
NASA
SPACESTATION
LIVE

1
00:00:08,150 --> 00:00:06,230
the international space station is home

2
00:00:10,470 --> 00:00:08,160
to many experiments that are looking

3
00:00:13,110 --> 00:00:10,480
into how the weightless environment in

4
00:00:15,110 --> 00:00:13,120
low earth orbit impacts the human body

5
00:00:17,189 --> 00:00:15,120
this is with an eye toward resolving the

6
00:00:19,269 --> 00:00:17,199
issues that could affect explorers on

7
00:00:20,310 --> 00:00:19,279
long journeys well beyond earth in the

8
00:00:22,950 --> 00:00:20,320
future

9
00:00:25,830 --> 00:00:22,960
one such experiment which is focusing on

10
00:00:28,390 --> 00:00:25,840
stiffening of the astronauts arteries is

11
00:00:29,750 --> 00:00:28,400
known as vascular echo and this morning

12
00:00:31,910 --> 00:00:29,760
we're going to find out more about it

13
00:00:34,310 --> 00:00:31,920

from the principal investigator dr

14
00:00:36,069 --> 00:00:34,320
richard hewson of the schlegel

15
00:00:38,630 --> 00:00:36,079
university of waterloo research

16
00:00:40,630 --> 00:00:38,640
institute for aging in waterloo ontario

17
00:00:42,470 --> 00:00:40,640
canada good morning sir

18
00:00:44,310 --> 00:00:42,480
good morning pat dr houston let me start

19
00:00:46,869 --> 00:00:44,320
by setting some of the groundwork for me

20
00:00:49,430 --> 00:00:46,879
tell me what is it that causes arteries

21
00:00:50,709 --> 00:00:49,440
to stiffen and and what is the the

22
00:00:51,910 --> 00:00:50,719
problem with that from a health

23
00:00:54,470 --> 00:00:51,920
standpoint

24
00:00:56,950 --> 00:00:54,480
okay well on on earth i think we all

25
00:00:58,389 --> 00:00:56,960
know about arteries getting stiff as we

26
00:00:59,270 --> 00:00:58,399
as we age

27
00:01:01,349 --> 00:00:59,280
and

28
00:01:03,110 --> 00:01:01,359
the problems there are somewhat

29
00:01:04,869 --> 00:01:03,120
different from space flight

30
00:01:07,670 --> 00:01:04,879
some of the causes we can talk about in

31
00:01:09,670 --> 00:01:07,680
a second might be similar though um

32
00:01:12,710 --> 00:01:09,680
people with hypertension

33
00:01:14,710 --> 00:01:12,720
but also as we age on earth are the

34
00:01:17,190 --> 00:01:14,720
elasticity in our arteries the elastic

35
00:01:20,070 --> 00:01:17,200
tissue starts to break down that causes

36
00:01:22,390 --> 00:01:20,080
stiffness when you get stiffer arteries

37
00:01:24,630 --> 00:01:22,400
unfortunately it doesn't buffer the

38
00:01:27,350 --> 00:01:24,640

energy that's put into the blood as it

39
00:01:29,830 --> 00:01:27,360
as it's being ejected from the heart

40
00:01:32,149 --> 00:01:29,840
so if it doesn't buffer that energy that

41
00:01:33,749 --> 00:01:32,159
energy gets transmitted into the into

42
00:01:36,149 --> 00:01:33,759
some of the smaller blood vessels and

43
00:01:39,190 --> 00:01:36,159
especially the brain and the kidney

44
00:01:40,950 --> 00:01:39,200
where they're very high flow organs

45
00:01:43,350 --> 00:01:40,960
you don't have

46
00:01:45,270 --> 00:01:43,360
that buffering and you get a real high

47
00:01:47,990 --> 00:01:45,280
impact of that energy on the smaller

48
00:01:50,069 --> 00:01:48,000
blood vessels it starts causing damage

49
00:01:52,389 --> 00:01:50,079
can lead to problems

50
00:01:55,030 --> 00:01:52,399
up to and including dementia and perhaps

51
00:01:57,350 --> 00:01:55,040
alzheimer's is part of that as well

52
00:01:59,910 --> 00:01:57,360
um but certainly there you know you can

53
00:02:01,910 --> 00:01:59,920
have a lot of damage to these these

54
00:02:03,030 --> 00:02:01,920
organs if you have that lifelong

55
00:02:05,510 --> 00:02:03,040
exposure

56
00:02:07,749 --> 00:02:05,520
now astronauts are relatively healthy

57
00:02:09,830 --> 00:02:07,759
and relatively young in fact

58
00:02:11,830 --> 00:02:09,840
how does an expert on aging get

59
00:02:14,229 --> 00:02:11,840
interested in using astronauts as

60
00:02:16,949 --> 00:02:14,239
research subjects in this area

61
00:02:19,030 --> 00:02:16,959
well i guess it really goes back to my

62
00:02:20,229 --> 00:02:19,040
interest in the benefits of physical

63
00:02:23,750 --> 00:02:20,239

