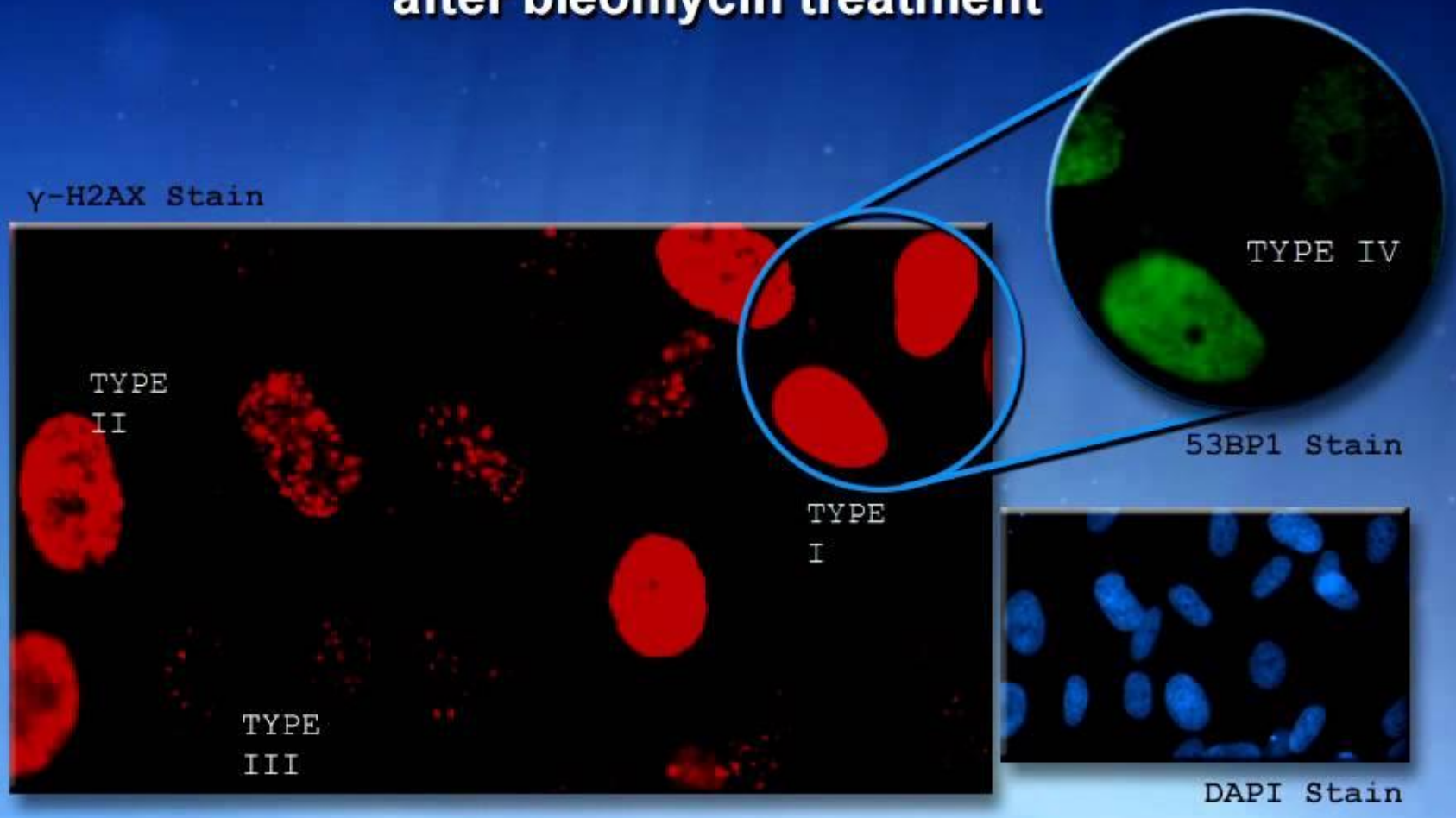
Damage in human fibroblasts will be measured by the phosphorylation of a histone protein H2AX after bleomycin treatment



