1
00:00:07,810 --> 00:00:05,950
one of the newer labs that arrived at

2
00:00:09,129 --> 00:00:07,820
the International Space Station was

3
00:00:11,440 --> 00:00:09,139
filled with fruit flies

4
00:00:12,610 --> 00:00:11,450
obviously might be asking why are we

5
00:00:15,129 --> 00:00:12,620
studying them when we already have

6
00:00:17,290 --> 00:00:15,139
humans in space one of the answers fruit

7
00:00:20,249 --> 00:00:17,300
flies a model organism used in many

8
00:00:23,200 --> 00:00:20,259
research studies and we actually sent

9
00:00:25,509 --> 00:00:23,210
225 flies up to the space station to

10
00:00:27,490 --> 00:00:25,519
study at the same time where we can only

11
00:00:29,079 --> 00:00:27,500
send a couple of humans a year out at

12
00:00:31,480 --> 00:00:29,089
the Marshall Space Flight Center our

13
00:00:33,100 --> 00:00:31,490

Lori Meggs visited the farm if you will

14
00:00:35,080 --> 00:00:33,110
which is located out at the Ames

15
00:00:37,569 --> 00:00:35,090
Research Center to learn a little bit

16
00:00:40,360 --> 00:00:37,579
more about raising fruit flies for Space

17
00:00:42,850 --> 00:00:40,370
Flight well we're here down on the farm

18
00:00:45,819 --> 00:00:42,860
but it's really not your average farm I

19
00:00:49,029 --> 00:00:45,829
mean it looks like a million fruit flies

20
00:00:50,799 --> 00:00:49,039
there jazz what we do here on the farm

21
00:00:53,650 --> 00:00:50,809
this is exactly what you're seeing so

22
00:00:55,869 --> 00:00:53,660
this is where we breed the Flies so this

23
00:00:57,880 --> 00:00:55,879
is where we could get hundreds and

24
00:01:00,220 --> 00:00:57,890
hundreds of flies that we need when we

25
00:01:01,869 --> 00:01:00,230
do Space Flight experiments and you know

26
00:01:03,490 --> 00:01:01,879
if there's a scrub because of bad

27
00:01:06,280 --> 00:01:03,500
weather or something like that we have

28
00:01:08,350 --> 00:01:06,290
to fly the next day or the day after you

29
00:01:11,560 --> 00:01:08,360
have a couple of extra we have yes yes

30
00:01:12,730 --> 00:01:11,570
exactly we have tons extra but these

31
00:01:14,410 --> 00:01:12,740
aren't the same they're all different

32
00:01:17,020 --> 00:01:14,420
kinds exactly that's what I was gonna

33
00:01:18,999 --> 00:01:17,030
say these are also all genetically all

34
00:01:22,120 --> 00:01:19,009
different so even though to you they all

35
00:01:24,789 --> 00:01:22,130
look like bottles of flies but these are

36
00:01:26,530 --> 00:01:24,799
genetically all different and so let's

37
00:01:28,300 --> 00:01:26,540
say if there was one of these genetic

38
00:01:30,670 --> 00:01:28,310

lines that we were gonna fly for space

39
00:01:34,690 --> 00:01:30,680
flight we would take that and we would

40
00:01:37,090 --> 00:01:34,700
expand that stock to make many many many

41
00:01:39,670 --> 00:01:37,100
copies so that whenever we needed it we

42
00:01:41,530 --> 00:01:39,680
were ready with young flies so to make

43
00:01:42,600 --> 00:01:41,540
copies we've got to feed them and that's

44
00:01:45,000 --> 00:01:42,610
what happens in here too

45
00:01:48,660 --> 00:01:45,010
exactly exactly so this stuff here that

46
00:01:50,550 --> 00:01:48,670
you can see is the food and so what you

47
00:01:53,040 --> 00:01:50,560
know as you can see it's a lot of work

48
00:01:55,470 --> 00:01:53,050
so what the team does is that they they

49
00:01:57,930 --> 00:01:55,480
make the food you have to give them food

50
00:02:00,600 --> 00:01:57,940
regularly unlike if you're working with

51
00:02:02,040 --> 00:02:00,610
say bacteria or yeast you don't want to

52
00:02:03,660 --> 00:02:02,050
work with them for a while you put them

53
00:02:05,220 --> 00:02:03,670
in the freezer and they're good to go

54
00:02:08,130 --> 00:02:05,230
and then when you're ready you come back

55
00:02:10,290 --> 00:02:08,140
and you revive them right you can't do

56
00:02:12,960 --> 00:02:10,300
that with flies you have to constantly

57
00:02:15,750 --> 00:02:12,970
keep them alive and give them food till

58
00:02:17,580 --> 00:02:15,760
you're ready to use them and then all

59
00:02:19,470 --> 00:02:17,590
these different genetics talks are used

60
00:02:20,820 --> 00:02:19,480
for different kinds of experiments I'm

61
00:02:22,530 --> 00:02:20,830
just gonna say how do you decide ok it's

62
00:02:24,810 --> 00:02:22,540
this jar that's going now or this bottle

63
00:02:27,030 --> 00:02:24,820

that's going now it's usually to do with

