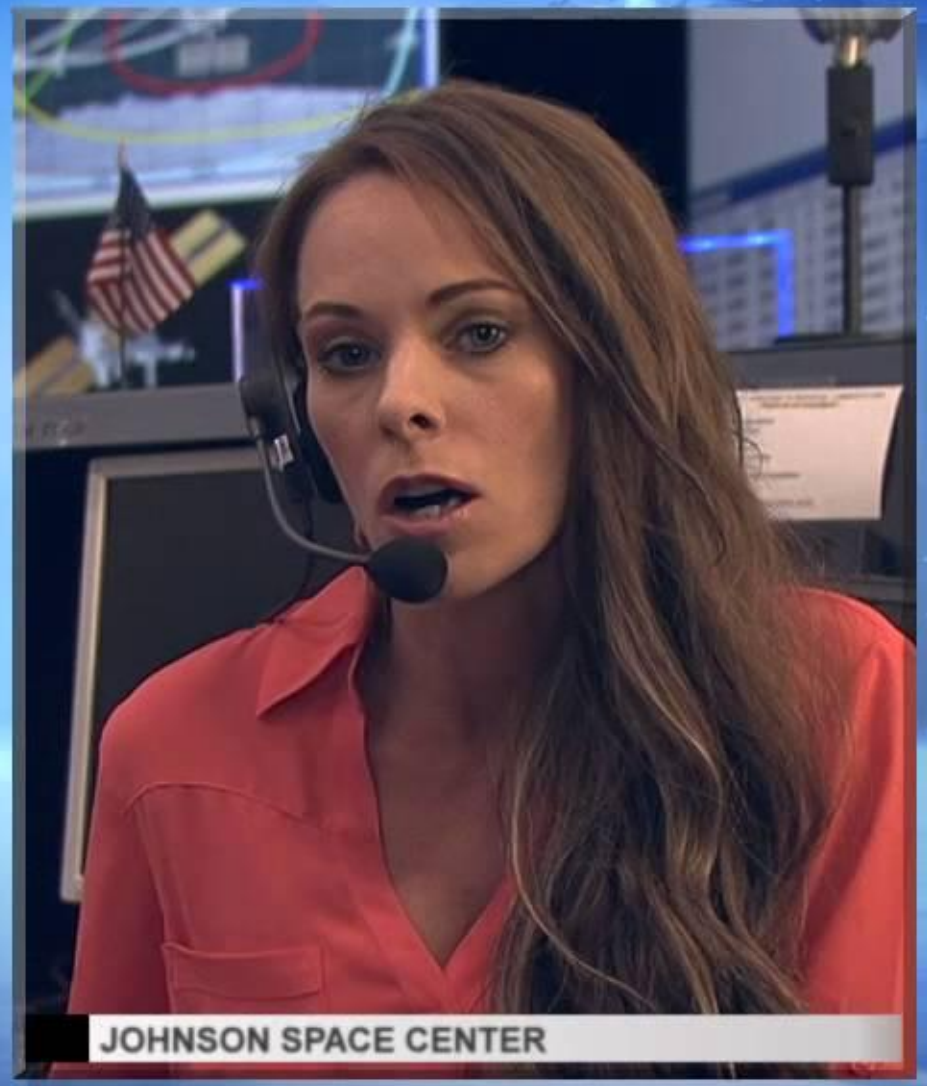
JOHNSON SPACE CENTER


KENNEDY SPACE CENTER

1
00:00:04,710 --> 00:00:03,189
the dragon spacecraft launching soon to

2
00:00:06,869 --> 00:00:04,720
the international space station is

3
00:00:09,190 --> 00:00:06,879
carrying supplies for the crew and a

4
00:00:11,430 --> 00:00:09,200
number of science experiments among them

5
00:00:13,190 --> 00:00:11,440
is a new hardware for new research

6
00:00:16,470 --> 00:00:13,200
that's focusing on crystallization of

7
00:00:19,109 --> 00:00:16,480
the cystic fibrosis protein which could

8
00:00:21,830 --> 00:00:19,119
help researchers develop better drugs to

9
00:00:24,550 --> 00:00:21,840
treat the disease joining us now we have

10
00:00:26,630 --> 00:00:24,560
principal investigator dr stephen aller

11
00:00:28,630 --> 00:00:26,640
of the advancing membrane protein

12
00:00:31,429 --> 00:00:28,640
crystallization by using microgravity

13
00:00:33,830 --> 00:00:31,439

experiment so very briefly can you just

14
00:00:37,110 --> 00:00:33,840
describe for us what causes cystic

15
00:00:39,430 --> 00:00:37,120
fibrosis and also how it is treated

16
00:00:41,990 --> 00:00:39,440
cystic fibrosis is

17
00:00:43,830 --> 00:00:42,000
a point mutation in a protein and 90

18
00:00:45,590 --> 00:00:43,840
percent of the patients in which the

19
00:00:47,350 --> 00:00:45,600
protein is misfolded

20
00:00:49,190 --> 00:00:47,360
and none of it gets to the cell surface

21
00:00:50,869 --> 00:00:49,200
where it's required to function

22
00:00:55,189 --> 00:00:50,879
its normal function is a chloride

23
00:00:57,029 --> 00:00:55,199
channel and allows plenty of water to uh

24
00:00:59,270 --> 00:00:57,039
to flow and

25
00:01:02,630 --> 00:00:59,280
lubricate the lungs and without this

26
00:01:05,429 --> 00:01:02,640
protein called cftr uh people develop

27
00:01:08,230 --> 00:01:05,439
very sticky mucous lungs uh and that

28
00:01:10,070 --> 00:01:08,240
results in infection and so we're trying

29
00:01:11,670 --> 00:01:10,080
to study the three-dimensional structure

30
00:01:13,030 --> 00:01:11,680
of this protein in order to understand

31
00:01:14,230 --> 00:01:13,040
how it works and how to correct the

32
00:01:17,350 --> 00:01:14,240
defects

33
00:01:19,910 --> 00:01:17,360
so why the focus on crystallizing the

34
00:01:22,149 --> 00:01:19,920
proteins for such treatment

35
00:01:24,390 --> 00:01:22,159
so a lot of drug screens that companies

36
00:01:26,789 --> 00:01:24,400
do are basically brute force and looking

37
00:01:29,270 --> 00:01:26,799
for an effect and they don't emphasize

38
00:01:31,190 --> 00:01:29,280

the mechanism by which drugs work and

39
00:01:33,510 --> 00:01:31,200
one of the important ways to learn by

40
00:01:35,350 --> 00:01:33,520
which drugs work is to see the

41
00:01:37,429 --> 00:01:35,360
the three-dimensional shape of the

42
00:01:39,990 --> 00:01:37,439
targets that the drugs bind to

43
00:01:42,389 --> 00:01:40,000
and we don't have any idea about the the

44
00:01:44,710 --> 00:01:42,399
atomic structure of this cystic fibrosis

45
00:01:46,550 --> 00:01:44,720
protein we have one structure of very

46
00:01:48,310 --> 00:01:46,560
