
EFRIGERATED CENTRIFUGE

1
00:00:05,110 --> 00:00:02,389
the human research facility racks in the

2
00:00:07,030 --> 00:00:05,120
columbus laboratory allow iss crew

3
00:00:09,190 --> 00:00:07,040
members to study one of earth's most

4
00:00:12,150 --> 00:00:09,200
advanced organisms

5
00:00:14,789 --> 00:00:12,160
the human body

6
00:00:16,630 --> 00:00:14,799
astronauts conduct medical exams track

7
00:00:18,710 --> 00:00:16,640
changes in health and behavior

8
00:00:20,870 --> 00:00:18,720
and research countermeasures to reduce

9
00:00:22,470 --> 00:00:20,880
the harmful effects space flight has on

10
00:00:24,310 --> 00:00:22,480
humans

11
00:00:26,550 --> 00:00:24,320
our bodies are well suited to work under

12
00:00:28,710 --> 00:00:26,560
the force of earth's gravity but long

13
00:00:31,189 --> 00:00:28,720

duration space flight results in muscle

14
00:00:33,670 --> 00:00:31,199
atrophy bone deterioration

15
00:00:35,910 --> 00:00:33,680
cardiovascular deconditioning and a

16
00:00:38,310 --> 00:00:35,920
weakened immune system

17
00:00:40,630 --> 00:00:38,320
in an effort to understand these changes

18
00:00:43,110 --> 00:00:40,640
and how they affect astronaut health the

19
00:00:45,510 --> 00:00:43,120
hrf is used to conduct several types of

20
00:00:48,709 --> 00:00:45,520
physiology experiments

21
00:00:51,110 --> 00:00:48,719
for example the card and integrated

22
00:00:53,029 --> 00:00:51,120
cardiovascular experiments are two

23
00:00:55,029 --> 00:00:53,039
investigations designed to better

24
00:00:57,029 --> 00:00:55,039
understand how the heart functions in

25
00:00:58,549 --> 00:00:57,039
microgravity

26
00:01:00,790 --> 00:00:58,559
without the force of gravity for the

27
00:01:02,790 --> 00:01:00,800
heart to pump against the heart muscle

28
00:01:04,710 --> 00:01:02,800
weakens in space

29
00:01:07,109 --> 00:01:04,720
scientists want to understand what this

30
00:01:09,750 --> 00:01:07,119
might mean for astronauts on orbit as

31
00:01:11,429 --> 00:01:09,760
they increase their time spent in space

32
00:01:13,830 --> 00:01:11,439
and also how this will affect their

33
00:01:15,990 --> 00:01:13,840
return to earth's gravity

34
00:01:18,950 --> 00:01:16,000
the space linear acceleration mass

35
00:01:21,749 --> 00:01:18,960
measurement device called slam d is an

36
00:01:24,390 --> 00:01:21,759
advanced scale that measures body mass

37
00:01:26,550 --> 00:01:24,400
without the pool of gravity

38
00:01:29,510 --> 00:01:26,560

it does this by applying newton's second

39
00:01:33,270 --> 00:01:29,520
law of motion which states that mass

40
00:01:35,910 --> 00:01:33,280
equals force divided by acceleration

41
00:01:38,310 --> 00:01:35,920
an astronaut sits on a pull-arm assembly

42
00:01:40,149 --> 00:01:38,320
that moves with a constant force

43
00:01:42,310 --> 00:01:40,159
while his or her acceleration is

44
00:01:44,789 --> 00:01:42,320
recorded with a precise optical

45
00:01:46,389 --> 00:01:44,799
instrument that measures position over

46
00:01:48,550 --> 00:01:46,399
time

47
00:01:50,950 --> 00:01:48,560
by tracking changes in astronauts body

48
00:01:52,950 --> 00:01:50,960
mass over time scientists can better

49
00:01:54,630 --> 00:01:52,960
understand their nutritional status

50
00:01:57,109 --> 00:01:54,640
while on orbit

51
00:01:59,990 --> 00:01:57,119
the nutrition status assessment focuses

52
00:02:02,149 --> 00:02:00,000
on the effects diet has on bone health

53
00:02:04,870 --> 00:02:02,159
chemical and hormone changes and

54
00:02:06,950 --> 00:02:04,880
oxidative damage in space

55
00:02:09,510 --> 00:02:06,960
urine and blood samples are collected

56
00:02:12,070 --> 00:02:09,520
before during and after space flight for

57
00:02:13,910 --> 00:02:12,080
biochemical analysis to determine the

58
00:02:16,229 --> 00:02:13,920
effectiveness of both nutrition and

59
00:02:18,470 --> 00:02:16,239
pharmaceuticals that are being tested

60
00:02:20,229 --> 00:02:18,480
for maintaining astronaut health on the

61
00:02:22,229 --> 00:02:20,239
space station

62
00:02:24,229 --> 00:02:22,239
nutrition research is necessary for

63
00:02:27,030 --> 00:02:24,239

establishing proper food and vitamin

64
00:02:29,510 --> 00:02:27,040
diets for long duration space missions

65
00:02:31,589 --> 00:02:29,520
as we explore destinations beyond low

66
00:02:33,830 --> 00:02:31,599
earth orbit

67
00:02:35,910 --> 00:02:33,840
although the intended goal of the hrs

68
00:02:38,150 --> 00:02:35,920
research is to understand how the human

69
00:02:40,550 --> 00:02:38,160
body reacts to long duration space

70
00:02:42,550 --> 00:02:40,560
flight the added benefit for much of

71
00:02:45,110 --> 00:02:42,560
this research is that it helps us to

72
00:02:47,670 --> 00:02:45,120
better understand heart disease muscle

73
00:02:49,750 --> 00:02:47,680
degeneration and osteoporosis