room with the orbit team

222
00:12:16,190 --> 00:12:21,850
who is overseeing the activities on
board the International Space Station.

223
00:12:21,850 --> 00:12:24,050
Scott, thank you very much for coming today.