close relative of it

47
00:01:50,069 --> 00:01:48,320
but right now we don't have any idea

48
00:01:52,550 --> 00:01:50,079
what the protein looks like particularly

49
00:01:54,710 --> 00:01:52,560
in the region where it is misfolded so

50
00:01:57,590 --> 00:01:54,720
if we could determine the shape of that

51
00:01:59,590 --> 00:01:57,600
to an atomic detail we can learn how to

52
00:02:01,749 --> 00:01:59,600
better correct the defect

53
00:02:04,069 --> 00:02:01,759
much more specifically and potent

54
00:02:06,389 --> 00:02:04,079
potently to get better drugs

55
00:02:07,190 --> 00:02:06,399
so can you explain to me also how is

56
00:02:10,790 --> 00:02:07,200
this

57
00:02:12,869 --> 00:02:10,800
experiment going to be working on orbit

58
00:02:15,030 --> 00:02:12,879
okay so the the general idea that we're

59
00:02:16,470 --> 00:02:15,040
testing is similar to other projects

60
00:02:19,030 --> 00:02:16,480
which are going up

61
00:02:21,270 --> 00:02:19,040
is that in space when you don't have

62
00:02:23,270 --> 00:02:21,280
gravity we don't have any convection

63
00:02:25,589 --> 00:02:23,280

forces these are like forces of wind

64
00:02:27,270 --> 00:02:25,599
which are in in the fluids and they're

65
00:02:28,949 --> 00:02:27,280
actually very strong forces that are

66
00:02:30,790 --> 00:02:28,959
banging around all the molecules that

67
00:02:32,150 --> 00:02:30,800
happens here in the ground and it makes

68
00:02:33,589 --> 00:02:32,160
it really challenging for protein

69
00:02:35,750 --> 00:02:33,599
crystals to form

70
00:02:38,070 --> 00:02:35,760
if you put a crystallization experiment

71
00:02:40,229 --> 00:02:38,080
in space with specialized hardware you

72
00:02:42,070 --> 00:02:40,239
remove this convection force and it

73
00:02:44,150 --> 00:02:42,080
gives the protein crystals much more

74
00:02:47,110 --> 00:02:44,160
time to form really really perfect

75
00:02:49,030 --> 00:02:47,120
lattices and for difficult proteins like

76
00:02:51,589 --> 00:02:49,040
the cystic fibrosis protein and two

77
00:02:53,430 --> 00:02:51,599
other relatives that we're studying

78
00:02:55,270 --> 00:02:53,440
they don't form very well ordered

79
00:02:57,190 --> 00:02:55,280
crystals on the ground and we're

80
00:02:59,270 --> 00:02:57,200
exploring the hypothesis that this

81
00:03:01,430 --> 00:02:59,280
microgravity will allow much much more

82
00:03:03,030 --> 00:03:01,440
perfect crystals to form and give us a

83
00:03:05,430 --> 00:03:03,040
lot more detailed information about the

84
00:03:07,030 --> 00:03:05,440
proteins so growing these crystals in

85
00:03:08,470 --> 00:03:07,040
space is better than on the ground and

86
00:03:10,550 --> 00:03:08,480
so we're going to be able to take

87
00:03:12,550 --> 00:03:10,560
advantage of that microgravity

88
00:03:14,710 --> 00:03:12,560

environment and aboard the international

89
00:03:16,869 --> 00:03:14,720
space station to conduct this experiment

90
00:03:18,790 --> 00:03:16,879
that's very good can you also tell me

91
00:03:19,990 --> 00:03:18,800
how long is it going to take to grow

92
00:03:21,270 --> 00:03:20,000
these crystals and when do they come

93
00:03:23,509 --> 00:03:21,280
home

