0:04
So next up, we have Dr.
0:05
Nir Barzilai.
0:08
Dr. Barzilai
0:09
is a founding director of the Institute for Aging Research
0:13
at the Albert Einstein College of Medicine.
0:16
He's a director of the Paul F Glenn's Center for the Biology of Human
0:19
Aging Research and the National Institutes of Health's Nathan Shock centers.
0:25
He also discovered the longevity gene in humans.
0:28
So that's quite important.
0:30
Dr. Barzilai.
0:37
I thought the average age here is 68 and I don't see it.
0:42
You look so much younger, you know.
0:45
Well, first of all, thank you, Aviv, for this opportunity and
0:50
and for me, you're, you know, you're the people who spread the gospels.
0:54
I think we were expecting a very different life from now on.
0:59
And this is the day that you have to decide.
1:02
You want to spend your time in sick care or do you want to spend time
1:06
in health care, in maximizing your health, as you heard from Eric with
1:12
with the exercise and diet and sleep and social connectivity.
1:18
And so
1:21
this is I'll just bring you to my life with this following story.
1:25
There's a 100 year old gentleman that walks into life insurance
1:29
and he wants life insurance and the clerk says,
1:33
100 years old, we don't give life insurance.
1:35

That's not true because my mother is insured here.
1:38
So how old is your mother?
1:39
She's hundred and 20 and she's fine.
1:43
So the clerk goes back, they talk to the boss
1:46
and they said, that's a great marketing.
1:48
You know,
1:49
we should give him life insurance and we'll, you know,
1:52
we can make something out of it.
1:54
So they come to the old gentleman and says, you know,
1:57
we're going to give you a life insurance.
1:58
In fact, come on Tuesday and we have everything ready, you can just sign.
2:03
They said, I'm sorry, I'm busy on Tuesday.
2:06
And they say, old man, what do you have on Tuesday?
2:08
Said, on Tuesday, my grandfather is getting married.
2:15
(laughter) How old?
2:15
How old is your grandfather?
2:17
He said 150.
2:21
150 and he wants to get married?
2:22
He said he doesn't want to, but his parents are putting lots of pressure
2:29
(laughter)
2:30
So you'll understand why.
2:33
This is my life and this is my horizon.
2:36
And I would tell you, whenever we are thinking of life like that,
2:39
they're trade offs, right?
2:41
Do you really want to be 150 year old and your in-laws

2:45
or mothers will tell you what to do?
2:46
You know,
2:49
There's going to be trade-offs.
2:51
And I also want to say I have,
2:56
thanks to Aviv, intervention
2:59
hyperbaric chamber for mice in my lab.
3:05
So just like if you go for that,
3:08
you can have an after work drink
3:11
a Eric said what he thinks about drinks, but I'm not going to talk about it now.
3:16
What I really want to talk about
3:18
is this incredible fact that in 100,000 years or so of human
3:23
evolution, life expectancy was between 20 and 30 years.
3:29
Okay?
3:29
It's only in the last hundred and 50 years.
3:31
That's why it looks so steep that we made this progress.
3:35
Okay.
3:36
So when people are coming to me and say, I have a prostate stuff, why didn't
3:40
evolution figure out? Well, evolution needs those 100,000 years to work.
3:45
But if people didn't get prostate problem
3:48
when they were 20, 30 we cannot solve it now.
3:51
Okay. Think also, you guys
3:55
not how rare
3:56
you would have been during human evolution,
3:59
but how many people do you think during
4:02

evolution were married for more than 30 years?
4:05
If life expectancy was 20 or 30?
4:07
Right. You're the world holder.
4:10
You're here, you're doing great.
4:12
Really great.
4:14
But this is the point
4:17
we got old
4:19
and we started getting age related disease.
4:21
We get the first disease and a treatment and the second disease and a treatment.
4:25
And eventually we end up with bad quality of life.
4:31
And what we have done
4:33
in those first hundred and 50 years,
4:37
a lot of what we have done has been prevention,
4:40
just harnessing agriculture so there's enough food,
4:43
cleaning the water, building sewers, a vaccination.
4:48
Right. A lot of it was prevention. Yeah.
4:50
We also invented antibiotics and surgery.
4:53
Okay.
4:55
But it's thinking of the prevention
4:58
that really makes us think
5:01
that there is a new
5:04
we can create a new history here,
5:06
because if we prevent the aging process before
5:10
the disease happened, then we've done a lot of things.
5:14
Right.

