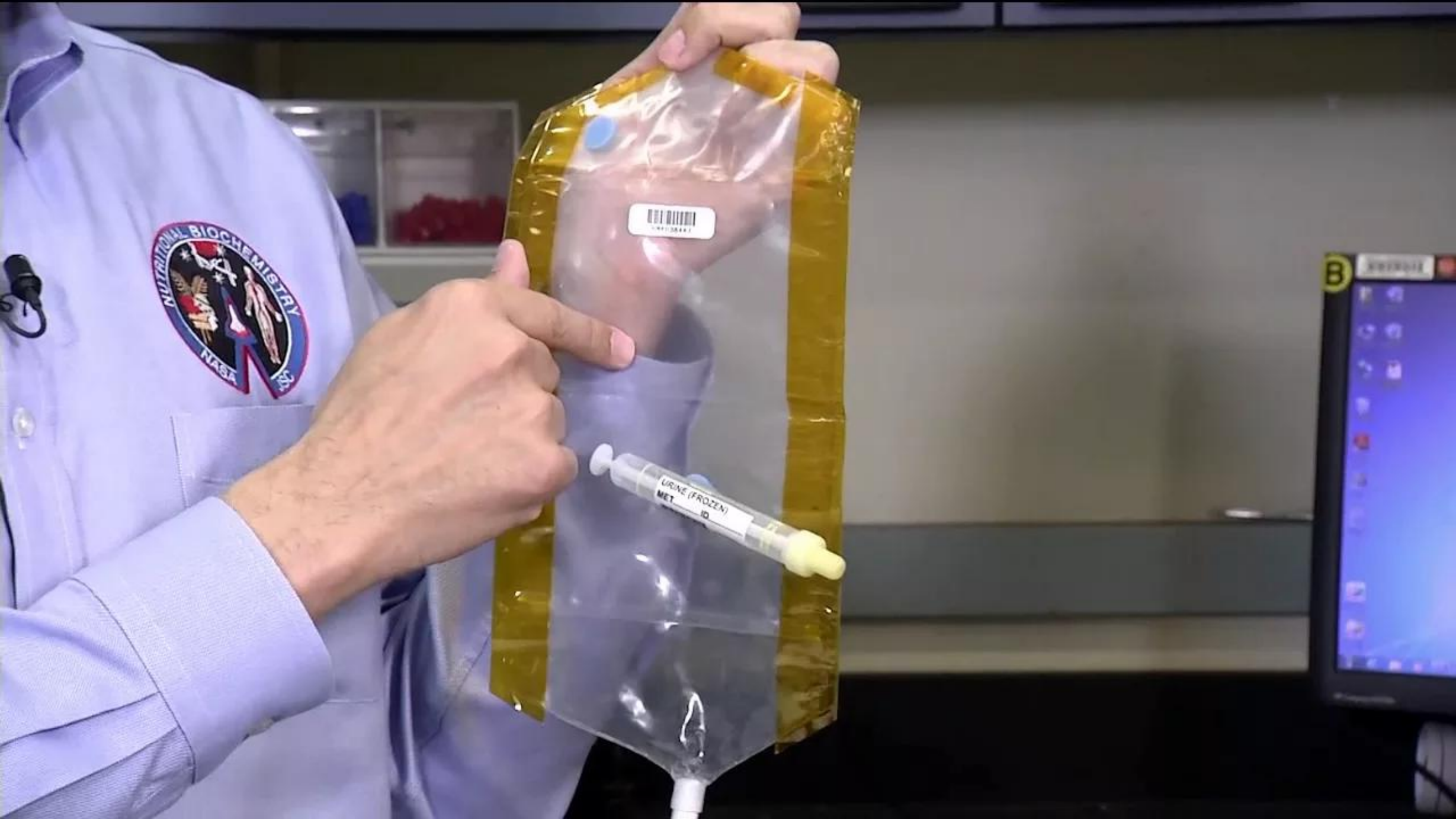
NUTRITIONAL BIOCHEMISTRY
NASA
URINE (FROZEN)
MET
ID