64
00:02:28,830 --> 00:02:27,040
the science question you're asking so

65
00:02:30,960 --> 00:02:28,840
some of them for example may be

66
00:02:33,240 --> 00:02:30,970
important for studying how the heart

67
00:02:35,790 --> 00:02:33,250
functions and so believe it or not these

68
00:02:39,240 --> 00:02:35,800
flies have little hearts exactly like we

69
00:02:41,730 --> 00:02:39,250
do that beat and that have the same kind

70
00:02:43,199 --> 00:02:41,740
of regulation for the rhythm sort of

71
00:02:47,310 --> 00:02:43,209
heart rhythm and so there are some

72
00:02:49,830 --> 00:02:47,320
mutants here where the the fly's heart

73
00:02:52,560 --> 00:02:49,840
function is altered just like they would

74
00:02:54,990 --> 00:02:52,570
be in a human in a family which had that

75
00:02:58,140 --> 00:02:55,000
particular mutation similarly there are

76
00:03:00,350 --> 00:02:58,150
mutations for the immune system so that

77
00:03:02,970 --> 00:03:00,360
the immune function may be impaired

78
00:03:05,870 --> 00:03:02,980
there's other kinds of mutations for

79
00:03:08,220 --> 00:03:05,880
example stress so we have some called

80
00:03:10,650 --> 00:03:08,230
their long live flies so there's this

81
00:03:13,310 --> 00:03:10,660
one that we love that's called Indy

82
00:03:15,780 --> 00:03:13,320
which stands for I'm not dead yet

83
00:03:18,120 --> 00:03:15,790
because those flies actually live almost

84
00:03:20,820 --> 00:03:18,130
twice as long as their counterpart

85
00:03:22,199 --> 00:03:20,830
without this particular gene change and

86
00:03:25,680 --> 00:03:22,209
that's usually 30 days right their

87
00:03:28,860 --> 00:03:25,690
lifespan is is it four days yeah so once

88
00:03:31,020 --> 00:03:28,870

the adults come out meaning that from

89
00:03:33,570 --> 00:03:31,030
the egg to the adult is about 10 to 12

90
00:03:36,030 --> 00:03:33,580
days and then once the adult comes out

91
00:03:38,310 --> 00:03:36,040
they can live anywhere from you know

92
00:03:40,800 --> 00:03:38,320
four to eight weeks usually about six

93
00:03:43,500 --> 00:03:40,810
weeks but then the long-lived mutants

94
00:03:45,690 --> 00:03:43,510
can live two months almost Wow and and I

95
00:03:47,190 --> 00:03:45,700
keep holding this but but yes these are

96
00:03:50,040 --> 00:03:47,200
breathable I mean it's not sealed

97
00:03:52,170 --> 00:03:50,050
exactly so that's an excellent question

98
00:03:54,660 --> 00:03:52,180
so yeah these bought these have actually

99
00:03:57,810 --> 00:03:54,670
living flies in them as well as eggs

100
00:03:59,820 --> 00:03:57,820
larvae pupae and the adults which are

101
00:04:02,160 --> 00:03:59,830
all the life stages and so they all need

102
00:04:03,840 --> 00:04:02,170
to breathe and so these are the caught

103
00:04:07,020 --> 00:04:03,850
these are cotton plugs that compressed

104
00:04:09,930 --> 00:04:07,030
cotton so what's neat is that allow air

105
00:04:12,810 --> 00:04:09,940
flow back and forth very well but yet

106
00:04:16,050 --> 00:04:12,820
they don't allow other infectious things

107
00:04:19,199 --> 00:04:16,060
or other bugs that you don't want in

108
00:04:21,449 --> 00:04:19,209
there to go in so it's protective but at

109
00:04:24,600 --> 00:04:21,459
the same time we double so we grow flies

110
00:04:27,090 --> 00:04:24,610
here all the time we do we do in fact we

111
00:04:29,550 --> 00:04:27,100
have to have a continual stop going and

112
00:04:31,950 --> 00:04:29,560
so all of these and you can you can tell

113
00:04:35,070 --> 00:04:31,960

this would be too much work to do all in

114
00:04:36,990 --> 00:04:35,080
one day and so basically the way we do

115
00:04:41,340 --> 00:04:37,000
it is you know folks in the lab on a

116
00:04:43,170 --> 00:04:41,350
weekly basis have to feed and mind you

117
00:04:46,050 --> 00:04:43,180
what you're seeing here is only a subset

118
00:04:48,840 --> 00:04:46,060
inside these incubators we have more

119
00:04:51,270 --> 00:04:48,850
flies as well and so all of them need to

120
00:04:54,090 --> 00:04:51,280
be fed on a regular basis so they don't

121
00:04:56,610 --> 00:04:54,100
run out of food and so that we're ready

122
00:04:59,940 --> 00:04:56,620
for space flight when we need to fly

123
00:05:01,710 --> 00:04:59,950
these fly knots up into space what is

124
00:05:03,150 --> 00:05:01,720
the one thing that we really have

125
00:05:05,100 --> 00:05:03,160
learned from studying fruit flies in

