
NASA Marshall Space Flight Center
Huntsville, Alabama
PAYCOM-1
SAFETY
OC
PRO-2

1
00:00:05,430 --> 00:00:03,189
on this science wednesday let's head out

2
00:00:07,030 --> 00:00:05,440
to the payload operations integration

3
00:00:09,509 --> 00:00:07,040
center at marshall space flight center

4
00:00:11,030 --> 00:00:09,519
in huntsville alabama now lori meggs is

5
00:00:12,870 --> 00:00:11,040
there and lori we're talking about

6
00:00:13,669 --> 00:00:12,880
nutrition and well-being for astronauts

7
00:00:16,310 --> 00:00:13,679
today

8
00:00:18,790 --> 00:00:16,320
as well as for here on earth kelly the

9
00:00:21,029 --> 00:00:18,800
number one priority for nasa is to keep

10
00:00:22,870 --> 00:00:21,039
our space station astronauts safe and

11
00:00:24,470 --> 00:00:22,880
healthy to do that we have to understand

12
00:00:25,830 --> 00:00:24,480
what really happens to our bodies in

13
00:00:27,990 --> 00:00:25,840

microgravity

14
00:00:29,349 --> 00:00:28,000
now there are two things two experiments

15
00:00:31,429 --> 00:00:29,359
that have looked at this

16
00:00:33,030 --> 00:00:31,439
one right now is the pro-k experiment

17
00:00:34,950 --> 00:00:33,040
looks at the nutritional intake of

18
00:00:36,310 --> 00:00:34,960
astronauts it's ongoing and the

19
00:00:39,110 --> 00:00:36,320
nutrition experiment which wrapped up

20
00:00:40,389 --> 00:00:39,120
earlier this year dr scott smith he is

21
00:00:41,750 --> 00:00:40,399
the lead for the nutrition and

22
00:00:43,750 --> 00:00:41,760
biochemistry

23
00:00:45,590 --> 00:00:43,760
lab at johnson space center and he tells

24
00:00:48,389 --> 00:00:45,600
us what we've learned from these

25
00:00:50,069 --> 00:00:48,399
experiments and where we're going

26
00:00:51,670 --> 00:00:50,079
i've always been very happy to say that

27
00:00:53,990 --> 00:00:51,680
we were the first blood collection on

28
00:00:55,350 --> 00:00:54,000
board the international space station

29
00:00:57,029 --> 00:00:55,360
we'd collected blood on shuttle we'd

30
00:00:58,630 --> 00:00:57,039
collect the blood on skylab but it took

31
00:01:00,470 --> 00:00:58,640
several years until we had enough until

32
00:01:02,069 --> 00:01:00,480
we had the right hardware onboard

33
00:01:04,070 --> 00:01:02,079
station to allow us to collect blood

34
00:01:05,830 --> 00:01:04,080
during flight on station

35
00:01:09,350 --> 00:01:05,840
anything you can share with us so far we

36
00:01:11,190 --> 00:01:09,360
found we've found several things

37
00:01:12,950 --> 00:01:11,200
the biggest thing i think we found is

38
00:01:15,429 --> 00:01:12,960

that

39
00:01:17,510 --> 00:01:15,439
we found metabolites in the blood

40
00:01:19,429 --> 00:01:17,520
that are reflective of a specific

41
00:01:22,469 --> 00:01:19,439
biochemical pathway what we call the one

42
00:01:24,710 --> 00:01:22,479
carbon metabolism pathway

43
00:01:26,630 --> 00:01:24,720
that are different

44
00:01:28,469 --> 00:01:26,640
in individuals that had vision issues

45
00:01:29,429 --> 00:01:28,479
during space flight

46
00:01:30,950 --> 00:01:29,439
okay

47
00:01:32,789 --> 00:01:30,960
and

48
00:01:35,590 --> 00:01:32,799
the the one carbon metabolism pathway is

49
00:01:37,590 --> 00:01:35,600
a very nutrition rich pathway it's got

50
00:01:40,550 --> 00:01:37,600
several vitamins tied into it vitamin b6

51
00:01:42,710 --> 00:01:40,560
vitamin b12 folate biotin

52
00:01:45,030 --> 00:01:42,720
a number of things that are involved

53
00:01:47,030 --> 00:01:45,040
which is why we were looking at it

54
