
NASA
SPACESTATION
LIVE

1
00:00:08,390 --> 00:00:06,470
so the international space station of

2
00:00:10,150 --> 00:00:08,400
course is a multi-disciplinary

3
00:00:11,749 --> 00:00:10,160
laboratory a number of different

4
00:00:13,749 --> 00:00:11,759
scientific experiments going on at any

5
00:00:15,910 --> 00:00:13,759
one time and in the field of cell

6
00:00:17,430 --> 00:00:15,920
biology researchers are looking for

7
00:00:19,029 --> 00:00:17,440
something called gene expression

8
00:00:20,950 --> 00:00:19,039
information it's going to unlock a lot

9
00:00:22,790 --> 00:00:20,960
of opportunities for them and there's a

10
00:00:24,390 --> 00:00:22,800
new piece of hardware being tested right

11
00:00:26,710 --> 00:00:24,400
now on board the station that's going to

12
00:00:28,790 --> 00:00:26,720
give it to them today i'm joined by dr

13
00:00:29,990 --> 00:00:28,800

macarani para from the ames research

14
00:00:32,470 --> 00:00:30,000
center she's one of the project

15
00:00:34,229 --> 00:00:32,480
scientists for wet lab 2 and first off

16
00:00:36,389 --> 00:00:34,239
thank you so much for joining me and if

17
00:00:39,110 --> 00:00:36,399
you could start us off what exactly is

18
00:00:40,950 --> 00:00:39,120
gene expression and you know why is this

19
00:00:43,990 --> 00:00:40,960
how or how do we typically collect this

20
00:00:46,549 --> 00:00:44,000
on board the international space station

21
00:00:48,150 --> 00:00:46,559
so i think everybody knows that like

22
00:00:49,750 --> 00:00:48,160
your genetic information tells you the

23
00:00:52,630 --> 00:00:49,760
color of your eyes and the color of your

24
00:00:54,790 --> 00:00:52,640
hair but what also is encoded in your

25
00:00:57,910 --> 00:00:54,800
genetic information is for example how

26
00:00:59,590 --> 00:00:57,920
you react to your environment and one

27
00:01:04,070 --> 00:00:59,600
good way to a couple of examples i'm

28
00:01:05,910 --> 00:01:04,080
going to use is if we're sick we have uh

29
00:01:07,270 --> 00:01:05,920
systems that help us fight the disease

30
00:01:08,550 --> 00:01:07,280
or if we're stressed we have systems

31
00:01:12,230 --> 00:01:08,560
that help us fight

32
00:01:14,870 --> 00:01:12,240
those distress so uh what what genetic

33
00:01:16,550 --> 00:01:14,880
what gene expression is is

34
00:01:18,550 --> 00:01:16,560
if you're healthy you obviously don't

35
00:01:20,630 --> 00:01:18,560
want to be fighting a disease you don't

36
00:01:22,710 --> 00:01:20,640
have and so you need to know when to

37
00:01:24,390 --> 00:01:22,720
turn on that machinery and when not to

38
00:01:26,070 --> 00:01:24,400

turn on that machinery and that's what

39
00:01:28,469 --> 00:01:26,080
gene expression is and so scientists

40
00:01:30,230 --> 00:01:28,479
learn a lot about it about how any

41
00:01:31,990 --> 00:01:30,240
organism is reacting to its environment

42
00:01:33,510 --> 00:01:32,000
by understanding which genes are being

43
00:01:34,870 --> 00:01:33,520
expressed which machineries are turned

44
00:01:37,910 --> 00:01:34,880
on and which genes are not being

45
00:01:40,149 --> 00:01:37,920
expressed and one of the ways scientists

46
00:01:43,270 --> 00:01:40,159
do this is by a technique called

47
00:01:45,350 --> 00:01:43,280
quantitative pcr and what it does is it

48
00:01:48,230 --> 00:01:45,360
actually allows the scientists to

49
00:01:49,830 --> 00:01:48,240
understand how much a specific

50
00:01:52,069 --> 00:01:49,840
piece of the machinery the proteins how

51
00:01:53,749 --> 00:01:52,079
much of it is being made how how much

52
00:01:56,389 --> 00:01:53,759
they're turned on and how much to turn

53
00:01:58,069 --> 00:01:56,399
off so that's what we refer to when we

54
00:02:00,149 --> 00:01:58,079
