
REFRIGERATED CENTRIFUGE
CENTRIFUGE

1
00:00:07,030 --> 00:00:05,079
we're joined today by dr. Scott Smith

2
00:00:08,560 --> 00:00:07,040
from here at Johnson Space Center you

3
00:00:10,089 --> 00:00:08,570
know a big part of the work that's done

4
00:00:12,430 --> 00:00:10,099
on the space station is trying to figure

5
00:00:14,230 --> 00:00:12,440
out how astronauts react to living in

6
00:00:16,480 --> 00:00:14,240
microgravity and one thing in particular

7
00:00:19,150 --> 00:00:16,490
that some of the experiments onboard the

8
00:00:22,090 --> 00:00:19,160
station look at is what nutrition can do

9
00:00:25,720 --> 00:00:22,100
to help with that dr. Scott Smith is a

10
00:00:27,250 --> 00:00:25,730
the with the biomedical research and

11
00:00:28,450 --> 00:00:27,260
environmental sciences division here at

12
00:00:29,950 --> 00:00:28,460
Johnson Space Center he's going to tell

13
00:00:32,100 --> 00:00:29,960

us a little bit more more about that

14
00:00:34,450 --> 00:00:32,110
thanks for joining us guy sure thing

15
00:00:36,310 --> 00:00:34,460
good morning well why don't we start

16
00:00:37,660 --> 00:00:36,320
with you know why nutritional needs

17
00:00:40,750 --> 00:00:37,670
would be different in space and they are

18
00:00:42,490 --> 00:00:40,760
here on the ground well that's a good

19
00:00:44,500 --> 00:00:42,500
question and obviously the answer is

20
00:00:46,540 --> 00:00:44,510
that you know when crew members when

21
00:00:47,740 --> 00:00:46,550
astronauts go into space it's a very

22
00:00:49,240 --> 00:00:47,750
unique environment there's a lot of

23
00:00:51,430 --> 00:00:49,250
things that are different about space

24
00:00:54,340 --> 00:00:51,440
flight and there are on earth besides

25
00:00:56,530 --> 00:00:54,350
the microgravity the cabin air that they

26
00:00:58,060 --> 00:00:56,540
breathe is different the way they

27
00:01:02,020 --> 00:00:58,070
exercise is different the radiation

28
00:01:04,750 --> 00:01:02,030
exposure is different and your body does

29
00:01:06,880 --> 00:01:04,760
what you pay it to do which is it adapts

30
00:01:09,450 --> 00:01:06,890
to live in that environment but what

31
00:01:13,260 --> 00:01:09,460
happens is in that adaptation it it

32
00:01:15,820 --> 00:01:13,270
requires different things and you know

33
00:01:17,560 --> 00:01:15,830
your skeleton is different your muscles

34
00:01:21,670 --> 00:01:17,570
are different your cardiovascular system

35
00:01:24,039 --> 00:01:21,680
works differently and again I work in

36
00:01:26,800 --> 00:01:24,049
the nutrition area and you know

37
00:01:28,960 --> 00:01:26,810
nutrition is how your body fuels all of

38
00:01:31,450 --> 00:01:28,970

those systems so trying to understand

39
00:01:33,609 --> 00:01:31,460
how those requirements change and how we

40
00:01:34,930 --> 00:01:33,619
can use nutrition to help mitigate some

41
00:01:37,899 --> 00:01:34,940
of the negative effects of space flight

42
00:01:40,450 --> 00:01:37,909
is at the heart of what we do so it's

43
00:01:43,929 --> 00:01:40,460
important but you can actually change

44
00:01:46,149 --> 00:01:43,939
the way that my astronauts react to

45
00:01:48,580 --> 00:01:46,159
microgravity using by changing their

46
00:01:51,370 --> 00:01:48,590
diet basically that's correct I mean

47
00:01:52,719 --> 00:01:51,380
obviously again in broad strokes what

48
00:01:55,570 --> 00:01:52,729
we're trying to do is see if we can use

49
00:01:57,100 --> 00:01:55,580
diet is a way to mitigate the bone loss

50
00:02:01,330 --> 00:01:57,110
of space flight or the muscle loss of

51
00:02:03,550 --> 00:02:01,340
space light so it's not just simply you