5:15
So if I have to summarize things that Eric
5:18
basically said before or how the field, in my words,
5:23
is that first of all, aging as a biology, we all know that, okay?
5:27
We all know that aging is a biology.
5:29
I think what we don't realize
5:32
is that this biology is what drives the diseases.
5:36
Okay?
5:37
You can be born with genes of Alzheimer.
5:40
There's this APOE4 if you heard, if you have both copies of the gene,
5:44
you're likely to get Alzheimer when you're 60 or 70 and be dead when you're 80.
5:48
But when you are born, you're not demented.
5:51
Then when we're your one year or ten year or 50 years, you're not demented.
5:55
You need this biology of aging to bring on the diseases.
5:59
And so that's why we're talking prevention.
6:01
You have to do it then
6:03
and the
6:04
good news is that aging can be targeted.
6:08
We've done it in animals.
6:10
We've done it in humans with a variety of tools.
6:14
And we've showed that aging can be delayed or stopped
6:18
or even reversed in several instances.
6:22
And if you're asking but what is it?
6:25
What is the biology?
6:27
I'm really not going to tell you in a 20 minute presentation what's the biology?
6:31

But just that, you know, for your eyes
6:34
that we have what's called the hallmarks of aging.
6:37
Okay, We kind of agree.
6:39
We neuroscientists agree those are the hallmarks of aging.
6:43
And to be a hallmark of aging, you have to show that something goes wrong
6:46
when you're old.
6:47
And if you fix it again in animals or humans, you get healthspan
6:51
most important health span and also lifespan extension.
6:57
And as I said,
6:58
targeting those hallmarks
7:02
improve lifespan and health span of animal.
7:06
But this is the thing
7:09
you don't have to deal with all of them at the same time.
7:14
That's why there are those lines going in between.
7:17
You can hit one of them and correct all of the other or most of the others.
7:23
And this is kind of the promise that we have now.
7:26
And we can test drugs by their ability to target those hallmarks.
7:32
And if they don't hit all or many of those hallmarks,
7:35
they are not really going to effect aging the way we want them to affect it.
7:41
So, we wrote a paper
7:45
and then a correction to a paper
7:48
where we took all the FDA approved drugs.
7:52
Okay.
7:53
Now, when I'm seeing FDA approved drugs, those drugs
7:56
have been approved for some use, so they're safe.

8:00
Okay.
8:00
We know everything about their safety, but we took all those drugs that were given
8:05
to animals to test some hypotheses, extended lifespan in animals.
8:10
And we took all the data that we had.
8:13
And you see on the right side, we have a scale that is up to 12
8:19
that looks at, you know, the hallmarks of aging in animals
8:24
and also what happens to humans.
8:27
And you see that there are a five drugs
8:31
that get scores between ten and 12.
8:35
In other words, those are drugs
8:37
that are approved by FDA for another purpose.
8:41
But if you take them for aging,
8:43
you might actually really target the biology, the biology of aging.
8:48
And I'll give one of them as an example.
8:51
The point is, and Eric said it, we don't sell drugs here, okay?
8:57
But any doctor can repurpose
8:59
any FDA approved drug and many have done it.
9:03
And they've done it mainly to a drug that's called metformin.
9:08
And metformin is the cheapest drug in the US formulary.
9:12
Okay, It's really cheap.
9:14
You can get it for more expensive in Amazon.
9:17
It would cost you a dollar a day, but it's really a $0.20 drug most
9:22
or if you get it from Mexico metformin is even cheaper
9:27
and there to
9:28

to kind of evidence that you have to do about metformin
9:31
the first one that is really important for me
9:34
it showed to target all of
9:39
the hallmarks of aging and people are saying, oh really?
9:43
How does one drug do the whole all hallmarks of aging?
9:46
and this is how we understand it.
9:51
There are some drugs that are going to target aging,
9:57
which means they're going
9:58
to take your old cell or old organ or old body and make it younger.
10:02
And by that it's going to improve a lot of things.
10:05
Other hallmarks.
10:07
Okay.
10:07
So that's what it's doing on very principle way.
10:12
And the reason we know that it's doing because metformin has been out there
10:17
for decades, actually for 70 or almost 80 years, by the way, it was used
10:22
initially to treat
10:26
it's an excerpt of the French lilac, but it's modulated.
10:29
So it's not nutraceutical, but it was used to treat arthritis and to prevent flu.
10:34
And then it was discovered that it lowers glucose in diabetics.
10:37
So it went to diabetes.
10:39
And in diabetes people have noticed that it's doing really well.
10:43
Why is it doing well?
10:44
First of all, in non-diabetic people, it will prevent diabetes.
10:49
It prevent heart disease, it prevents cancer, it
10:52
prevents cognitive decline and prevents mortality.