00:01:48,789 --> 00:01:47,040
it wasn't until we started

55
00:01:49,670 --> 00:01:48,799
teasing out crew members that had vision

56
00:01:50,950 --> 00:01:49,680
issues

57
00:01:53,749 --> 00:01:50,960
and crew members that didn't have vision

58
00:01:55,270 --> 00:01:53,759
issues that allowed us to to see that

59
00:01:56,709 --> 00:01:55,280
there was a there appeared to be a

60
00:01:58,630 --> 00:01:56,719
relationship

61
00:02:00,230 --> 00:01:58,640
the striking thing

62
00:02:02,630 --> 00:02:00,240
was not only that we had differences in

63
00:02:05,109 --> 00:02:02,640

blood levels of these metabolites

64
00:02:07,670 --> 00:02:05,119
in individuals with vision issues

65
00:02:08,949 --> 00:02:07,680
the bigger thing i think is that we had

66
00:02:11,029 --> 00:02:08,959
differences

67
00:02:13,190 --> 00:02:11,039
pre-flight

68
00:02:15,030 --> 00:02:13,200
and after we ruled out a number of other

69
00:02:16,630 --> 00:02:15,040
things and looked at the data as many

70
00:02:17,910 --> 00:02:16,640
ways as we could

71
00:02:22,470 --> 00:02:17,920
we

72
00:02:24,630 --> 00:02:22,480
genetic differences

73
00:02:26,390 --> 00:02:24,640
could be causing this biochemical

74
00:02:28,070 --> 00:02:26,400
difference which could be related to

75
00:02:30,949 --> 00:02:28,080
these changes in vision

76
00:02:32,229 --> 00:02:30,959
and we're now doing a follow-on study

77
00:02:33,030 --> 00:02:32,239
which isn't really a flight study

78
00:02:34,309 --> 00:02:33,040
although we're doing it with the

79
00:02:35,990 --> 00:02:34,319
astronauts

80
00:02:38,869 --> 00:02:36,000
we're actually going back in and looking

81
00:02:40,949 --> 00:02:38,879
at their genes for specific enzymes in

82
00:02:43,830 --> 00:02:40,959
this pathway to see if we can then

83
00:02:46,470 --> 00:02:43,840
relate the actual genetic information

84
00:02:48,309 --> 00:02:46,480
to um to vision issues

85
00:02:51,110 --> 00:02:48,319
and how can this help us here on earth

86
00:02:54,869 --> 00:02:52,710
it could be a lot of things i mean we

87
00:02:56,630 --> 00:02:54,879
could still you know i i always say as a

88
00:02:58,309 --> 00:02:56,640

caveat you know

89
00:03:00,149 --> 00:02:58,319
we're very excited about these data we

90
00:03:01,990 --> 00:03:00,159
think we're going down the right path we

91
00:03:04,309 --> 00:03:02,000
could be wrong so

92
00:03:05,750 --> 00:03:04,319
this could be a fluke when we look at

93
00:03:09,190 --> 00:03:05,760
the scientific literature in the medical

94
00:03:11,270 --> 00:03:09,200
literature about this this pathway

95
00:03:13,030 --> 00:03:11,280
people with alterations in this pathway

96
00:03:13,990 --> 00:03:13,040
also tend to have increased risk of

97
00:03:16,309 --> 00:03:14,000
stroke

98
00:03:18,550 --> 00:03:16,319
increased risk of migraines

99
00:03:20,710 --> 00:03:18,560
increased risk of of other types of

100
00:03:23,670 --> 00:03:20,720
vascular diseases

101
00:03:25,190 --> 00:03:23,680
and it's possible that again if

102
00:03:26,630 --> 00:03:25,200
if our data help

103
00:03:28,710 --> 00:03:26,640
flush this out

104
00:03:29,990 --> 00:03:28,720
um that this may also have implications

105
00:03:31,509 --> 00:03:30,000
for

106
00:03:32,710 --> 00:03:31,519
understanding of health and physiology

107
00:03:34,070 --> 00:03:32,720
in

108
00:03:35,350 --> 00:03:34,080
everyday humans

109
00:03:37,910 --> 00:03:35,360
and then the second experiment is what

110
00:03:38,949 --> 00:03:37,920
we call pro k which is getting at

111
00:03:47,270 --> 00:03:38,959