52
00:02:05,230 --> 00:02:03,560
know eating to maintain you know

53
00:02:08,109 --> 00:02:05,240
everyday life it's it's you're trying to

54
00:02:09,940 --> 00:02:08,119
overcome this environmental challenge

55
00:02:11,229 --> 00:02:09,950
that you've got okay and I know there

56
00:02:12,879 --> 00:02:11,239
are a few different experiments going on

57
00:02:14,000 --> 00:02:12,889
I think one of them is biochemical

58
00:02:15,410 --> 00:02:14,010
profile can you tell

59
00:02:18,890 --> 00:02:15,420
a little bit about that one well the

60
00:02:19,910 --> 00:02:18,900
biochemical profile is I just depends

61
00:02:21,920 --> 00:02:19,920
how you look at it as sort of a simple

62
00:02:24,170 --> 00:02:21,930
experiment and what we're doing there is

63
00:02:26,440 --> 00:02:24,180

we're collecting blood samples and urine

64
00:02:30,350 --> 00:02:26,450
samples occasionally from the cruise and

65
00:02:32,990 --> 00:02:30,360
we measure a whole host of of chemicals

66
00:02:36,140 --> 00:02:33,000
in those samples so we can get a

67
00:02:37,460 --> 00:02:36,150
snapshot if you will of markers that

68
00:02:41,240 --> 00:02:37,470
tell us about nutritional status

69
00:02:43,339 --> 00:02:41,250
vitamins minerals proteins we also get

70
00:02:45,679 --> 00:02:43,349
markers of bone metabolism we get

71
00:02:49,280 --> 00:02:45,689
markers of oxidative stress and changes

72
00:02:51,500 --> 00:02:49,290
in oxygen metabolism and by looking at

73
00:02:53,599 --> 00:02:51,510
all of those chemicals over the course

74
00:02:55,490 --> 00:02:53,609
of a mission we can look at how things

75
00:02:57,170 --> 00:02:55,500
change during flight we can look at that

76
00:03:01,000 --> 00:02:57,180
in relationship to what they ate or what

77
00:03:04,250 --> 00:03:01,010
they did and it allows us to have a

78
00:03:06,470 --> 00:03:04,260
database if you will to go back and look

79
00:03:08,780 --> 00:03:06,480
at if there are issues that come up with

80
00:03:10,280 --> 00:03:08,790
individual crews or groups of crews and

81
00:03:11,839 --> 00:03:10,290
so that one's going on right now I guess

82
00:03:13,670 --> 00:03:11,849
you don't have that database yet you're

83
00:03:15,259 --> 00:03:13,680
building it that's correct and it

84
00:03:17,780 --> 00:03:15,269
actually the biochemical profile

85
00:03:20,270 --> 00:03:17,790
experiment started last year and it was

86
00:03:22,580 --> 00:03:20,280
a an extension if you will of an

87
00:03:24,890 --> 00:03:22,590
experiment we flew earlier called the

88
00:03:26,809 --> 00:03:24,900

nutrition experiment and that was the

89
00:03:28,430 --> 00:03:26,819
same sort of thing it's been a bit

90
00:03:30,319 --> 00:03:28,440
different but so we've been collecting

91
00:03:34,009 --> 00:03:30,329
blood and urine samples on cruise since

92
00:03:35,900 --> 00:03:34,019
back on expedition 14 in 2006 we've got

93
00:03:37,879 --> 00:03:35,910
a fair amount of data but indeed the

94
00:03:40,250 --> 00:03:37,889
biochemical profiles new and we're still

95
00:03:41,900 --> 00:03:40,260
we're still working with those okay and

96
00:03:44,629 --> 00:03:41,910
then I guess there's another experiment

97
00:03:47,420 --> 00:03:44,639
called pro k it is actually completed

98
00:03:49,490 --> 00:03:47,430
right our last our last comer has come

99
00:03:51,979 --> 00:03:49,500
home indeed he landed Reid Wiseman was

100
00:03:54,500 --> 00:03:51,989
our last subject he landed in November

101
00:03:56,869 --> 00:03:54,510
and even though even though Reid came

102
00:03:59,119 --> 00:03:56,879
home some of his samples are still

103
