

A middle-aged man with glasses, wearing a light blue dress shirt and a blue tie with a pattern of small houses and trees, is shown from the chest up. He has his hands clasped together in front of him and is speaking. The background is a dark room with blue lighting, possibly a laboratory or office, with some blurred equipment visible.

that perfectly binds to this protein.

1  
00:00:05,730 --> 00:00:09,720

[ Music ]

2  
00:00:09,720 --> 00:00:18,890

DMD or Duchenne muscular dystrophy is the most common muscle disease affecting young

3  
00:00:18,890 --> 00:00:21,370

boys; it affects about 1 in 3,600.

4  
00:00:21,370 --> 00:00:28,210

It's an incurable condition, and it results in really muscle weakness that worsens over

5  
00:00:28,210 --> 00:00:29,960

a boy's lifetime.

6  
00:00:29,960 --> 00:00:34,570

Typically, boys lose their ability to walk around age 12.

7  
00:00:34,570 --> 00:00:40,530

As boys go through adolescence, they have usually additional complications related to

8  
00:00:40,530 --> 00:00:46,510

their lung or pulmonary health, as well as more often than not will develop cardiac disease,

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00:00:46,510 --> 00:00:52,170

heart disease, and fortunately most boys will pass away in their 20s from complications

10  
00:00:52,170 --> 00:00:57,969

such as pneumonia, or heart failure.

11  
00:00:57,969 --> 00:01:01,980

[ Music ]

12  
00:01:01,980 --> 00:01:06,160  
In order to combat diseases like this we have to study the structure of proteins that are

13  
00:01:06,160 --> 00:01:08,880  
associated with that particular disease.

14  
00:01:08,880 --> 00:01:14,540  
In order to do that, we first must crystallize the protein, and that crystal is basically

15  
00:01:14,540 --> 00:01:20,440  
millions of copies of that same protein aligned like a row of bricks on a wall, but in three

16  
00:01:20,440 --> 00:01:21,800  
dimensions.

17  
00:01:21,800 --> 00:01:25,650  
But here's the problem, when we try to grow a crystal on earth gravity can affect the

18  
00:01:25,650 --> 00:01:30,920  
way the molecules become aligned on the crystal's surface and that affects the overall quality

19  
00:01:30,920 --> 00:01:32,780  
of the crystal.

20  
00:01:32,780 --> 00:01:37,040  
The ideal environment to grow a more perfect crystal would be a lab that we could have

21  
00:01:37,040 --> 00:01:41,890  
up in space orbiting the globe so that we are free of earth's gravity.

22  
00:01:41,890 --> 00:01:46,470  
Luckily we have one of those with the International

Space Station.

23  
00:01:46,470 --> 00:01:53,880  
Since 2003, the Japan Aerospace Exploration Agency has conducted more than 16 sessions

24  
00:01:53,880 --> 00:01:59,560  
of the protein crystal growth experiments onboard the International Space Station.

25  
00:01:59,560 --> 00:02:04,830  
In microgravity the crystals grow much more slowly, but the molecules have more time to

26  
00:02:04,830 --> 00:02:11,710  
get perfectly arranged on the surface of the crystal, and that gives us much better data.

27  
00:02:11,710 --> 00:02:17,459  
One of the most promising results has been gained by studying a protein associated with

28  
00:02:17,459 --> 00:02:20,010  
Duchenne muscular disorder.

29  
00:02:20,010 --> 00:02:26,600  
Studying this protein that [inaudible] discovery like a key fitting into a key hole we are

30  
00:02:26,600 --> 00:02:31,910  
able to design the graph that perfectly binds to this protein.

31  
00:02:31,910 --> 00:02:37,590  
By knowing the shape of that key hole we can tailor make a drug to fit into a specific

32  
00:02:37,590 --> 00:02:39,959  
location of the protein.

33  
00:02:39,959 --> 00:02:48,640  
What this means is we may be able to slow  
the disease by half instead of being in a

34  
00:02:48,640 --> 00:02:55,400  
wheelchair at 12 we might be able to push  
that age to 25.

35  
00:02:55,400 --> 00:03:05,579  
Instead of being dependent upon this vision  
at 20 years old you live to be 40.

36  
00:03:05,579 --> 00:03:16,090  
What are we talking about is potentially doubling  
the life span of many of the DMD patients.

37  
00:03:16,090 --> 00:03:25,240  
And it's all because of such a [inaudible]  
afforded to us by the International Space

38  
00:03:25,240 --> 00:03:26,340  
Station.

39  
00:03:26,340 --> 00:03:30,980  
This research is really just in its infancy;  
there are literally thousands of other proteins

40  
00:03:30,980 --> 00:03:35,239  
who's structures we need to determine, and  
the International Space Station is going to

41  
00:03:35,239 --> 00:03:39,260  
provide a platform where we can hopefully  
grow much better crystals that will allow

42  
00:03:39,260 --> 00:03:44,469  
us to get structures and to learn more about  
how these molecules function in our body,

43

00:03:44,469 --> 00:03:47,160  
in bacteria, or in viruses.

44  
00:03:47,160 --> 00:03:51,920  
We're doing this research not just for ourselves  
or our children, but for generations to come.

45  
00:03:51,920 --> 00:03:55,730  
Many of the protein structures that will be  
determined wouldn't be possible without the

46  
00:03:55,730 --> 00:04:01,849  
International Space Station.

47  
00:04:01,849 --> 00:04:07,029  
[ Music ]

48  
00:04:07,029 --> 00:04:12,110  
I'm hoping that those trials will be successful,  
that they will tell us yes there is a way

49  
00:04:12,110 --> 00:04:16,019  
that we can keep these boys stronger for a  
longer period of time.

50  
00:04:16,019 --> 00:04:19,410  
That we can help their heart and pulmonary  
function and that they can live longer; that