1
00:00:09,270 --> 00:00:07,349
science of course remains the name of

2
00:00:10,950 --> 00:00:09,280
the game aboard the international space

3
00:00:12,709 --> 00:00:10,960
station and we've all heard the saying

4
00:00:14,150 --> 00:00:12,719
you are what you eat

5
00:00:15,669 --> 00:00:14,160
well there's several space station

6
00:00:17,590 --> 00:00:15,679
experiments that have looked into what

7
00:00:19,910 --> 00:00:17,600
crews are eating and how their diet may

8
00:00:23,429 --> 00:00:19,920
affect things such as bone loss muscle

9
00:00:24,950 --> 00:00:23,439
loss and also vision issues or problems

10
00:00:27,269 --> 00:00:24,960
in order to do that samples are

11
00:00:29,509 --> 00:00:27,279
collected on orbit of blood and urine

12
00:00:31,589 --> 00:00:29,519
periodically when those are returned to

13
00:00:33,430 --> 00:00:31,599

earth those samples have to go someplace

14
00:00:36,389 --> 00:00:33,440
and that place is where we find my

15
00:00:38,150 --> 00:00:36,399
colleague lori meggs who visited one of

16
00:00:40,790 --> 00:00:38,160
our labs here at the johnson space

17
00:00:43,590 --> 00:00:40,800
center to learn more about nutrition and

18
00:00:44,869 --> 00:00:43,600
biochemistry

19
00:00:46,389 --> 00:00:44,879
we're talking blood and urine today

20
00:00:48,229 --> 00:00:46,399
nobody likes to talk about it but dr

21
00:00:49,830 --> 00:00:48,239
scott smith has to deal with it when the

22
00:00:52,069 --> 00:00:49,840
samples come back from the space station

23
00:00:53,110 --> 00:00:52,079
they come to this lab tell us about that

24
00:00:55,189 --> 00:00:53,120
well we

25
00:00:56,069 --> 00:00:55,199
we are the nutritional biochemistry lab

26
00:00:57,590 --> 00:00:56,079
and

27
00:00:58,869 --> 00:00:57,600
i usually like to draw the distinction

28
00:01:00,310 --> 00:00:58,879
that there's a food lab here at nasa

29
00:01:01,590 --> 00:01:00,320
that makes the food

30
00:01:04,229 --> 00:01:01,600
we are not the food lab we are the

31
00:01:06,070 --> 00:01:04,239
nutrition lab um and our job is to

32
00:01:07,270 --> 00:01:06,080
understand the nutritional requirements

33
00:01:09,190 --> 00:01:07,280
of the body

34
00:01:10,550 --> 00:01:09,200
and what the body needs how much calcium

35
00:01:12,149 --> 00:01:10,560
how much iron how much zinc how much

36
00:01:14,070 --> 00:01:12,159
protein

37
00:01:14,950 --> 00:01:14,080
and the way we get at that is by looking

38
00:01:16,789 --> 00:01:14,960

at

39
00:01:18,630 --> 00:01:16,799
blood and urine samples by collecting

40
00:01:20,149 --> 00:01:18,640
blood in urine it can tell us

41
00:01:23,030 --> 00:01:20,159
what's going on in the body what your

42
00:01:26,310 --> 00:01:23,040
bones are doing what your muscles doing

43
00:01:27,830 --> 00:01:26,320
fuel homeostasis lots of things

44
00:01:29,510 --> 00:01:27,840
come out of blood and urine and there's

45
00:01:31,910 --> 00:01:29,520
a lot of things to learn from that and

46
00:01:34,149 --> 00:01:31,920
the difference in microgravity that's on

47
00:01:35,109 --> 00:01:34,159
earth absolutely so how do you do that

48
00:01:37,429 --> 00:01:35,119
well

49
00:01:39,270 --> 00:01:37,439
a lot of the basic sample processing

50
00:01:41,270 --> 00:01:39,280
happens in this lab

51
00:01:42,789 --> 00:01:41,280
when we collect samples on earth before

52
00:01:44,230 --> 00:01:42,799
and after flight

53
00:01:46,469 --> 00:01:44,240
the crews will carry around a bag that

54
00:01:47,910 --> 00:01:46,479
has bottles in it for their urine

55
00:01:49,910 --> 00:01:47,920
we'll go meet up with them and stick a

56
00:01:51,109 --> 00:01:49,920
needle in them and collect some blood

57
00:01:52,950 --> 00:01:51,119
and that all comes back here for

58
00:01:54,310 --> 00:01:52,960
processing

59
00:01:55,749 --> 00:01:54,320
when we collect urine and blood in

60
00:01:57,590 --> 00:01:55,759
flight the blood collection is the same

61
00:02:00,230 --> 00:01:57,600
thing um

62
00:02:01,590 --> 00:02:00,240
again it's a needle some tubes

63
00:02:03,190 --> 00:02:01,600

sometimes the crews will draw their own

64
00:02:04,389 --> 00:02:03,200