00:04:01,819 --> 00:03:59,129
onboard station so we're anxiously

104
00:04:03,740 --> 00:04:01,829
waiting space x5 to come home because

105
00:04:05,449 --> 00:04:03,750
that's that's the way our samples get

106
00:04:07,550 --> 00:04:05,459
home at this point okay so it's still a

107
00:04:09,289 --> 00:04:07,560
little early I guess to tell us you know

108
00:04:10,640 --> 00:04:09,299
what the results are but can you tell us

109
00:04:12,800 --> 00:04:10,650
a little bit more about that experiment

110
00:04:14,420 --> 00:04:12,810
how it was different the point of that

111
00:04:15,890 --> 00:04:14,430
study again as you mentioned it was

112
00:04:18,349 --> 00:04:15,900
called pro k and what we're getting at

113
00:04:20,870 --> 00:04:18,359

there is the relationship of animal

114
00:04:22,310 --> 00:04:20,880
protein and potassium in the diet and

115
00:04:23,330 --> 00:04:22,320
the chemical abbreviation for potassium

116
00:04:26,390 --> 00:04:23,340
is

117
00:04:29,900 --> 00:04:26,400
so that's where we came from and what we

118
00:04:32,450 --> 00:04:29,910
maintain is that the higher the ratio of

119
00:04:35,719 --> 00:04:32,460
those two things in your diet the worse

120
00:04:38,090 --> 00:04:35,729
it is for bone so in short the more red

121
00:04:39,980 --> 00:04:38,100
meat you eat and the less fruits and

122
00:04:43,939 --> 00:04:39,990
vegetables you eat the more bone loss

123
00:04:45,950 --> 00:04:43,949
he'll have and what we set off to to

124
00:04:48,320 --> 00:04:45,960
study is if we could use that as a way

125
00:04:50,870 --> 00:04:48,330
to mitigate bone changes during flight

126
00:04:53,330 --> 00:04:50,880
so we would feed crews for a short

127
00:04:54,770 --> 00:04:53,340
period of time for days at a time we

128
00:04:58,490 --> 00:04:54,780
would feed them a diet that was either

129
00:05:00,890 --> 00:04:58,500
high animal protein and low potassium or

130
00:05:03,350 --> 00:05:00,900
the other way around low panel protein

131
00:05:05,540 --> 00:05:03,360
high potassium and then we looked at the

132
00:05:08,360 --> 00:05:05,550
difference in the way their bones were

133
00:05:11,390 --> 00:05:08,370
metabolising the calcium metabolism as a

134
00:05:14,690 --> 00:05:11,400
result of those diets okay and again

135
00:05:16,250 --> 00:05:14,700
it's it's still preliminary but the

136
00:05:19,909 --> 00:05:16,260
initial data we've seen so far are

137
00:05:21,560 --> 00:05:19,919
encouraging also because we're seeing

138
00:05:24,110 --> 00:05:21,570

what we expected which is always a good

139
00:05:26,779 --> 00:05:24,120
thing with the experiment that things

140
00:05:29,719 --> 00:05:26,789
line up the way you expected and that is

141
00:05:33,110 --> 00:05:29,729
again that the higher animal protein and

142
00:05:35,750 --> 00:05:33,120
potassium ratio diets were associated

143
00:05:37,790 --> 00:05:35,760
with more higher bone breakdown okay

144
00:05:40,430 --> 00:05:37,800
conversely and i will tell you also

145
00:05:43,279 --> 00:05:40,440
though one of the things we found which

146
00:05:45,290 --> 00:05:43,289
is which was a little bit of surprises

147
00:05:49,250 --> 00:05:45,300
that there are it seems there are many

148
00:05:50,690 --> 00:05:49,260
factors that also involve bone so one of

149
00:05:53,900 --> 00:05:50,700
the things that seems to be contributing

150
00:05:55,520 --> 00:05:53,910
to the the results of the study is that

151
00:05:58,190 --> 00:05:55,530
the carbon dioxide levels onboard

152
00:06:00,350 --> 00:05:58,200
station the in air that the crews are

153
00:06:02,300 --> 00:06:00,360
breathing seems to be a confounding

154