activity

64
00:02:25,990 --> 00:02:23,760
and ever since the shuttle days when

65
00:02:28,150 --> 00:02:26,000
astronauts often went up for you know

66
00:02:30,550 --> 00:02:28,160
maybe a week or two at a time

67
00:02:33,430 --> 00:02:30,560
and many of them were unable to perform

68
00:02:35,750 --> 00:02:33,440
really more than very minimal activity

69
00:02:37,030 --> 00:02:35,760
up there exercise that's you know

70
00:02:39,910 --> 00:02:37,040
because otherwise they're floating

71
00:02:41,910 --> 00:02:39,920
around in the in the uh in the shuttle

72
00:02:42,710 --> 00:02:41,920
or in the space station now

73
00:02:45,110 --> 00:02:42,720
so

74
00:02:46,869 --> 00:02:45,120
that the level of activity is greatly

75
00:02:48,309 --> 00:02:46,879
reduced compared to what we do here on

76
00:02:49,509 --> 00:02:48,319
earth when we have to work against

77
00:02:50,390 --> 00:02:49,519
gravity

78
00:02:52,710 --> 00:02:50,400
so

79
00:02:56,309 --> 00:02:52,720
if you take away the daily physical

80
00:02:58,229 --> 00:02:56,319
activity and you now have them

81
00:03:00,869 --> 00:02:58,239
floating

82
00:03:03,830 --> 00:03:00,879
when you introduce exercise the question

83
00:03:05,430 --> 00:03:03,840
is is that enough

84
00:03:06,869 --> 00:03:05,440
the answer that we've come up with we

85
00:03:10,309 --> 00:03:06,879
just finished the study that was called

86
00:03:13,830 --> 00:03:10,319
vascular before the vascular echo study

87
00:03:15,670 --> 00:03:13,840
and in vascular um we documented that

88
00:03:18,070 --> 00:03:15,680

astronauts are actually doing only about

89
00:03:20,869 --> 00:03:18,080
30 minutes per day of aerobic type of

90
00:03:22,229 --> 00:03:20,879
exercise plus what they do on the on the

91
00:03:23,110 --> 00:03:22,239
a red

92
00:03:24,949 --> 00:03:23,120
and

93
00:03:26,869 --> 00:03:24,959
we know on earth now there are many

94
00:03:28,949 --> 00:03:26,879
studies starting to appear

95
00:03:30,309 --> 00:03:28,959
showing that if you went to the gym in

96
00:03:31,990 --> 00:03:30,319
the morning but then sat at your

97
00:03:34,149 --> 00:03:32,000
computer for the rest of the day and did

98
00:03:36,949 --> 00:03:34,159
no physical activity

99
00:03:38,949 --> 00:03:36,959
you do start showing signs of

100
00:03:40,949 --> 00:03:38,959
um

101
00:03:44,309 --> 00:03:40,959
signs of change that include arterial

102
00:03:45,589 --> 00:03:44,319
stiffness also include insulin

103
00:03:48,390 --> 00:03:45,599
resistance

104
00:03:50,550 --> 00:03:48,400
and the potential for developing

105
00:03:53,110 --> 00:03:50,560
type 2 diabetes

106
00:03:55,270 --> 00:03:53,120
so inside the vascular study

107
00:03:58,550 --> 00:03:55,280
we also measured insulin resistance and

108
00:04:00,550 --> 00:03:58,560
documented that astronauts do have an

109
00:04:02,550 --> 00:04:00,560
increase in insulin resistance

110
00:04:04,229 --> 00:04:02,560
now they're not type 2 diabetics by any

111
00:04:05,830 --> 00:04:04,239
means but they're going in that

112
00:04:08,390 --> 00:04:05,840
direction and showing us just how

113
00:04:09,509 --> 00:04:08,400

important daily physical activities

114
00:04:11,509 --> 00:04:09,519
really are

115
00:04:13,429 --> 00:04:11,519
so in this case what is it that you're

116
00:04:16,469 --> 00:04:13,439
having the astronauts do in order to

117
00:04:19,430 --> 00:04:16,479
gather data to assist this research

118
00:04:21,189 --> 00:04:19,440
okay and in the vascular echo study we

119
00:04:23,510 --> 00:04:21,199
are collecting some blood samples so we

120
00:04:26,230 --> 00:04:23,520
can look at those biomarkers but the

121
00:04:29,510 --> 00:04:26,240
major focus is on using ultrasound

122
00:04:32,469 --> 00:04:29,520
technology to look at the arteries

123
00:04:35,510 --> 00:04:32,479
we also look at veins and the heart but

124
00:04:37,670 --> 00:04:35,520
the focus on the arteries we

125
00:04:40,150 --> 00:04:37,680
we can image the artery as it's

126
00:04:42,870 --> 00:04:40,160
expanding with each heartbeat

127
00:04:45,270 --> 00:04:42,880
and we can determine is it expanding as

128
00:04:46,150 --> 00:04:45,280