refer to gene expression

55
00:02:01,830 --> 00:02:00,159
and up until now a lot of this has had

56
00:02:04,789 --> 00:02:01,840
to be collected by samples that are

57
00:02:06,709 --> 00:02:04,799
returned back down to earth first so why

58
00:02:08,790 --> 00:02:06,719
is that not ideal why are we looking to

59
00:02:11,110 --> 00:02:08,800
get this information right there on

60
00:02:13,350 --> 00:02:11,120
board the station

61
00:02:15,670 --> 00:02:13,360
so uh there's a number of reasons why

62
00:02:16,949 --> 00:02:15,680
that's not ideal and probably the most

63
00:02:19,270 --> 00:02:16,959

the one that affects absolutely

64
00:02:20,869 --> 00:02:19,280
everybody is time which means that you

65
00:02:23,350 --> 00:02:20,879
need to wait

66
00:02:25,589 --> 00:02:23,360
sometimes weeks sometimes months to get

67
00:02:27,350 --> 00:02:25,599
your your samples down and be able to

68
00:02:28,309 --> 00:02:27,360
get the information and then if you wish

69
00:02:29,830 --> 00:02:28,319
you had done something a little

70
00:02:31,270 --> 00:02:29,840
differently you need to you need to

71
00:02:33,750 --> 00:02:31,280
essentially wait until you can get to

72
00:02:35,270 --> 00:02:33,760
fly the experiment again um so that's

73
00:02:37,110 --> 00:02:35,280
that's one that affects everybody but

74
00:02:38,710 --> 00:02:37,120
then there's also

75
00:02:40,229 --> 00:02:38,720
in order to understand gene expression

76
00:02:42,390 --> 00:02:40,239
you deal with something called

77
00:02:44,070 --> 00:02:42,400
ribonucleic acid or rna and it's very

78
00:02:45,430 --> 00:02:44,080
unstable and so

79
00:02:47,190 --> 00:02:45,440
no matter how much you try to preserve

80
00:02:48,309 --> 00:02:47,200
it there's always a possibility that it

81
00:02:51,589 --> 00:02:48,319
could be

82
00:02:54,070 --> 00:02:51,599
essentially breaking down over time and

83
00:02:55,670 --> 00:02:54,080
without without knowing how well you've

84
00:02:58,309 --> 00:02:55,680
done a job preserving without having a

85
00:03:00,390 --> 00:02:58,319
control of how it looks like on orbit

86
00:03:01,830 --> 00:03:00,400
it's hard to tell whether or not uh

87
00:03:03,270 --> 00:03:01,840
you've done a good job of preserving it

88
00:03:04,550 --> 00:03:03,280

and how much you can trust your results

89
00:03:06,790 --> 00:03:04,560
on the ground

90
00:03:07,910 --> 00:03:06,800
so those are two pretty large reasons as

91
00:03:10,630 --> 00:03:07,920
to why

92
00:03:12,790 --> 00:03:10,640
doing the analysis on orbit is preferred

93
00:03:15,270 --> 00:03:12,800
and so i imagine that's where the wetlab

94
00:03:17,350 --> 00:03:15,280
rna smart cycle is going to come in how

95
00:03:18,949 --> 00:03:17,360
is it going to do its job on board the

96
00:03:20,949 --> 00:03:18,959
station how are the crew members going

97
00:03:22,869 --> 00:03:20,959
to be interacting with it there on board

98
00:03:26,390 --> 00:03:22,879
the station

99
00:03:30,070 --> 00:03:26,400
so the idea of the wetland 2 system is

100
00:03:31,990 --> 00:03:30,080
to allow a crew member to sample from

101
00:03:34,949 --> 00:03:32,000
whatever the researcher is studying

102
00:03:37,110 --> 00:03:34,959
let's just say it's a bacteria and then

103
00:03:38,789 --> 00:03:37,120
to be able to take that sample and put

104
00:03:40,789 --> 00:03:38,799
it into our system and our system

105
00:03:43,110 --> 00:03:40,799
actually extracts the ribonucleic acid

106
00:03:45,509 --> 00:03:43,120
that i spoke about earlier and allows

107
00:03:47,990 --> 00:03:45,519
you to allows the crew member really to

108
00:03:50,630 --> 00:03:48,000
add that that purified ribonucleic acid

109
00:03:53,270 --> 00:03:50,640
to tubes which then do the analysis the

110