00:06:04,909 --> 00:06:02,310
factor that with higher co2 levels on

155
00:06:07,100 --> 00:06:04,919
the diet doesn't seem to have as big an

156
00:06:09,440 --> 00:06:07,110
effect and that's one of the things

157
00:06:11,360 --> 00:06:09,450
we're waiting on our final sets of data

158
00:06:14,629 --> 00:06:11,370
be able to really go in and dig at that

159
00:06:17,330 --> 00:06:14,639
but interesting on it's it's it's

160
00:06:19,279 --> 00:06:17,340
intriguing so is there something that

161
00:06:21,110 --> 00:06:19,289
you could do with that information just

162
00:06:22,760 --> 00:06:21,120
you keep adjusting the diet or I guess

163
00:06:24,589 --> 00:06:22,770

you can't really adjust the the type of

164
00:06:26,210 --> 00:06:24,599
area they're breathing well you know

165
00:06:27,500 --> 00:06:26,220
there's a couple things we can do I mean

166
00:06:29,000 --> 00:06:27,510
obviously we we make dietary

167
00:06:31,190 --> 00:06:29,010
recommendations to cruise all the time

168
00:06:32,719 --> 00:06:31,200
of you know here's how much protein your

169
00:06:34,100 --> 00:06:32,729
seed and here's you know try to get more

170
00:06:34,580 --> 00:06:34,110
fruits and vegetables those kinds of

171
00:06:38,240 --> 00:06:34,590
things

172
00:06:41,000 --> 00:06:38,250
as we look towards exploration one of

173
00:06:42,590 --> 00:06:41,010
the things we can drive is ambient co2

174
00:06:45,770 --> 00:06:42,600
levels carbon dioxide levels in the

175
00:06:48,260 --> 00:06:45,780
cabin so that indeed it's hard it's hard

176
00:06:50,810 --> 00:06:48,270
but not impossible to change the co2

177
00:06:52,520 --> 00:06:50,820
levels on board station okay again as

178
00:06:55,910 --> 00:06:52,530
the engineers are off building the next

179
00:06:58,520 --> 00:06:55,920
vehicles knowing that knowing that the

180
00:06:59,990 --> 00:06:58,530
environment can affect bone can help

181
00:07:02,300 --> 00:07:00,000
provide them with guidelines to help

182
00:07:03,860 --> 00:07:02,310
make things better great well what about

183
00:07:05,390 --> 00:07:03,870
for us here on earth are there any

184
00:07:09,500 --> 00:07:05,400
implications that something like this

185
00:07:10,970 --> 00:07:09,510
would have for us indeed and in in many

186
00:07:13,370 --> 00:07:10,980
ways I think everything we do has

187
00:07:16,550 --> 00:07:13,380
implications on earth in part because

188
00:07:19,070 --> 00:07:16,560

we're studying a generally very healthy

189
00:07:20,660 --> 00:07:19,080
group of individuals and we're putting

190
00:07:23,960 --> 00:07:20,670
them in a very strange environment so

191
00:07:26,000 --> 00:07:23,970
the bone loss for example that we see is

192
00:07:28,550 --> 00:07:26,010
very similar to people with bone

193
00:07:30,380 --> 00:07:28,560
diseases on earth the difference is that

194
00:07:33,050 --> 00:07:30,390
we see it much faster than you see it on

195
00:07:34,850 --> 00:07:33,060
earth so we can study it over a shorter

196
00:07:36,410 --> 00:07:34,860
period of time we can study ways to

197
00:07:39,560 --> 00:07:36,420
counteract it over a shorter period of

198
00:07:42,500 --> 00:07:39,570
time on a on a six-month space mission

199
00:07:43,670 --> 00:07:42,510
for example we see about the same change

200
00:07:46,040 --> 00:07:43,680
in bone that you would see over about

201
00:07:50,540 --> 00:07:46,050
five years in somebody on earth so it

202
00:07:53,000 --> 00:07:50,550
allows you to do sort of a rapid look at

203
00:07:55,010 --> 00:07:53,010
at those changes okay well it sounds

204
00:07:56,870 --> 00:07:55,020
like a fascinating project and hope to