



1  
00:00:00,006 --> 00:00:01,046  
[ Sound Effects ]

2  
00:00:01,046 --> 00:00:02,006  
Hello, I am Claudia Cortez

3  
00:00:02,006 --> 00:00:04,726  
from Brownsville Independent  
School District in Brownsville,

4  
00:00:04,726 --> 00:00:06,966  
Texas and this is NASA NOW.

5  
00:00:07,516 --> 00:00:29,896  
[ Sound Effects ]

6  
00:00:30,396 --> 00:00:33,646  
Hey, I'm Kristin,  
and this is NASA Now.

7  
00:00:34,326 --> 00:00:37,326  
As human beings push further  
and further into space,

8  
00:00:37,326 --> 00:00:39,996  
it is critical to  
understand the challenges

9  
00:00:40,206 --> 00:00:42,036  
and changes the human  
body experiences

10  
00:00:42,086 --> 00:00:43,936  
in a microgravity environment.

11  
00:00:43,936 --> 00:00:47,196  
Our expert today will  
examine the physiology

12

00:00:47,196 --> 00:00:50,246

of astronauts onboard the  
International Space Station

13

00:00:50,246 --> 00:00:52,496

and share what scientists  
have learned.

14

00:00:53,086 --> 00:00:56,976

That's ahead, first here's  
what's happening at NASA Now.

15

00:00:57,516 --> 00:01:00,616

[ Sound Effects ]

16

00:01:01,116 --> 00:01:04,166

Taking another step towards  
deep space exploration.

17

00:01:04,716 --> 00:01:07,956

In the Spring of 2015,  
NASA Astronaut, Scott Kelly

18

00:01:08,086 --> 00:01:10,256

and Russian Cosmonaut, Mikhail  
Kornienko (Mik-ale Kor-ne-yenko)

19

00:01:10,406 --> 00:01:12,126

will embark on a  
remarkable journey.

20

00:01:12,406 --> 00:01:13,816

The two astronauts are scheduled

21

00:01:13,816 --> 00:01:16,116

to launch aboard the  
Russian Soyuz spacecraft

22

00:01:16,116 --> 00:01:17,766

to the International  
Space Station.

23

00:01:18,056 --> 00:01:20,276

Here they will carry  
out a 12-month mission

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00:01:20,276 --> 00:01:23,506

in Space the longest ever on  
the International Space Station.

25

00:01:24,086 --> 00:01:27,026

Data from this special mission  
will be used to develop ways

26

00:01:27,026 --> 00:01:29,556

to help reduce some of  
the risks associated

27

00:01:29,556 --> 00:01:31,966

with long duration space  
missions, including:

28

00:01:31,966 --> 00:01:35,366

bone and muscle loss, decreased  
cardiovascular function,

29

00:01:35,596 --> 00:01:37,976

vision changes, and decreased  
sensory motor performance.

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00:01:38,796 --> 00:01:42,286

This information will help NASA  
prepare and plan future missions

31

00:01:42,286 --> 00:01:44,976

to the Moon, to an asteroid,  
and eventually to Mars.

32

00:01:45,516 --> 00:01:47,976

[ Sound Effects ]

33

00:01:48,476 --> 00:01:52,046

The International Space Station  
Medical Project is responsible

34

00:01:52,046 --> 00:01:54,056

for implementing  
science experiments

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00:01:54,136 --> 00:01:57,376

for NASA's Human Research  
Program in low Earth orbit.

36

00:01:58,106 --> 00:02:01,736

As the lead of a team that  
consists of engineers, planners,

37

00:02:01,736 --> 00:02:04,256

procedure writers and  
science support personnel,

38

00:02:04,616 --> 00:02:07,266

Dr. Liz Warren has  
a big responsibility

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00:02:07,366 --> 00:02:09,496

to ensure successful  
science in orbit.

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00:02:09,496 --> 00:02:12,406

An extremely important  
area of study

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00:02:12,406 --> 00:02:15,966

for the project is the effect  
of microgravity and ways

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00:02:15,966 --> 00:02:18,306

in which humans may

benefit here on Earth

43

00:02:18,306 --> 00:02:19,696  
from what we learn in space.

44

00:02:20,031 --> 00:02:22,031  
[ Music ]

45

00:02:22,046 --> 00:02:25,016  
Physiology is the  
study of living things.