1
00:00:06,710 --> 00:00:04,550
the launch date for the space x3 mission

2
00:00:08,390 --> 00:00:06,720
has not been reset yet but when it does

3
00:00:10,230 --> 00:00:08,400
launch the next dragon cargo ship will

4
00:00:13,030 --> 00:00:10,240
deliver hardware for a number of new

5
00:00:15,509 --> 00:00:13,040
science experiments one of them known as

6
00:00:17,430 --> 00:00:15,519
micro 7 is looking at the impact of

7
00:00:19,269 --> 00:00:17,440
microgravity on the human body at the

8
00:00:21,429 --> 00:00:19,279
cellular level

9
00:00:24,390 --> 00:00:21,439
i spoke with the principal investigator

10
00:00:25,830 --> 00:00:24,400
dr hong lu wu a life sciences researcher

11
00:00:28,070 --> 00:00:25,840
in the biomedical research and

12
00:00:30,150 --> 00:00:28,080
environmental sciences division here at

13
00:00:33,030 --> 00:00:30,160

johnson space center and i asked him to

14
00:00:35,590 --> 00:00:33,040
explain what micro 7 is

15
00:00:38,709 --> 00:00:35,600
when astronauts fly in space they are

16
00:00:41,670 --> 00:00:38,719
exposed to microgravity as well as a

17
00:00:44,389 --> 00:00:41,680
space radiation so one of the important

18
00:00:47,910 --> 00:00:44,399
question is that how

19
00:00:50,150 --> 00:00:47,920
cells respond to dna damages induced

20
00:00:52,869 --> 00:00:50,160
from radiation exposure so this

21
00:00:53,830 --> 00:00:52,879
particular experiment will fly human

22
00:00:54,709 --> 00:00:53,840
cells

23
00:00:58,229 --> 00:00:54,719
to

24
00:01:00,630 --> 00:00:58,239
space and damage the dna in the cells

25
00:01:03,510 --> 00:01:00,640
with the chemical called bleomycin and

26
00:01:05,590 --> 00:01:03,520
we will study the cellular response to

27
00:01:07,109 --> 00:01:05,600
such a damage so it sounds like there's

28
00:01:08,630 --> 00:01:07,119
kind of several different aspects of

29
00:01:10,550 --> 00:01:08,640
this you fly first of all the dna to

30
00:01:12,550 --> 00:01:10,560
space then you damage it and then i

31
00:01:15,590 --> 00:01:12,560
guess bring it back and study it yes and

32
00:01:18,230 --> 00:01:15,600
we'll fly our live cells to space rather

33
00:01:22,390 --> 00:01:18,240
than make the dna yes then we will

34
00:01:23,429 --> 00:01:22,400
damage the dna in space and then fix the

35
00:01:25,910 --> 00:01:23,439
cells

36
00:01:28,230 --> 00:01:25,920
in space and bring the samples back to

37
00:01:30,870 --> 00:01:28,240
the earth and perform all the analysis

38
00:01:33,270 --> 00:01:30,880

on the ground now how how unique is this

39
00:01:35,990 --> 00:01:33,280
have we had dna in space before have we

40
00:01:38,630 --> 00:01:36,000
damaged it in space yes uh dna has been

41
00:01:41,030 --> 00:01:38,640
damaged in space and there has been a

42
00:01:42,630 --> 00:01:41,040
number of experiments before but there

43
00:01:45,830 --> 00:01:42,640
are a couple of uh

44
00:01:47,270 --> 00:01:45,840
novelties in our experiment one is that

45
00:01:50,710 --> 00:01:47,280
previously

46
00:01:54,389 --> 00:01:50,720
the cells were damaged

47
00:01:55,749 --> 00:01:54,399
by a radiation sometimes immediately

48
00:01:58,789 --> 00:01:55,759
after they

49
00:02:00,870 --> 00:01:58,799
reach orbit and but in this case we will

50
00:02:03,350 --> 00:02:00,880
let the cells

51
00:02:06,709 --> 00:02:03,360
adapt to the space environment before

52
00:02:08,949 --> 00:02:06,719
damaging the dna and two is that we will

53
00:02:13,270 --> 00:02:08,959
look at the molecular changes

54
00:02:16,470 --> 00:02:13,280
dna rna and protein changes after uh dna

55
00:02:19,670 --> 00:02:16,480
damages and this is uh has not been done

56
00:02:21,589 --> 00:02:19,680
in space by other investigators okay and

57
00:02:22,550 --> 00:02:21,599
i guess this is all to kind of simulate

58
00:02:25,910 --> 00:02:22,560
what we

59
00:02:28,229 --> 00:02:25,920
think happens in space to astronaut dna

60
00:02:31,030 --> 00:02:28,239
now this is uh uh

61
00:02:33,589 --> 00:02:31,040
only the first step of a serious

62
00:02:36,550 --> 00:02:33,599
experiment i hope to address these

63
00:02:37,830 --> 00:02:36,560

important questions as to how

64
00:02:40,949 --> 00:02:37,840
cells

65
00:02:43,350 --> 00:02:40,959
or human body respond to damages to

66
00:02:46,630 --> 00:02:43,360
space radiation exposure and

67
00:02:49,350 --> 00:02:46,640