the

112
00:03:49,910 --> 00:03:47,280
and what we believe in that experiment

113
00:03:52,229 --> 00:03:49,920

is that the ratio of animal protein and

114
00:03:55,350 --> 00:03:52,239
potassium in your diet

115
00:03:57,429 --> 00:03:55,360
may have an effect on your bone health

116
00:03:59,509 --> 00:03:57,439
that is the more

117
00:04:01,270 --> 00:03:59,519
the more animal protein you consume the

118
00:04:02,710 --> 00:04:01,280
more red meat you consume

119
00:04:05,110 --> 00:04:02,720
and the less fruits and vegetables you

120
00:04:06,070 --> 00:04:05,120
consume which are rich in potassium

121
00:04:09,750 --> 00:04:06,080
the more

122
00:04:12,070 --> 00:04:09,760
breakdown you see so

123
00:04:12,789 --> 00:04:12,080
the converse is yes that we believe that

124
00:04:16,629 --> 00:04:12,799
by

125
00:04:18,390 --> 00:04:16,639
increasing fruits and vegetables

126
00:04:20,629 --> 00:04:18,400
decreasing red meat and perhaps

127
00:04:23,350 --> 00:04:20,639
increasing fish intake or

128
00:04:25,749 --> 00:04:23,360
vegetable protein intake that that may

129
00:04:28,550 --> 00:04:25,759
be one made one way to help mitigate the

130
00:04:30,310 --> 00:04:28,560
bone loss that we see in astronauts and

131
00:04:32,469 --> 00:04:30,320
joining me now is someone who knows

132
00:04:34,390 --> 00:04:32,479
about nutrition and our diets and how

133
00:04:36,310 --> 00:04:34,400
that affects everyday life is linda

134
00:04:37,590 --> 00:04:36,320
stakely she is a nutritionist and

135
00:04:39,030 --> 00:04:37,600
registered dietitian at the huntsville

136
00:04:40,629 --> 00:04:39,040
hospital wellness center linda thanks

137
00:04:42,629 --> 00:04:40,639
for joining us today

138
00:04:44,550 --> 00:04:42,639

you heard dr smith and what he had to

139
00:04:47,030 --> 00:04:44,560
say tell us your thoughts on how that

140
00:04:49,830 --> 00:04:47,040
translates to us here on earth well when

141
00:04:51,590 --> 00:04:49,840
i think about an astronaut's diet and

142
00:04:53,189 --> 00:04:51,600
people that are up at the payload

143
00:04:54,550 --> 00:04:53,199
station i'm thinking of more of a

144
00:04:56,790 --> 00:04:54,560
perfect diet because it's been

145
00:04:58,710 --> 00:04:56,800
formulated they've had biochemists work

146
00:05:00,550 --> 00:04:58,720
on it they've had dietitians work on it

147
00:05:02,870 --> 00:05:00,560
scientists so it's more of a perfect

148
00:05:03,990 --> 00:05:02,880
diet but here on earth our diets are not

149
00:05:05,749 --> 00:05:04,000
so perfect

150
00:05:07,670 --> 00:05:05,759
and the one of the studies that he

151
00:05:10,150 --> 00:05:07,680
looked at was the pro k

152
00:05:12,550 --> 00:05:10,160
and they're decreasing the the protein

153
00:05:14,469 --> 00:05:12,560
but increasing the potassium in the diet

154
00:05:17,029 --> 00:05:14,479
and that has to do with bone density and

155
00:05:19,270 --> 00:05:17,039
so i brought along a plate with me today

156
00:05:21,189 --> 00:05:19,280
just to show how we could how we can

157
00:05:22,310 --> 00:05:21,199
compute that into real life it looks

158
00:05:23,350 --> 00:05:22,320
pretty good

159
00:05:25,270 --> 00:05:23,360
it does

160
00:05:26,550 --> 00:05:25,280
if you would take your plate and divide

161
00:05:28,550 --> 00:05:26,560
it into

162
00:05:30,390 --> 00:05:28,560
four quadrants what we'd like to see

163
00:05:32,230 --> 00:05:30,400

people to do is have a fourth of your

164
00:05:34,310 --> 00:05:32,240
plate as your protein and this is a

165
00:05:36,469 --> 00:05:34,320