blood which gets interesting because

65
00:02:06,550 --> 00:02:04,399
they will

66
00:02:08,710 --> 00:02:06,560
we train them ahead of time

67
00:02:11,270 --> 00:02:08,720
and they will voluntarily decide to

68
00:02:13,030 --> 00:02:11,280
stick themselves um which has worked out

69
00:02:14,790 --> 00:02:13,040
really really well we've been

70
00:02:18,070 --> 00:02:14,800
collecting blood for a little over for

71
00:02:19,270 --> 00:02:18,080
almost 10 years um onboard space station

72
00:02:21,430 --> 00:02:19,280
um

73
00:02:22,869 --> 00:02:21,440
and uh the crews have done phenomenally

74
00:02:23,910 --> 00:02:22,879
well now i would think the urine is a

75
00:02:25,510 --> 00:02:23,920
little trickier though the urine is a

76
00:02:26,869 --> 00:02:25,520
little trickier i would say we've had a

77
00:02:28,470 --> 00:02:26,879
lot of folks collect urine in flight not

78
00:02:31,270 --> 00:02:28,480
one of them has come back and said

79
00:02:32,550 --> 00:02:31,280
that's a great way to collect hearing

80
00:02:35,750 --> 00:02:32,560
when the crews go to the bathroom there

81
00:02:37,750 --> 00:02:35,760
is a toilet on board obviously

82
00:02:40,150 --> 00:02:37,760
but that that all goes inside the toilet

83
00:02:41,750 --> 00:02:40,160
at home it all goes into a main dump

84
00:02:42,949 --> 00:02:41,760
area that if you want to sample it

85
00:02:44,309 --> 00:02:42,959
you're out of luck

86
00:02:46,150 --> 00:02:44,319
so when we do experiments what we have

87
00:02:47,430 --> 00:02:46,160
to do is the crew uses

88
00:02:48,630 --> 00:02:47,440

these devices

89
00:02:51,110 --> 00:02:48,640
and this is what's called a urine

90
00:02:53,990 --> 00:02:51,120
collection device

91
00:02:55,430 --> 00:02:54,000
it's just a plastic type bag

92
00:02:56,470 --> 00:02:55,440
what happens is the crew will void into

93
00:03:00,550 --> 00:02:56,480
the bag

94
00:03:01,990 --> 00:03:00,560
lithium chloride which is just a

95
00:03:03,830 --> 00:03:02,000
chemical salt

96
00:03:06,710 --> 00:03:03,840
and we add that lithium chloride a small

97
00:03:08,630 --> 00:03:06,720
amount of it to the bag before it flies

98
00:03:09,990 --> 00:03:08,640
we do that in the lab two doors down

99
00:03:11,190 --> 00:03:10,000
well what happens is we can't bring this

100
00:03:13,589 --> 00:03:11,200
whole bag back

101
00:03:15,509 --> 00:03:13,599
so the crew will void into the bag

102
00:03:18,070 --> 00:03:15,519
they'll mix the urine by pressing on the

103
00:03:19,509 --> 00:03:18,080
bag so the lithium chloride gets mixed

104
00:03:20,710 --> 00:03:19,519
in with the urine

105
00:03:22,229 --> 00:03:20,720
and what happens is i'll take one of

106
00:03:23,589 --> 00:03:22,239
these syringes

107
00:03:26,550 --> 00:03:23,599
and then out of the other end of the bag

108
00:03:28,630 --> 00:03:26,560
they will take the lid off the syringe

109
00:03:29,509 --> 00:03:28,640
pop it in this little rubber opening

110
00:03:33,270 --> 00:03:29,519
here

111
00:03:36,149 --> 00:03:33,280
and we'll then withdraw a urine sample

112
00:03:38,390 --> 00:03:36,159
and easy as that easy as that and

113
00:03:39,990 --> 00:03:38,400

they'll put the cap back on here

114
00:03:42,390 --> 00:03:40,000
this gets pulled out to the end and then

115
00:03:44,470 --> 00:03:42,400
the white piece breaks off

116
00:03:45,670 --> 00:03:44,480
and this syringe part is what goes in

117
00:03:48,789 --> 00:03:45,680
the freezer

118
00:03:51,110 --> 00:03:48,799
space station until

119
00:03:53,190 --> 00:03:51,120
there's a spacex vehicle coming home

120
00:03:54,070 --> 00:03:53,200
realize that when they void into this

121
00:03:55,350 --> 00:03:54,080
bag

122
00:03:57,350 --> 00:03:55,360
typically they collect three of these

123
00:03:58,949 --> 00:03:57,360
syringes out of that bag

124
00:03:59,990 --> 00:03:58,959
because this supports not only our

125
00:04:01,350 --> 00:04:00,000
experiment but a number of other

126
00:04:03,030 --> 00:04:01,360
experiments so

127
00:04:05,750 --> 00:04:03,040
um we do take a little bit more out of

128
00:04:07,670 --> 00:04:05,760
each void okay so let's talk about your

