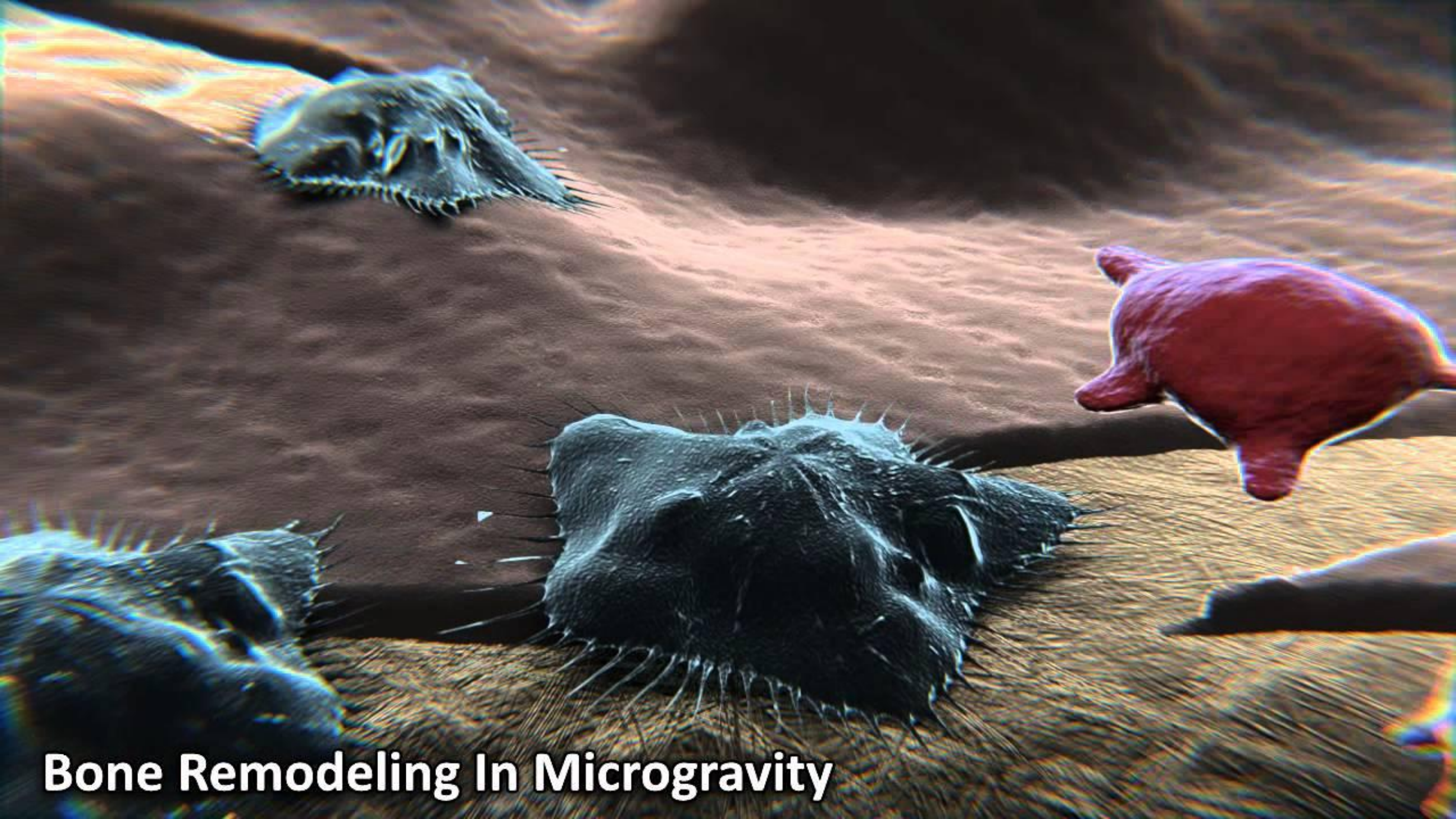
Bone Remodeling In Microgravity

1
00:00:04,630 --> 00:00:02,149
the bones in our bodies are alive

2
00:00:05,990 --> 00:00:04,640
growing and changing all the time

3
00:00:07,909 --> 00:00:06,000
our bones are composed of different

4
00:00:10,230 --> 00:00:07,919
layers the outer surface of bone is

5
00:00:11,910 --> 00:00:10,240
called cortical bone this is the smooth

6
00:00:13,749 --> 00:00:11,920
hard part of the bone that we can see

7
00:00:15,669 --> 00:00:13,759
when we look at a skeleton inside the

8
00:00:17,430 --> 00:00:15,679
cortical bone is the trabecular bone

9
00:00:20,630 --> 00:00:17,440
this type of bone looks like a sponge

10
00:00:22,390 --> 00:00:20,640
and helps to protect the bone marrow

11
00:00:25,109 --> 00:00:22,400
the constant process of bones growing

12
00:00:26,870 --> 00:00:25,119
and changing is known as bone remodeling

13
00:00:28,950 --> 00:00:26,880

this process is carried out by specific

14
00:00:31,109 --> 00:00:28,960
cells in our bones cells called

15
00:00:33,110 --> 00:00:31,119
osteoclasts have the role of breaking

16
00:00:35,030 --> 00:00:33,120
down our bone and removing any parts

17
00:00:36,470 --> 00:00:35,040
that need replacing

18
00:00:38,950 --> 00:00:36,480
at the same time cells called

19
00:00:40,790 --> 00:00:38,960
osteoblasts have the job of making new

20
00:00:42,869 --> 00:00:40,800
bone and helping to repair any parts of

21
00:00:45,190 --> 00:00:42,879
the bone that have been damaged

22
00:00:47,110 --> 00:00:45,200
on earth in healthy individuals this

23
00:00:49,270 --> 00:00:47,120
process is normally balanced so that the

24
00:00:53,910 --> 00:00:49,280
same amount of bone is made and broken

25
00:00:57,990 --> 00:00:55,990
in space astronauts are exposed to lower

26
00:00:59,510 --> 00:00:58,000
levels of gravity than on earth this

27
00:01:01,029 --> 00:00:59,520
means that they have less mechanical

28
00:01:02,069 --> 00:01:01,039
stress put on their bones as they move

29
00:01:03,670 --> 00:01:02,079
around

30
00:01:05,189 --> 00:01:03,680
scientists believe that the bones

31
00:01:06,870 --> 00:01:05,199
naturally try to adapt to this new

32
00:01:08,230 --> 00:01:06,880
environment by increasing the rate that

33
00:01:10,870 --> 00:01:08,240
the bone is broken down by the

34
00:01:12,630 --> 00:01:10,880
osteoclasts meanwhile bone formation

35
00:01:14,230 --> 00:01:12,640
continues to occur at the same rate as

36
00:01:15,910 --> 00:01:14,240
it does on earth

37
00:01:17,590 --> 00:01:15,920
the result is an imbalance in bone

38
00:01:21,270 --> 00:01:17,600

remodeling which leads to an overall