three ounce portion of chicken and

166
00:05:37,990 --> 00:05:36,479
that's really about all we need and then

167
00:05:39,830 --> 00:05:38,000
a quarter of your plate would be your

168
00:05:42,710 --> 00:05:39,840
starch and this just happens to be brown

169
00:05:45,189 --> 00:05:42,720
rice but i like to see half of your

170
00:05:46,870 --> 00:05:45,199
plate as fruits and vegetables and i

171
00:05:48,870 --> 00:05:46,880
like to see the more colorful vegetables

172
00:05:50,629 --> 00:05:48,880
that have the antioxidants in it but the

173
00:05:52,390 --> 00:05:50,639
thing about this is you're getting more

174
00:05:55,189 --> 00:05:52,400
potassium when you're eating fruits and

175
00:05:57,670 --> 00:05:55,199
vegetables and so you get an added

176
00:05:59,430 --> 00:05:57,680
benefit when you have extra potassium in

177
00:06:01,029 --> 00:05:59,440
your diet to lower your blood pressure

178
00:06:02,230 --> 00:06:01,039
so not only does it have bone density

179
00:06:04,550 --> 00:06:02,240
but it helps to lower your blood

180
00:06:05,909 --> 00:06:04,560
pressure so how much protein potassium

181
00:06:08,230 --> 00:06:05,919
i'm sorry do we need we need probably

182
00:06:11,350 --> 00:06:08,240
about 3 500 ml equivalents of potassium

183
00:06:12,710 --> 00:06:11,360
a day and we easily get that if we

184
00:06:15,590 --> 00:06:12,720
include fruits and vegetables in our

185
00:06:18,230 --> 00:06:15,600
diet but the problem is we are a meat

186
00:06:19,909 --> 00:06:18,240
and potato society so it's more half our

187
00:06:22,070 --> 00:06:19,919
plates meat and half of our plate is

188
00:06:23,510 --> 00:06:22,080

potatoes so we need to include more

189
00:06:26,150 --> 00:06:23,520
fruits and vegetables in the diet to get

190
00:06:28,309 --> 00:06:26,160
that potassium that we need and probably

191
00:06:29,749 --> 00:06:28,319
if you're eating 45 to 55 grams of

192
00:06:31,990 --> 00:06:29,759
protein for a female you're getting

193
00:06:34,870 --> 00:06:32,000
enough for a male probably no more than

194
00:06:37,510 --> 00:06:34,880
about 65 grams unless you're really

195
00:06:39,909 --> 00:06:37,520
a weight in weight training and then you

196
00:06:42,150 --> 00:06:39,919
might need as much as 100 110 or 20

197
00:06:44,070 --> 00:06:42,160
grams of protein but most people don't

198
00:06:46,710 --> 00:06:44,080
need that much but that's what we end up

199
00:06:48,550 --> 00:06:46,720
getting we talk about the perfect diets

200
00:06:50,150 --> 00:06:48,560
of those in space but but they're

201
00:06:52,629 --> 00:06:50,160
sometimes in a stressful situation tell

202
00:06:53,990 --> 00:06:52,639
us how stress relates to what we eat and

203
00:06:56,070 --> 00:06:54,000
how that affects well when we're

204
00:06:58,629 --> 00:06:56,080
stressed here on earth we don't eat

205
00:07:01,350 --> 00:06:58,639
right we don't choose right and and when

206
00:07:03,670 --> 00:07:01,360
we feel those stress hormones we tend to

207
00:07:05,430 --> 00:07:03,680
want something salty something sweet

208
00:07:07,510 --> 00:07:05,440
something fatty and so we make bad

209
00:07:10,309 --> 00:07:07,520
choices we don't go and eat a good

210
00:07:12,070 --> 00:07:10,319
vegetable lunch or dinner so the stress

211
00:07:13,670 --> 00:07:12,080
can cause you to drink more coffee which

212
00:07:16,629 --> 00:07:13,680
is going to increase the stress it can

213
00:07:19,110 --> 00:07:16,639

cause you to drink more alcohol

214
00:07:22,230 --> 00:07:19,120
to skip meals and to overeat when you do