94
00:03:25,910 --> 00:03:23,519
uh mission is scheduled to come back in

95
00:03:27,990 --> 00:03:25,920
july okay so that's several months and

96
00:03:30,630 --> 00:03:28,000
we need that extra time

97
00:03:32,949 --> 00:03:30,640
because the process is much slower

98
00:03:34,630 --> 00:03:32,959
so up until you know we had the space

99
00:03:36,869 --> 00:03:34,640
shuttle program which was limited to a

100
00:03:37,990 --> 00:03:36,879
very short duration a lot of this wasn't

101
00:03:39,589 --> 00:03:38,000
possible

102
00:03:41,270 --> 00:03:39,599
but because we have the resources on the

103
00:03:44,309 --> 00:03:41,280
space station it's up there for many

104
00:03:46,949 --> 00:03:44,319
many months we now have capabilities to

105
00:03:48,710 --> 00:03:46,959
allow experiments to go for much longer

106
00:03:50,309 --> 00:03:48,720
and hopefully capture crystallization

107
00:03:51,350 --> 00:03:50,319
processes which are which are much

108
00:03:52,949 --> 00:03:51,360
slower

109
00:03:55,270 --> 00:03:52,959
to happen

110
00:03:57,190 --> 00:03:55,280
can you tell me also what will become of

111
00:03:58,550 --> 00:03:57,200
these crystals during this flight once

112
00:04:00,470 --> 00:03:58,560
they are returned

113
00:04:02,070 --> 00:04:00,480

well hopefully when they are when

114
00:04:04,550 --> 00:04:02,080
they're they'll be returned in

115
00:04:07,190 --> 00:04:04,560
specialized hardware and and recovered

116
00:04:09,830 --> 00:04:07,200
uh they splashed down in the ocean and

117
00:04:14,070 --> 00:04:09,840
recovered by a special team uh they're

118
00:04:15,110 --> 00:04:14,080
flown in a uh uh um a jet

119
00:04:17,030 --> 00:04:15,120
that

120
00:04:19,509 --> 00:04:17,040
handles them very carefully

121
00:04:22,150 --> 00:04:19,519
and then my group will one by one

122
00:04:25,350 --> 00:04:22,160
examine the crystals that are in them

123
00:04:27,030 --> 00:04:25,360
and protect them from a process called

124
00:04:28,710 --> 00:04:27,040
cryo protection to protect them from

125
00:04:30,710 --> 00:04:28,720
damage during freezing

126
00:04:33,110 --> 00:04:30,720
and then we will ship them to u.s

127
00:04:34,870 --> 00:04:33,120
synchrotrons for data collection and

128
00:04:37,830 --> 00:04:34,880
synchrotrons are very critical for our

129
00:04:40,310 --> 00:04:37,840
proteins because they offer us very high

130
00:04:42,230 --> 00:04:40,320
intensity x-ray beam

131
00:04:44,950 --> 00:04:42,240
and much better data quality than what

132
00:04:45,909 --> 00:04:44,960
is possible with a lower intensity home

133
00:04:47,590 --> 00:04:45,919
source

134
00:04:49,990 --> 00:04:47,600
so we will collect the data from the

135
00:04:52,390 --> 00:04:50,000
crystals and in some cases compare them

136
00:04:54,550 --> 00:04:52,400
to earth-grown crystals uh in one case

137
00:04:57,189 --> 00:04:54,560
where we have enough protein to do that

138
00:04:59,350 --> 00:04:57,199

and we will know with high confidence

139
00:05:01,670 --> 00:04:59,360
just the effects of microgravity on

140
00:05:03,270 --> 00:05:01,680
these specific proteins

141
00:05:05,909 --> 00:05:03,280
best of luck to you and thanks again for