129
00:04:09,910 --> 00:04:07,680
experiments you've finished a nutrition

130
00:04:12,070 --> 00:04:09,920
experiment you've finished a pro k

131
00:04:14,070 --> 00:04:12,080
experiment tell us about that and then

132
00:04:16,310 --> 00:04:14,080
the biochem that's the big one that's

133
00:04:19,189 --> 00:04:16,320
going on indeed um well the nutrition

134
00:04:21,270 --> 00:04:19,199
study that we finished was was literally

135
00:04:23,110 --> 00:04:21,280
uh simple let's collect blood and urine

136
00:04:24,469 --> 00:04:23,120
and see what happens during flight um

137
00:04:25,990 --> 00:04:24,479
that went very well and what happened

138
00:04:27,749 --> 00:04:26,000

when that one ended is there was a

139
00:04:28,469 --> 00:04:27,759
decision

140
00:04:32,390 --> 00:04:28,479
to

141
00:04:34,150 --> 00:04:32,400
and that's what the biochemical profile

142
00:04:36,469 --> 00:04:34,160
study is and we're looking

143
00:04:37,749 --> 00:04:36,479
for that to give us a broad

144
00:04:39,430 --> 00:04:37,759
broad look at

145
00:04:42,150 --> 00:04:39,440
crew biochemistry

146
00:04:44,150 --> 00:04:42,160
that we can then relate to changes in

147
00:04:45,990 --> 00:04:44,160
diet changes and exercise changes in

148
00:04:48,230 --> 00:04:46,000
other countermeasures that we're testing

149
00:04:50,550 --> 00:04:48,240
on space station so we provide

150
00:04:52,390 --> 00:04:50,560
information to the space station program

151
00:04:54,469 --> 00:04:52,400
and a lot of the other scientists that

152
00:04:55,909 --> 00:04:54,479
have studies going on on station so how

153
00:04:56,710 --> 00:04:55,919
does this all relate to us on earth

154
00:04:59,749 --> 00:04:56,720
though

155
00:05:01,749 --> 00:04:59,759
um well you know it it depends on on

156
00:05:03,110 --> 00:05:01,759
each facet but i would tell you that in

157
00:05:05,590 --> 00:05:03,120
my opinion

158
00:05:07,029 --> 00:05:05,600
everything we do in space relates in one

159
00:05:08,150 --> 00:05:07,039
way or the other to what's happening on

160
00:05:09,670 --> 00:05:08,160
earth

161
00:05:11,350 --> 00:05:09,680
you mentioned the pro case study which

162
00:05:15,350 --> 00:05:11,360
is a study we're looking at

163
00:05:17,189 --> 00:05:15,360

to modify the diet to help mitigate bone

164
00:05:18,070 --> 00:05:17,199
loss and what we're specifically trying

165
00:05:19,510 --> 00:05:18,080
to do

166
00:05:22,230 --> 00:05:19,520
is to decrease the amount of animal

167
00:05:23,909 --> 00:05:22,240
protein people consume and increase the

168
00:05:24,950 --> 00:05:23,919
amount of fruits and vegetables people

169
00:05:26,550 --> 00:05:24,960
consume

170
00:05:27,510 --> 00:05:26,560
and we think that by doing those two

171
00:05:29,029 --> 00:05:27,520
things

172
00:05:30,390 --> 00:05:29,039
and that is the ratio of those two

173
00:05:32,550 --> 00:05:30,400
things

174
00:05:34,870 --> 00:05:32,560
that you'll lose less bone

175
00:05:36,550 --> 00:05:34,880
so we we fed the crews different diets

176
00:05:38,950 --> 00:05:36,560
collected blood and urine and are now

177
00:05:40,950 --> 00:05:38,960
looking at how the diet affected that

178
00:05:42,950 --> 00:05:40,960
metabolism now

179
00:05:45,110 --> 00:05:42,960
that relates obviously

180
00:05:46,629 --> 00:05:45,120
to all of us here on earth

181
00:05:49,909 --> 00:05:46,639
and will help us better understand the

182
00:05:51,430 --> 00:05:49,919
relationship of diet with bone

183
00:05:53,590 --> 00:05:51,440
and you know the people that make the

184
00:05:55,990 --> 00:05:53,600
dietary recommendations for

185
00:05:57,749 --> 00:05:56,000
americans

186
00:05:59,749 --> 00:05:57,759
read our scientific papers as they do

187
00:06:01,670 --> 00:05:59,759
many other scientific papers and we

188
00:06:03,189 --> 00:06:01,680

contribute to that body of knowledge

189
00:06:04,150 --> 00:06:03,199
that helps them make decisions that

190
00:06:06,070 --> 00:06:04,160
affect

191
00:06:08,230 --> 00:06:06,080
everybody i know you have a lot of

192
00:06:10,150 --> 00:06:08,240
samples to get to so we're going to let