215
00:07:23,749 --> 00:07:22,240
eat at meal time so a stressful diet is

216
00:07:25,510 --> 00:07:23,759
obviously going to affect your immune

217
00:07:27,909 --> 00:07:25,520
system it's going to affect how you feel

218
00:07:31,029 --> 00:07:27,919
how you perform so

219
00:07:33,029 --> 00:07:31,039
eating more healthy foods and more like

220
00:07:34,950 --> 00:07:33,039
dr smith is talking about

221
00:07:36,469 --> 00:07:34,960
less protein more fruits and vegetables

222
00:07:37,749 --> 00:07:36,479
is going to be the healthy approach but

223
00:07:40,070 --> 00:07:37,759
that's not what we turn to when we're

224
00:07:42,870 --> 00:07:40,080
stressed we turn to something in fact i

225
00:07:45,430 --> 00:07:42,880
asked you earlier what is is stressed

226
00:07:47,430 --> 00:07:45,440
spelled backwards it is dessert it is

227
00:07:49,029 --> 00:07:47,440
dessert and that's what people tend to

228
00:07:51,350 --> 00:07:49,039
go to something sweet you know

229
00:07:53,270 --> 00:07:51,360
especially women you know we oftentimes

230
00:07:55,670 --> 00:07:53,280
want that piece of cake or we want that

231
00:07:57,189 --> 00:07:55,680
cookie or that that sweet after a meal

232
00:07:59,029 --> 00:07:57,199
and many times it's just because we're

233
00:08:00,790 --> 00:07:59,039
feeling so stressed and uptight and it's

234
00:08:02,710 --> 00:08:00,800
that carbohydrate which releases

235
00:08:04,309 --> 00:08:02,720
serotonin it's that feel-good hormone

236
00:08:06,230 --> 00:08:04,319
and it kind of helps us get through it

237
00:08:09,029 --> 00:08:06,240
briefly he talked a little bit about the

238
00:08:10,469 --> 00:08:09,039

the b vitamin yeah too uh tell us what

239
00:08:13,589 --> 00:08:10,479
are some sources of b vitamins well your

240
00:08:16,070 --> 00:08:13,599
b vitamins mainly come from your breads

241
00:08:18,150 --> 00:08:16,080
and cereals but the problem with that is

242
00:08:20,550 --> 00:08:18,160
so many of our breads and cereals are

243
00:08:23,189 --> 00:08:20,560
highly processed what you want to look

244
00:08:26,469 --> 00:08:23,199
for on your label is a hundred percent

245
00:08:28,550 --> 00:08:26,479
whole wheat or a hundred percent whole

246
00:08:30,950 --> 00:08:28,560
grain product so if your label does not

247
00:08:33,990 --> 00:08:30,960
say whole grain or whole wheat then it

248
00:08:36,149 --> 00:08:34,000
is a highly processed food white bread

249
00:08:38,310 --> 00:08:36,159
uh the iron kids bread the white wheat

250
00:08:40,469 --> 00:08:38,320
bread honey wheat bread all of that is

251
00:08:42,469 --> 00:08:40,479
very processed and what you really want

252
00:08:44,550 --> 00:08:42,479
is 100 whole wheat

253
00:08:46,550 --> 00:08:44,560
or whole grain because the nutrients

254
00:08:48,150 --> 00:08:46,560
have not been removed and they're there

255
00:08:49,829 --> 00:08:48,160
for us and they're better utilized by

256
00:08:50,790 --> 00:08:49,839
the body than what they just throw in

257
00:08:52,630 --> 00:08:50,800
there

258
00:08:54,310 --> 00:08:52,640
we also talked about bone health that's

259
00:08:56,070 --> 00:08:54,320
a big deal on space station what what

260
00:08:57,910 --> 00:08:56,080
other factors influence but there are a

261
00:09:00,150 --> 00:08:57,920
lot of factors here on earth that

262
00:09:02,310 --> 00:09:00,160
influence bone health if you are doing

263
00:09:05,110 --> 00:09:02,320

load-bearing exercise that is going to

264
00:09:07,350 --> 00:09:05,120
be a really important thing to to help

265