unfortunately currently we don't have a

68
00:02:50,390 --> 00:02:49,360
controlled radiation source

69
00:02:53,430 --> 00:02:50,400
in space

70
00:02:54,550 --> 00:02:53,440
so the first step is to produce such a

71
00:02:56,390 --> 00:02:54,560
damage

72
00:02:58,470 --> 00:02:56,400
with a chemical

73
00:03:00,470 --> 00:02:58,480
okay interesting well what what kind of

74
00:03:02,949 --> 00:03:00,480
things can you learn from this

75
00:03:05,030 --> 00:03:02,959
we'll learn uh many different things

76
00:03:07,910 --> 00:03:05,040
basically uh

77
00:03:10,390 --> 00:03:07,920
the most importantly we'll know whether

78
00:03:12,229 --> 00:03:10,400
the cells uh in the microgravity

79
00:03:15,750 --> 00:03:12,239
environment are

80
00:03:19,990 --> 00:03:15,760
more sensitive to radiation damage or

81
00:03:22,869 --> 00:03:20,000
more resistant to radiation damages or

82
00:03:24,550 --> 00:03:22,879
using more technical terms is how dna

83
00:03:27,190 --> 00:03:24,560
repair

84
00:03:28,789 --> 00:03:27,200
will be affected by the microgravity

85
00:03:31,589 --> 00:03:28,799
environment

86
00:03:32,869 --> 00:03:31,599
and is that something that that we would

87
00:03:34,869 --> 00:03:32,879
we would see the repair in this

88
00:03:37,190 --> 00:03:34,879

experiment or is that

89
00:03:39,910 --> 00:03:37,200
do you hypothesize that yes and we will

90
00:03:43,589 --> 00:03:39,920
uh look at the dna repair

91
00:03:46,869 --> 00:03:43,599
by analyzing the uh gene expressions

92
00:03:48,229 --> 00:03:46,879
particularly those genes responsible for

93
00:03:50,229 --> 00:03:48,239
dna repair

94
00:03:52,309 --> 00:03:50,239
okay well what part do the astronauts

95
00:03:54,470 --> 00:03:52,319
play in this experiment do they

96
00:03:57,110 --> 00:03:54,480
have any interaction with it yes and

97
00:03:59,670 --> 00:03:57,120
this is a rather

98
00:04:02,390 --> 00:03:59,680
complex experiment as a matter of fact

99
00:04:03,670 --> 00:04:02,400
so once the cells reach orbit

100
00:04:06,390 --> 00:04:03,680
and

101
00:04:09,429 --> 00:04:06,400
after several days on the space station

102
00:04:12,949 --> 00:04:09,439
the astronauts will treat the cells with

103
00:04:14,789 --> 00:04:12,959
biomycin and then fix the cells as

104
00:04:17,749 --> 00:04:14,799
different time points

105
00:04:22,150 --> 00:04:17,759
and for the analysis

106
00:04:25,350 --> 00:04:22,160
of dna rna and proteins as well as

107
00:04:26,150 --> 00:04:25,360
the analysis for dna damage markers

108
00:04:27,189 --> 00:04:26,160
okay

109
00:04:29,909 --> 00:04:27,199
well so

110
00:04:32,310 --> 00:04:29,919
is this something that is um

111
00:04:34,710 --> 00:04:32,320
just applicable to space travel or is it

112
00:04:37,749 --> 00:04:34,720
helpful for people here on earth as well

113
00:04:39,270 --> 00:04:37,759

yes and as a matter of fact if we can

114
00:04:42,150 --> 00:04:39,280
understand how

115
00:04:43,350 --> 00:04:42,160
uh space environment microgravity in

116
00:04:44,790 --> 00:04:43,360
particular

117
00:04:47,990 --> 00:04:44,800
influenced the

118
00:04:49,430 --> 00:04:48,000
cellular response to dna damage and that

119
00:04:51,670 --> 00:04:49,440
would have

120
00:04:53,590 --> 00:04:51,680
an impact on earth

121
00:04:56,550 --> 00:04:53,600
and particularly

122
00:04:59,110 --> 00:04:56,560
in the field of radiation therapy

123
00:05:02,710 --> 00:04:59,120
because some of the tumor cells are

124
00:05:03,510 --> 00:05:02,720
resistant to radiation damage and if we

125
00:05:06,710 --> 00:05:03,520
will

126
00:05:09,909 --> 00:05:06,720
be able to identify some new pathways

127
00:05:12,310 --> 00:05:09,919
that will sensitize the cells to

128
00:05:13,749 --> 00:05:12,320
radiation and that will be very helpful

129
00:05:15,029 --> 00:05:13,759
sounds like it well thank you so much

130
00:05:16,710 --> 00:05:15,039
for coming and talking with us we really

131
00:05:18,550 --> 00:05:16,720
appreciate it thank you very much my

132
00:05:20,310 --> 00:05:18,560
pleasure all right again this was dr

133
00:05:22,070 --> 00:05:20,320
hong lu wu who is the principal

134
00:05:24,390 --> 00:05:22,080
investigator for micro seven it's going

135
00:05:26,070 --> 00:05:24,400
to be launching on spacex 3 so we'll

136
00:05:28,070 --> 00:05:26,080
hope to hear more about that in the