much for a change in blood pressure or

129
00:04:48,070 --> 00:04:46,160
less

130
00:04:50,629 --> 00:04:48,080
and certainly in the vascular study we

131
00:04:53,749 --> 00:04:50,639
saw that it was expanding less

132
00:04:55,749 --> 00:04:53,759
so it has a stiffer artery

133
00:04:56,390 --> 00:04:55,759
and we're we're really focusing in on

134
00:05:01,110 --> 00:04:56,400
the

135
00:05:03,590 --> 00:05:01,120
primary

136
00:05:05,990 --> 00:05:03,600
place that we expect to see this

137
00:05:08,710 --> 00:05:06,000
the reason for that um i mentioned

138
00:05:12,390 --> 00:05:08,720

earlier hypertension well astronauts are

139
00:05:13,749 --> 00:05:12,400
in effect hypertensive from their heart

140
00:05:15,430 --> 00:05:13,759
up to their head

141
00:05:17,670 --> 00:05:15,440
um you know as you and i are sitting

142
00:05:20,070 --> 00:05:17,680
here right now the blood pressure up in

143
00:05:22,710 --> 00:05:20,080
our head is as much as 30 millimeters of

144
00:05:25,189 --> 00:05:22,720
mercury less than it is at heart level

145
00:05:26,790 --> 00:05:25,199
because of gravity because of gravity

146
00:05:28,629 --> 00:05:26,800
yes because you're having to pump up

147
00:05:31,270 --> 00:05:28,639
against gravity so the hydrostatic

148
00:05:34,230 --> 00:05:33,110
takes away some of the pressure as it's

149
00:05:37,029 --> 00:05:34,240
going up

150
00:05:38,390 --> 00:05:37,039
in space that pressure stays the same

151
00:05:41,270 --> 00:05:38,400
throughout the body

152
00:05:43,909 --> 00:05:41,280
up to the head all day long 24 hours a

153
00:05:45,430 --> 00:05:43,919
day so so they are in effect and

154
00:05:47,990 --> 00:05:45,440
hypertensive

155
00:05:50,950 --> 00:05:48,000
in the in the head region compared to

156
00:05:53,830 --> 00:05:50,960
what we normally experience on earth

157
00:05:54,950 --> 00:05:53,840
so are there any initial thoughts about

158
00:05:56,870 --> 00:05:54,960
uh

159
00:05:58,950 --> 00:05:56,880
about the ways that this arterial

160
00:06:01,430 --> 00:05:58,960
stiffening can be prevented for

161
00:06:04,070 --> 00:06:01,440
astronauts that which in fact might be

162
00:06:05,430 --> 00:06:04,080
able to help the rest of us too

163
00:06:07,670 --> 00:06:05,440

yeah the

164
00:06:09,270 --> 00:06:07,680
um well there's not much they can do

165
00:06:10,950 --> 00:06:09,280
about that change in the hydrostatic

166
00:06:12,629 --> 00:06:10,960
pressures their blood pressure in the

167
00:06:14,230 --> 00:06:12,639
head is going to be higher

168
00:06:15,350 --> 00:06:14,240
physical activity

169
00:06:17,029 --> 00:06:15,360
um

170
00:06:18,790 --> 00:06:17,039
30 minutes per day

171
00:06:21,189 --> 00:06:18,800
in one session

172
00:06:22,870 --> 00:06:21,199
probably is not enough so you know if

173
00:06:25,909 --> 00:06:22,880
you start talking about exploratory

174
00:06:27,350 --> 00:06:25,919
missions back to the moon and to mars

175
00:06:29,830 --> 00:06:27,360
people are going to have to exercise

176
00:06:31,670 --> 00:06:29,840
more frequently throughout the day

177
00:06:33,830 --> 00:06:31,680
and we hope that that's going to be of

178
00:06:36,230 --> 00:06:33,840
some benefit

179
00:06:38,390 --> 00:06:36,240
mean nutrition is perhaps a thing that

180
00:06:39,590 --> 00:06:38,400
can be worried about as well

181
00:06:41,670 --> 00:06:39,600
certainly the

182
00:06:42,950 --> 00:06:41,680
you know the the insulin resistance that

183
00:06:44,870 --> 00:06:42,960
we detected

184
00:06:46,550 --> 00:06:44,880
could mean that high glucose levels are

185
00:06:48,469 --> 00:06:46,560
happening if you have high glucose

186
00:06:50,870 --> 00:06:48,479
levels you can have

187
00:06:53,430 --> 00:06:50,880
formation of

188
00:06:56,230 --> 00:06:53,440

cross bridges inside the

189
00:06:57,990 --> 00:06:56,240
vascular smooth muscles

190
00:07:00,070 --> 00:06:58,000
walls

191
00:07:02,710 --> 00:07:00,080
and those cross bridges

192
00:07:05,189 --> 00:07:02,720
can introduce stiffening so we want to

193
00:07:07,589 --> 00:07:05,199
try to avoid that so again you know the

194
00:07:10,230 --> 00:07:07,599
best we can do is to sort of maintain