46

00:02:25,286 --> 00:02:28,506  
Now, it's a little bit  
different than biology

47

00:02:28,506 --> 00:02:30,996  
because physiology goes a  
little bit more in depth

48

00:02:30,996 --> 00:02:34,226  
to the structure and  
function of living things

49

00:02:34,226 --> 00:02:36,496  
and how systems work together.

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00:02:36,626 --> 00:02:39,326  
For example how the heart  
works with the lungs

51

00:02:39,436 --> 00:02:41,856  
and how the muscles  
work with the bones.

52

00:02:42,516 --> 00:02:44,946  
[ Music ]

53

00:02:45,446 --> 00:02:47,926

I work for the Human  
Research Program.

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00:02:48,206 --> 00:02:51,266

The Human Research  
Program conducts research

55

00:02:51,576 --> 00:02:55,986

and develops technologies that  
allow humans to travel safely

56

00:02:55,986 --> 00:02:58,776

and productively in  
the space environment.

57

00:02:59,166 --> 00:03:03,616

When human beings live in space,  
their bodies change a lot.

58

00:03:03,686 --> 00:03:07,416

And the longer they live in  
space, the more changes occur.

59

00:03:08,516 --> 00:03:10,546

[ Music ]

60

00:03:11,046 --> 00:03:14,916

Bones can lose up to 2  
percent of their density

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00:03:14,916 --> 00:03:18,066

and thus their strength every  
month that they're in space.

62

00:03:18,636 --> 00:03:20,916

There's a misconception  
that bone is just kind

63

00:03:20,916 --> 00:03:24,086

of like dead tissue and

it's just hard like wood.

64

00:03:24,086 --> 00:03:25,936

But that's not entirely  
the case.

65

00:03:26,046 --> 00:03:26,976

Bone is a living thing.

66

00:03:28,326 --> 00:03:31,266

There are cells in our  
bones that are responsible

67

00:03:31,446 --> 00:03:35,196

for producing blood cells,  
red cells and white cells.

68

00:03:35,516 --> 00:03:38,966

The bone provides protection  
from our inner organs.

69

00:03:39,136 --> 00:03:41,946

Like our brain, you've got a  
skull to protect your brain.

70

00:03:41,946 --> 00:03:44,246

You've got a rib cage to  
protect your inner organs.

71

00:03:44,996 --> 00:03:48,146

It provides structure so  
we can stand and move.

72

00:03:48,546 --> 00:03:52,826

Our bones also provide  
a storage for calcium,

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00:03:52,986 --> 00:03:54,546

magnesium, and phosphorus.

74

00:03:55,136 --> 00:03:58,766

These minerals and blood and  
cells are constantly flowing

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00:03:58,876 --> 00:04:00,946

in and out of the bone.

76

00:04:01,046 --> 00:04:03,836

Osteoporosis is a  
disease state of bone

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00:04:04,066 --> 00:04:07,366

in which the bone gets  
weaker and thus more prone

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00:04:07,366 --> 00:04:09,056

to fracture and breaking.

79

00:04:09,766 --> 00:04:12,796

When osteoporosis occurs  
and the bones get weaker,

80

00:04:13,186 --> 00:04:15,066

all of those things  
are less effective.

81

00:04:16,076 --> 00:04:19,586

Now if we can figure out how to  
prevent osteoporosis in space,

82

00:04:20,396 --> 00:04:22,736

we can apply that  
knowledge here on the ground.

83

00:04:23,516 --> 00:04:26,546

[ Music ]

84

00:04:27,046 --> 00:04:31,766

Another effect of living

in space is a fluid shift.

85

00:04:32,756 --> 00:04:36,206

Our bodies on Earth have evolved and developed systems

86

00:04:36,846 --> 00:04:39,296

to keep blood flowing up to our brain.

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00:04:39,296 --> 00:04:41,546

It's very important to keep blood up to our brain

88

00:04:41,846 --> 00:04:43,406

and that's actually quite challenging

89

00:04:43,506 --> 00:04:46,136

for our cardiovascular system because it constantly has

90

00:04:46,186 --> 00:04:47,976

to fight against gravity.

91

00:04:48,246 --> 00:04:50,756

Think about the distance that a single drop of blood has

92

00:04:50,796 --> 00:04:53,286

to travel to go from your toe all the way to your head.

93

00:04:53,846 --> 00:04:54,266

It's a lot.

94

00:04:54,436 --> 00:04:57,256

And it is actually a lot of work to move fluid around your body.