39
00:01:23,030 --> 00:01:21,280
decrease in bone mineral density

40
00:01:24,469 --> 00:01:23,040
while in space astronauts can manage

41
00:01:26,550 --> 00:01:24,479
with lower bone density but when they

42
00:01:28,630 --> 00:01:26,560
return their bones are less able to cope

43
00:01:30,950 --> 00:01:28,640
with earth's gravity this increases the

44
00:01:32,310 --> 00:01:30,960
risk of fracture and injury scientists

45
00:01:34,550 --> 00:01:32,320
use many different tests to measure the

46
00:01:36,710 --> 00:01:34,560
density of the astronauts bones results

47
00:01:38,870 --> 00:01:36,720
show that the astronauts while in space

48
00:01:41,190 --> 00:01:38,880
lose bone in a similar pattern to people

49
00:01:43,190 --> 00:01:41,200
on earth who suffer from osteoporosis

50
00:01:46,310 --> 00:01:43,200
but the astronauts lose it at a much

51
00:01:49,830 --> 00:01:48,069
scientists have found that exercise when

52
00:01:52,310 --> 00:01:49,840
combined with good nutrition and

53
00:01:53,990 --> 00:01:52,320
increased vitamin d intake is able to

54
00:01:55,749 --> 00:01:54,000
preserve some of the bone that was

55
00:01:57,910 --> 00:01:55,759
previously being lost

56
00:01:59,749 --> 00:01:57,920
since 2008 astronauts have been able to

57
00:02:02,069 --> 00:01:59,759
use a new exercise machine called the

58
00:02:04,550 --> 00:02:02,079
advanced resistive exercise device or a

59
00:02:06,870 --> 00:02:04,560
red it is thought that this increase in

60
00:02:08,309 --> 00:02:06,880
force triggers the formation of new bone

61
00:02:10,550 --> 00:02:08,319
bringing more balance to the bone

62
00:02:12,229 --> 00:02:10,560
remodeling process and allowing the bone

63
00:02:15,990 --> 00:02:12,239

density to stay at roughly the same

64
00:02:17,510 --> 00:02:16,000
level as it was before the space flight

65
00:02:19,589 --> 00:02:17,520
it is a significant achievement to be

66
00:02:21,190 --> 00:02:19,599
able to maintain bone density in space

67
00:02:22,869 --> 00:02:21,200
but more experiments need to be carried

68
00:02:25,030 --> 00:02:22,879
out to see whether the new bone which is

69
00:02:26,869 --> 00:02:25,040
formed in space has the same structure

70
00:02:28,949 --> 00:02:26,879
and strength as new bone which is formed

71
00:02:30,949 --> 00:02:28,959
on earth understanding bone loss

72
00:02:32,949 --> 00:02:30,959
associated with microgravity may lead to

73
00:02:34,710 --> 00:02:32,959
better preventive care or therapeutic

74
00:02:36,869 --> 00:02:34,720
treatments for people on earth suffering

75
00:02:39,670 --> 00:02:36,879
bone loss as a result of bone diseases