00:03:55,910 --> 00:03:53,280
qpcr analysis that i explained earlier

111
00:03:58,229 --> 00:03:55,920
so that the results are now essentially

112
00:04:00,309 --> 00:03:58,239
just an excel file that can be given to

113
00:04:01,910 --> 00:04:00,319

the to the researcher when when the

114
00:04:03,750 --> 00:04:01,920
analysis is complete

115
00:04:05,670 --> 00:04:03,760
so i mean we're essentially transferring

116
00:04:07,670 --> 00:04:05,680
a lot of this analysis work from the

117
00:04:09,270 --> 00:04:07,680
ground and then just doing it right

118
00:04:10,470 --> 00:04:09,280
there on site onboard the international

119
00:04:11,910 --> 00:04:10,480
space station

120
00:04:14,789 --> 00:04:11,920
that's pretty cool

121
00:04:16,789 --> 00:04:14,799
yeah that's the idea yeah and so clearly

122
00:04:18,550 --> 00:04:16,799
a very exciting new piece of technology

123
00:04:21,110 --> 00:04:18,560
what is this going to unlock in the

124
00:04:22,230 --> 00:04:21,120
future for cell biologists looking to do

125
00:04:24,950 --> 00:04:22,240
their research on board the

126
00:04:27,030 --> 00:04:24,960
international space station

127
00:04:29,110 --> 00:04:27,040
so so again there's a number of benefits

128
00:04:32,070 --> 00:04:29,120
that that can come of this and one of

129
00:04:34,950 --> 00:04:32,080
them is the the first uh first problem i

130
00:04:36,469 --> 00:04:34,960
told you about which is time and

131
00:04:38,629 --> 00:04:36,479
now researchers will get their

132
00:04:40,629 --> 00:04:38,639
information a lot earlier than they

133
00:04:42,230 --> 00:04:40,639
could have possibly done so before but

134
00:04:44,070 --> 00:04:42,240
also it allows us to start actually

135
00:04:46,390 --> 00:04:44,080
using the international space station as

136
00:04:48,550 --> 00:04:46,400
a lab rather than as what we like to

137
00:04:50,469 --> 00:04:48,560
call an exposure facility where you used

138
00:04:52,150 --> 00:04:50,479

to have to package your organism up it

139
00:04:53,990 --> 00:04:52,160
goes it gets exposed to microgravity

140
00:04:55,830 --> 00:04:54,000
down it comes and now you find out how

141
00:04:57,749 --> 00:04:55,840
it did and instead of doing that we're

142
00:05:00,150 --> 00:04:57,759
now not only exposing it but we're also

143
00:05:02,870 --> 00:05:00,160
getting the information and if a

144
00:05:05,029 --> 00:05:02,880
researcher was to plan to do say two or

145
00:05:06,469 --> 00:05:05,039
three subsequent runs of an experiment

146
00:05:08,070 --> 00:05:06,479
they would have the information from the

147
00:05:09,670 --> 00:05:08,080
first run and then they could change

148
00:05:12,230 --> 00:05:09,680
parameters for their second and third

149
00:05:14,550 --> 00:05:12,240
run so that they can actually

150
00:05:16,629 --> 00:05:14,560
do the equivalent of what now has to be

151
00:05:19,350 --> 00:05:16,639
three to separate flights but all in one

152
00:05:21,270 --> 00:05:19,360
flight which is financially better time

153
00:05:23,670 --> 00:05:21,280
wise better and really

154
00:05:25,830 --> 00:05:23,680
an advanced for research in general

155
00:05:27,430 --> 00:05:25,840
all right well again dr macarena power

156
00:05:29,749 --> 00:05:27,440
from the amus research center talking to

157
00:05:31,270 --> 00:05:29,759
us about the wet lab rna smart cycler

158
00:05:33,189 --> 00:05:31,280
coming to a space station near you

159
00:05:34,950 --> 00:05:33,199
looking to get that gene expression

160
00:05:36,390 --> 00:05:34,960
information to scientists we're really

161
00:05:38,150 --> 00:05:36,400
excited to see what this is going to

162
00:05:39,430 --> 00:05:38,160
unlock in the future thank you so much

163
00:05:41,189 --> 00:05:39,440

for joining me today we really