126
00:05:07,980 --> 00:05:05,110
space we've actually learned several

127
00:05:10,830 --> 00:05:07,990
things one of them just to give you an

128
00:05:14,550 --> 00:05:10,840
example from the last experiment is that

129
00:05:16,920 --> 00:05:14,560
we the immune system of the fruit fly is

130
00:05:19,800 --> 00:05:16,930
affected by spaceflight which you know

131
00:05:22,140 --> 00:05:19,810
is not surprising in terms of we see

132
00:05:24,390 --> 00:05:22,150
that in humans and in other animals we

133
00:05:26,880 --> 00:05:24,400
see indications of that we also see that

134
00:05:29,430 --> 00:05:26,890
in fly so then slice act as a good model

135
00:05:33,360 --> 00:05:29,440
to study the changes in the immune

136
00:05:36,240 --> 00:05:33,370
system in spaceflight we also find that

137
00:05:37,980 --> 00:05:36,250
there are changes in stress which again

138
00:05:39,570 --> 00:05:37,990

you know happens to humans in

139
00:05:41,659 --> 00:05:39,580
spaceflight as you can imagine it's a

140
00:05:44,899 --> 00:05:41,669
pretty stressful environment

141
00:05:46,520 --> 00:05:44,909
it happens to foo flies as well and so

142
00:05:50,059 --> 00:05:46,530
what we learned from looking at their

143
00:05:52,820 --> 00:05:50,069
their physiology and their genetic

144
00:05:55,820 --> 00:05:52,830
changes after spaceflight is that there

145
00:05:58,369 --> 00:05:55,830
are these changes in oxidative stress so

146
00:06:00,439 --> 00:05:58,379
you can study the mechanism by which the

147
00:06:03,499 --> 00:06:00,449
stress happens and what you can do to

148
00:06:06,469 --> 00:06:03,509
counter it with the Flies

149
00:06:08,989 --> 00:06:06,479
in the future oh another thing for to

150
00:06:11,480 --> 00:06:08,999
give you an example is a group of

151
00:06:14,749 --> 00:06:11,490
scientists along with myself and our

152
00:06:17,480 --> 00:06:14,759
collaborators Ralph Bodmer Karen oak or

153
00:06:19,510 --> 00:06:17,490
Peter Lee what we're looking at we're

154
00:06:22,909 --> 00:06:19,520
also using the fly as a model to study

155
00:06:26,089 --> 00:06:22,919
cardiovascular function so you can look

156
00:06:28,820 --> 00:06:26,099
at flies look at heart function and how

157
00:06:31,850 --> 00:06:28,830
it's altered in space and also have

158
00:06:34,820 --> 00:06:31,860
genetically engineered versions that

159
00:06:37,010 --> 00:06:34,830
have the same sorts of defects in heart

160
00:06:39,350 --> 00:06:37,020
function that the human population have

161
00:06:41,510 --> 00:06:39,360
there are some mutants where you know if

162
00:06:43,100 --> 00:06:41,520
a family has it in the human population

163
00:06:45,829 --> 00:06:43,110

they're predisposed to heart problems

164
00:06:49,219 --> 00:06:45,839
the flies have families like that too

165
00:06:51,320 --> 00:06:49,229
and so we study those in the spaceflight

166
00:06:53,510 --> 00:06:51,330
context to understand you know what are

167
00:06:56,269 --> 00:06:53,520
the alterations what can you do to try

168
00:06:59,149 --> 00:06:56,279
and prevent those and things like that

169
00:07:01,790 --> 00:06:59,159
what the fruit flies eat so fruit flies

170
00:07:04,579 --> 00:07:01,800
eat a mixture it's it's kind of a it's a

171
00:07:06,290 --> 00:07:04,589
nutritious diet there are two different

172
00:07:07,999 --> 00:07:06,300
kinds of diets that we have in the lab

173
00:07:10,399 --> 00:07:08,009
there's this this food that you see in

174
00:07:13,279 --> 00:07:10,409
the white color and then there's another

175
00:07:16,159 --> 00:07:13,289
one that we're using that we use for for

176
00:07:18,559 --> 00:07:16,169
a space flight that that Shoko was just

177
00:07:20,600 --> 00:07:18,569
working on which is this blue color we

178
00:07:22,369 --> 00:07:20,610
put this blue food dye in but

179
00:07:25,100 --> 00:07:22,379
essentially it's a mixture

180
00:07:27,709 --> 00:07:25,110
there's agar to kind of hold shape but

181
00:07:31,100 --> 00:07:27,719
that's cornmeal there's sugars like

182
00:07:33,200 --> 00:07:31,110
dextrose and stuff there's some yeast

183
00:07:35,060 --> 00:07:33,210
he killed yeast that we put in you know

184
00:07:39,110 --> 00:07:35,070
to get proteins and vitamins and things

185
00:07:41,390 --> 00:07:39,120
like that so it's a nutritious meal that

186
00:07:42,650 --> 00:07:41,400
we and a complete meal not enough for me

187
00:07:43,940 --> 00:07:42,660
I'm gonna have to look in one of these