10:56
The most important and really convincing
10:59
data recently was from a study, a clinical study.
11:03
So it's a controlled study.
11:04
Or let let me say differently, nine studies around the world during
11:10
COVID have showed that people in metformin have less hospitalizations and deaths.
11:15
So in the United States, they they had a controlled study
11:19
where they took not diabetic people
11:22
and they gave them metformin within three days of a positive COVID,
11:27
and it decreased hospitalization by more than 40%, death
11:30
by more than 40% and long COVID by more than 40%.
11:35
And this just shows you why those drugs are important, because it's not diabetes.
11:40
It it's not metabolism.
11:41
It's also immunology. Right.
11:44
It improves your immune function.
11:46
And maybe it's improved other things because COVID is a severe disease.
11:49
It gives you the ability to fight the disease.
11:52
So there is a lot of evidence to use.
11:55
Use a it for me
11:58
and you might ask then why is metformin
12:03
not official target in aging?
12:06
And the reason is that the FDA
12:09
doesn't recognize aging as a preventable condition.
12:13
And if that happens, health
12:15
care providers don't have to pay you.
12:18

And if that happens, pharmaceuticals
12:21
that can develop better drugs, combination of drugs
12:24
and other drugs are not going to jump in because they need a business plan.
12:28
Okay.
12:29
And that's why what we're leading as a group,
12:33
the American Federation of Aging Research leads a group
12:38
that's called We're going to do this study
12:41
and we're going to show in a controlled study double line control
12:46
that we're going to in one study
12:49
to prevent a cluster of age related disease.
12:51
Of course, cardiovascular disease, cancer, cognition, mortality.
12:56
We're working with the FDA.
12:57
We asked the FDA, is that okay?
12:59
They said, well, you should do some changes.
13:01
We made some changes and we're going to launch this study now.
13:05
Okay.
13:06
But but you have to understand, we have it.
13:10
Everybody has to be on board and we have to have this study.
13:13
So nobody will say, you didn't prove anything for me.
13:17
We've proved everything because in different studies we showed
13:20
what the cluster will do, but we have to do the cluster
13:24
in order for the FDA to say, you know, maybe, maybe you're right.
13:28
Okay,
13:29
is metformin the only drug?
13:32
So now I'll go back and connect it to the 100 years old and and by the way,

13:38
I appreciated how many of you want to be a hundred years old.
13:42
So I'll I'll talk about my study in a
13:48
those are the poster child of my study.
13:50
Those are four siblings that were born between 1910 and 1920 in New York.
13:57
And what happened to them?
14:00
All of them
14:02
reached over the age of 102,
14:04
in fact, with their little sister on the right died.
14:07
They were shocked.
14:08
Okay.
14:09
The other is
14:12
the other sister, the older sister standing on the left,
14:15
on the left, Helen, who died at 110.
14:20
I met her first time in a New York apartment when she was 100 years old.
14:26
She opened the door.
14:28
She was smoking a cigarette.
14:31
I said,
14:32
Helen, nobody told you to stop smoking.
14:35
And she said, The four doctors told me to stop smoking.
14:38
They died. (laughter)
14:42
Those guys, I have 750 like that.
14:46
Okay, Those guys,
14:48
60% of men, 30% of women were smokers.
14:51
obesity or overweight,
14:54

more than 50% exercising, even housework,
14:59
walking less than 50%, 2% vegetarian.
15:03
They didn't do what they had to do.
15:06
And the point here is we talked about
15:09
environment is a major thing for you, but not for 100 years old.
15:14
Okay.
15:15
With Helen, the conversation, well
15:17
if you stop smoking, maybe you live 120 years.
15:20
Okay.
15:22
But they were not people who were interacting with their environment.
15:27
And that's why they're so special for us, because something slowed their aging.
15:33
And how did it slow the aging
15:36
is what one of the things actually it was very important
15:41
for us from the beginning to ask, did they get sick when everybody gets sick?
15:46
And now they're just living with the disease longer,
15:49
they're sick longer, or is their lifespan and health span?
15:53
Did it go together?
15:55
And what you see here on the graph
15:58
that initially everyone don't have a disease.
16:03
The scale is disease free survival.
16:06
So everybody is okay.
16:07
And then you go with the green group.
16:09
The green group
16:11
are what we call our control, that they are age of their kids, actually, okay?
16:15
They're like regular people.