95

00:04:57,676 --> 00:05:02,466

When you live in space, without gravity, it's much easier

96

00:05:02,576 --> 00:05:03,966

to move fluid around your body.

97

00:05:04,706 --> 00:05:07,526

But your body is going to continuously try to push fluid

98

00:05:07,626 --> 00:05:08,926

up to your upper body.

99

00:05:09,636 --> 00:05:11,736

The result of living in space

100

00:05:11,946 --> 00:05:13,956

and this fluid shift together means

101

00:05:13,956 --> 00:05:15,926

that your upper body gets too much fluid.

102

00:05:15,926 --> 00:05:18,316

And you can see it in the astronauts' faces.

103

00:05:18,576 --> 00:05:19,906

They look a little puffy.

104

00:05:20,516 --> 00:05:23,466

[ Music ]

105

00:05:23,966 --> 00:05:28,946

NASA has been launching human beings to space for 50 years,

106

00:05:29,246 --> 00:05:31,526

and we've learned a  
lot about what happens

107

00:05:31,716 --> 00:05:33,146

to human bodies in space.

108

00:05:33,896 --> 00:05:39,496

If astronauts exercise up to two  
hours a day and they eat right

109

00:05:39,666 --> 00:05:42,106

so their nutrition is  
very carefully monitored,

110

00:05:42,516 --> 00:05:45,566

we can prevent a lot of  
those changes from happening.

111

00:05:46,056 --> 00:05:49,196

Now, we can't prevent them  
entirely, but we can help

112

00:05:49,296 --> 00:05:51,786

to prevent them and  
continue to learn

113

00:05:51,786 --> 00:05:53,906

about why they're happening.

114

00:05:54,516 --> 00:05:57,546

[ Sound Effects ]

115

00:05:58,046 --> 00:06:00,086

Did you know that a  
technology initially developed

116

00:06:00,086 --> 00:06:03,016

from space technology is helping

us communicate right here

117

00:06:03,016 --> 00:06:03,416  
on Earth?

118

00:06:04,126 --> 00:06:06,706  
This portable and inflatable  
ground-based satellite

119

00:06:06,706 --> 00:06:09,686  
communications antenna, was  
used following Hurricane Katrina

120

00:06:09,686 --> 00:06:12,636  
in 2005 and the Haiti  
earthquake in 2010.

121

00:06:13,286 --> 00:06:16,766  
During both events GATR  
or Ground to Air Transmit

122

00:06:16,766 --> 00:06:19,856  
and Receive, connected the  
survivors and first responders

123

00:06:19,926 --> 00:06:22,236  
with the outside world when  
phone lines were knocked out

124

00:06:22,446 --> 00:06:24,436  
and cell phone service  
was unavailable.

125

00:06:25,176 --> 00:06:27,816  
This technology is now  
being used worldwide

126

00:06:27,936 --> 00:06:30,636  
to provide communications  
tools to disaster relief

127

00:06:30,636 --> 00:06:33,036  
and military personnel,  
and to assist

128

00:06:33,036 --> 00:06:34,616  
in the search for  
missing persons.

129

00:06:35,386 --> 00:06:35,976  
Now you know.

130

00:06:36,516 --> 00:06:38,936  
[ Sound Effects ]

131

00:06:39,436 --> 00:06:41,716  
Our expert, Dr. Warren  
talked about some

132

00:06:41,716 --> 00:06:44,866  
of the physical changes  
astronauts experience in space.

133

00:06:45,526 --> 00:06:47,296  
Here's a way you  
can put yourself

134

00:06:47,396 --> 00:06:49,266  
to the test right here on Earth.

135

00:06:50,346 --> 00:06:52,976  
Teachers, your students  
can experience changes

136

00:06:53,016 --> 00:06:54,916  
to the human body just  
like the astronauts.

137

00:06:55,426 --> 00:06:57,786

Look for Human Body:  
Space Adaptations.

138

00:06:58,256 --> 00:07:00,496

You'll find it by checking  
out the extension activity

139

00:07:00,576 --> 00:07:03,656

for this program on the NASA  
Explorer Schools Virtual Campus.

140

00:07:04,356 --> 00:07:06,116

Well that's it for NASA NOW.

141

00:07:06,446 --> 00:07:09,046

Be sure to visit our Facebook  
page and leave a comment.

142

00:07:09,496 --> 00:07:11,896

We'll see you next  
time on NASA NOW!

143

00:07:12,516 --> 00:07:18,706

[ Sound Effects ]