00:09:09,350 --> 00:09:07,360
you to strengthen your bones but also

266
00:09:12,389 --> 00:09:09,360
calcium is important and calcium that

267
00:09:14,389 --> 00:09:12,399
has calcium that you also have vitamin d

268
00:09:16,070 --> 00:09:14,399
at the same time helps to make those

269
00:09:17,829 --> 00:09:16,080
bones stronger so

270
00:09:20,150 --> 00:09:17,839
calcium in the diet load-bearing

271
00:09:22,790 --> 00:09:20,160
exercise those are important things and

272
00:09:24,389 --> 00:09:22,800
again too much protein in the diet is

273
00:09:26,389 --> 00:09:24,399
not going to be healthy for the bones

274
00:09:28,070 --> 00:09:26,399
here on earth as well as in space how

275
00:09:31,190 --> 00:09:28,080
much protein should we have

276
00:09:33,110 --> 00:09:31,200
about 45 to 55 for women and probably 65

277
00:09:34,949 --> 00:09:33,120
to 75 for men don't need any more than

278
00:09:36,389 --> 00:09:34,959
that you know three ounces of meat at

279
00:09:40,470 --> 00:09:36,399
lunch and three ounces at dinner's

280
00:09:44,389 --> 00:09:42,630
but what happens when we go out to eat

281
00:09:46,070 --> 00:09:44,399
we get five to six ounces at lunch and

282
00:09:47,829 --> 00:09:46,080
maybe even more at dinner

283
00:09:49,509 --> 00:09:47,839
and when we eat so much meat we don't

284
00:09:50,470 --> 00:09:49,519
eat those vegetables and that's the

285
00:09:52,470 --> 00:09:50,480
problem

286
00:09:53,590 --> 00:09:52,480
all right and i know it probably excites

287
00:09:55,190 --> 00:09:53,600
you to hear about what do you think when

288
00:09:57,670 --> 00:09:55,200

you hear about nutritional studies in

289
00:09:59,509 --> 00:09:57,680
space oh it's wonderful it's so exciting

290
00:10:01,190 --> 00:09:59,519
that they're doing all of this and then

291
00:10:03,110 --> 00:10:01,200
we take that information and we can

292
00:10:04,949 --> 00:10:03,120
apply it here on earth

293
00:10:07,110 --> 00:10:04,959
and i love the fact that the diets that

294
00:10:08,710 --> 00:10:07,120
they uh prepare for the astronauts are

295
00:10:10,870 --> 00:10:08,720
so carefully planned to give them

296
00:10:13,509 --> 00:10:10,880
everything that they need and if it were

297
00:10:15,829 --> 00:10:13,519
just so here on earth and so simple but

298
00:10:18,550 --> 00:10:15,839
we have a variety of choices and we

299
00:10:20,389 --> 00:10:18,560
oftentimes make the wrong choices so

300
00:10:22,790 --> 00:10:20,399
maybe all this good information to show

301
00:10:24,710 --> 00:10:22,800
how well our astronauts do in space will

302
00:10:25,750 --> 00:10:24,720
help people to realize if they just ate

303
00:10:27,750 --> 00:10:25,760
better

304
00:10:29,350 --> 00:10:27,760
they would be a lot healthier so much

305
00:10:31,190 --> 00:10:29,360
good information thank you linda so much

306
00:10:32,870 --> 00:10:31,200
for being with us today linda stakely

307
00:10:34,550 --> 00:10:32,880
from huntsville hospital wellness center

308
00:10:36,710 --> 00:10:34,560
now let's take a live look into the

309
00:10:39,030 --> 00:10:36,720
payload operations integration center

310
00:10:41,190 --> 00:10:39,040
they've just wrapped up working on the

311
00:10:43,829 --> 00:10:41,200
in space experiment this morning they're

312
00:10:45,910 --> 00:10:43,839
putting some things away for that and

313
00:10:47,590 --> 00:10:45,920

planning for a new crew so that'll do it

314
00:10:49,590 --> 00:10:47,600
for us here from the payload operations

315
00:10:51,030 --> 00:10:49,600
integration center at nasa's marshall