16:17
And after the age of 60, they start to accumulate diseases.
16:20
And at age 80, only 10% of them don't have a disease.
16:25
But you see that the centenarians, they're free of disease 20, 30 years longer.
16:31
Okay. So this is for me.
16:32
This is what we're trying to do.
16:34
We're trying to increase health span.
16:37
The side effect will be increased lifespan.
16:40
But we have population that can do it.
16:42
It's with within our ability as humans.
16:44
We actually think that we have the ability to live,
16:47
at least statistically, 250 years.
16:50
There's a woman that was 122 years, but we have this capacity
16:54
and we're dying here in the United States to be below the age of 76.
16:58
Okay.
16:59
So those centenarians live longer, they're healthier.
17:02
But that's not actually the interesting thing.
17:06
They have what
17:07
we called a contraction of morbidity.
17:10
They are sick very little time at the end of their lives.
17:14
Okay.
17:14
You see that even the centenarians who are 100 years old, 30% of them,
17:19
don't have any disease and some of them will just not wake up one morning.
17:24
Okay.
17:25
But they spend very little time if at all, being sick.
17:30

And this is very important because even the CDC now,
17:35
we all know what's the CDC
17:38
showed that the medical cost
17:41
in the last two years of somebody who dies over the age of 100
17:44
is a third of those who die when they are 70.
17:48
Okay. So we know that it's true.
17:50
And then comes this Professor Andrew Scott from
17:54
from who's the economist in the London School of Economy.
17:56
And he said, Guys, you're out of your mind
17:59
what you what you're measuring, you're measuring.
18:01
So they're not in the hospital.
18:03
But if they're not in the hospital, what are they doing?
18:05
What are you guys doing?
18:07
You're traveling, you're shopping.
18:10
You're building houses for your your kids.
18:14
There is an economical value of not being sick that we forget some time.
18:19
And he calculate that this economy volume
18:22
value is $39 trillion.
18:25
If we affect-- a year, if we affect healthspan by a year or two.
18:30
Okay.
18:31
So we cannot afford not to do that.
18:34
I would tell you that one of our major initiatives these days
18:40
is and we started it, it's
18:42
it's called the Super Ager Initiative, the Super Ager Family Study.
18:46
It's led by American Federation for Aging Research.

18:50
And we're trying to get 10,000 centenarians and their families
18:54
in 750 centenarians,
18:56
we discovered a longevity
19:00
genes of which two are already went to a,
19:04
By the way, I should explain that when we find the genes, okay,
19:09
we can do something about it, not for the centenarians, but for others.
19:14
Okay.
19:15
When we find what's the gene, we see the mechanism.
19:18
And usually what we do is we develop a drug.
19:21
Two thirds of the FDA-approved drugs last year were based on genetic study.
19:26
So we want the genetics of the people who slows aging
19:31
so much that they live 40% more than then their friends.
19:35
Right This is what we want. There are several.
19:38
There's not one of them, but all of them are druggable.
19:41
And we'll have to find which drug is good for which people.
19:45
But that that could be done.
19:47
So if you know any centenarians, please register them on the web.
19:52
And what we do is we send them a kit
19:54
and they spit into the kit and then we have their data and we find
19:58
genes in there, their and and their families.
20:02
Okay.
20:03
I want to take it a notch farther and just talk a little bit
20:08
about how how this biology looks in the lab
20:12
and what I'm showing you now
20:15

is that we measured 5000 proteins
20:19
of the blood of a thousand people between the ages 65 and 95.
20:25
And we asked what changes between 65 and 95?
20:29
Okay, those are a lot of proteins, 5000 time, thousand proteins.
20:34
So we put them in this mountain where
20:37
there are computers in and they throw out lava stones.
20:41
Those are the red dots that you see.
20:44
The higher it goes, the more statistical it is.
20:49
And the statistics here are ten to the -80.
20:52
Okay? It's very highly statistical.
20:54
And the farther it goes to the left and the right is more effect it is.
20:57
Now, those that go,
20:59
the lava stones that go to the right, they increase and those that go to the
21:04
is decrease because your protein when you age, go both direction.
21:08
Some of them you're losing, some of them you're gaining,
21:10
some of them are good, some of them are bad.
21:13
it's a whole, it's a whole other thing
21:18
But what we've done in
21:21
a Nature paper that was published last week,
21:26
we found out
21:29
not only what are the proteins, what's the total
21:33
that determine your biological age, but also where they're coming from.
21:38
A lot of that is breakdown of tissues.
21:42
So where are those proteins coming from?
21:45
Some are coming from the brains and some from the liver and some from the kidney.

21:50
And when we do that, we see the generally the age of your liver
21:55
is like the age of your whole body 80% of the time.
22:00
But sometimes we see that your kidneys aging faster
22:05
than the rest of their body or your brain is aging faster.
22:10
And so maybe we should look at the brain, and maybe
22:13
that's where your aging is led by.
22:16
And maybe that's where we need to interfere,
22:18
intervene first, and maybe there are better drugs
22:21
for the brain and others, for the kidney or for your heart.
22:25
Okay. So this is where
22:29
the research, it is highly AI
22:33
there's a lot of data coming in,
22:36
but we've become really good at that.
22:39
And we're accelerating our our discoveries.
22:44
So can we develop general therapeutics?
22:47
We do.
22:48
And we have developed gerotherapeutics and those gerotherapeutics
22:52
in the next few years will be validated, will get blessing of the FDA
22:58
and will enable us to stunt
23:01
your aging much more effectively.
23:04
As I said, the results of centenarians
23:07
have been translated into drugs.
23:14
Where do we stand now on other parts of aging?
23:18
I'll just make really several small,
23:23

but what you see on the left side
23:26
is the three major category that we're dealing with.
23:30
One is what I describe as compression of morbidity with the
23:34
with the example of metformin.
23:37
The other
23:38
is reversing aging, which by the way, we call it Dorian Gray.
23:42
Dorian Gray stopped aging.
23:44
But when he looked at the mirror, he saw his right age.
23:48
Okay.
23:50
When I'm looking at Zoom, I'm saying, that's the Dorian age.
23:54
I'm much younger. But, you know,
23:57
reversing aging is the, Wolverine or the fountain of youth.
24:02
It's not happening and it's not happening soon.
24:04
But there are drugs that are being developed
24:08
that are going to make you healthier, even if they're not going
24:12
to extend your lifespan so much, but they're going to make a difference.
24:16
So we're making it's called senolytics.
24:18
We're making a program with them and then and I'm talking
24:22
50 years from now, there's the Forever Young, the Peter Pan.
24:28
Okay.
24:29
And with Peter Pan, we're making some progress, but not in whole body.
24:34
The idea is, is that you'll come when you're 20 years old
24:40
and you'll get the treatment
24:42
and you repeat the treatment every few months or every few years.
24:46
And it will stand you know, it will reverse your aging enough

24:50
so that you can live healthier without growing old.
24:54
For me, it's 50 years away, okay?
24:57
Because I don't want to be alive to see what happens
25:01
and to be blamed if it's not or.
25:03
Yes, but it's really happening, in the sense
25:06
that in organ-specific ways and in animals, we're making progress.
25:11
And I'm sure that some of it will be okay.
25:15
Let let me explain it in a different way.
25:18
I showed you we can measure biological aging.
25:22
We can take a sperm of a 90 year old man
25:26
or maybe the 100 year old man that that wants a life insurance
25:30
and fertilize an egg of a 50 year old woman.
25:35
And we will know the age of the egg and the sperm.
25:41
But when you form
25:43
a baby, the stem cells that form a baby, they go to zero.
25:48
They don't remember our aging.
25:50
They totally go to zero.
25:52
And then they start the clock.
25:56
So we figured out how to do it in our own body.
25:59
We have this biological capacity.
26:02
This biological capacity.
26:04
We want to really make relevant
26:08
for all of us in the future.
26:11
This is my hyperbaric chamber for mice and rats.
26:15

I didn't talk about it,
26:17
Could our kids and grandkids be healthy centenarians?
26:23
I think absolutely.
26:25
I also want to say that
26:28
this is not only about you guys.
26:30
It's not only about
26:33
getting old.
26:36
People who survived cancer, kids who survived cancer are aging rapidly.
26:41
What did we do? We give them radiation and chemotherapy.
26:43
We age them.
26:44
They get heart disease when they're 35 years old.
26:49
People who have
26:49
HIV getting disease ten years before their friends.
26:53
People are disabled because they cannot move because they eat so much.
26:57
You know, because they cannot exercise. Right.
27:00
They die sooner.
27:02
Or let's look at another extreme.
27:05
If we want to go to Mars,
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we are not going to get there before we stop aging. It
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with radiation, we'll have cardiovascular disease, cancer
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by the time we get to Mars and we're not going to come back.
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So for all those reasons, we have to stop aging.
27:24
So wish us and you luck.
27:26
And thank you very much for listening.