UNIT 11 Audioscript

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Host Andy Davis: Today I'm pleased to be speaking with Dr. Natalie Aldrich about the changes in the human life span. Good afternoon, Dr. Aldrich.

Guest Dr. Natalie Aldrich: Hello, Andy. Please call me Natalie.

Host: OK, so Natalie, are people really living longer?

Guest: Absolutely. For thousands of years, living until 40 was considered old, and then around the beginning of the 19th century that all began to change. For instance, in 1840, the average life expectancy for women was around 45 years, and today it's 85 years.

Host: My gosh, so life spans have doubled in that time!

Guest: That's right. And when we look at the average increase, it comes out to an increase of about three months per year.

Host: Three months per year means that for every year we live now, we may live three months longer?

Guest: No. Let me give you an example. At the beginning of the 20th century, the average life span in the United States was 47 years and now that figure has risen to 79 years. If we continue to add three months every year, the average American will be living until 88 by around 2050 and by the end of this century the average will be 100.

Host: Amazing! But in order to sustain this rate of growth, don't we need to make some major medical breakthroughs? New medicines, new medical treatments?

Guest: Well, actually no. When we look at the past, that doesn't appear to be the case. Life spans didn't suddenly increase when new medicines such as antibiotics became commonplace. And the outbreak of diseases didn't cause the average to fall. When you look at the global average, you simply see a steady rise. The whole world is living longer.

Host: Do you think that scientists will make new discoveries that will increase the life span even more?

Guest: Yes, I'm quite confident that will happen. One example of that kind of work is the Buck Institute in Marin County, California, which is a private research facility investigating ways to extend the human life span. Researchers at that institute have quadrupled the life span of various species of worms in their laboratory. And they think these kinds of breakthroughs will help them understand how to extend the human life span.

Host: This is fascinating. So what breakthroughs do you think are coming in the next few years …

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Speaker: So, on to indicators of aging. The condition of our skin is one obvious indicator of aging. One reason that our skin ages prematurely is because of overeating foods such as meat, soft drinks, and sweets. These foods are associated with problems such as wrinkling. So what can be done about this? Well, for one, you can switch your diet to foods like olive oil, fish, eggs, vegetables, and fruit. All of these foods are associated with healthier skin. A second major reason that our skin ages is exposure to direct sunlight. The key to solving this problem is to avoid spending a lot of time outside between 10 A.M. and 4 P.M. And when you are outside, use a sunscreen that protects against UVA and UVB rays. It's also a good idea to get in the habit of wearing a hat. With a good diet and limited exposure to the sun, you can keep nice looking skin for many years to come.

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Professor Emma Gertz: E01 OK, today I'd like to look at some theories of aging. Many theories of aging have been suggested, but most of them fall into just two categories: program theories and damage theories. Program theories say that our bodies are programmed to live for a limited amount of time—that information about our life span is encoded in our DNA. Damage theories, however, believe that damage to our cells is responsible for aging. Some early damage theories were based on the idea that the human body is mechanical, like a car, so it naturally breaks down over time. Now that is true to some extent, but unlike cars, our body has the capacity to heal and repair itself. **E02** So let's look at these two theories about aging, and along with that, consider some approaches to life extension. OK, let's first look at a program theory, the Hayflick Limit Theory. This theory was proposed in the 1960s by two biologists who discovered that some cells divide about 50 times, then suddenly stop dividing. These were like lung, muscle, and heart cells, for example. In other words, after about 50 generations of cell division, which takes place over many years, the DNA just stops functioning. One interpretation of this is that a cellular clock is at work—that your time alive is genetically predestined. Now, this sounds like bad news, right? But there is some good news here. And here it is: The rate of cell division is directly affected by the amount of waste products in the cell. OK? So if we reduce the amount of waste, then the cells will divide more slowly. This means we can slow the hands of the clock and live longer. **E03** So how do we reduce cellular waste?

(COACHING TIP 1) Well, some scientists think they've found an effective way to do this: Eat less. About 30 percent less. It's called calorie restriction, or C-R. You cut out foods high in calories and low in nutrition–like those desserts we all love. And replace them with foods that are high in nutrition and low in calories—like fresh vegetables, for example. Currently, CR is the only known way to consistently increase life span. It's actually been shown to work well in dogs and monkeys. Also, CR doesn't just slow cell division, it lowers metabolic rate. Now this is potentially important because in mammals, lower metabolic rates are associated with longer life spans. So listen carefully: The benefits of CR are twofold, right? One: slower cell division. And two: slower metabolism. Both of these can offer life extension. **E04** However, let's think about the implications of a CR diet for a moment. Like, what economic impact would it have on the 1 million-plus restaurants in the US? After all, they generate $500 billion annually. Or what about the people who earn a living on their physical strength? Could they function effectively on a CR diet? **(COACHING TIP 2) E05** OK, a second theory of aging–and this is a damage theory–states that our cells accumulate free radical damage with the passage of time. Now, what are free radicals? They're molecules in our body that have an extra electron. In normal molecules, electrons are paired so that their electrical energies are balanced. But free radicals have an extra negative charge, and this causes them to attach to other molecules and cause an imbalance. They're caused by environmental factors that concern oxygen intake—air pollution and cigarette smoke, for example. And not only do they damage a cell's membrane and DNA, but they also make it more difficult for cells to repair the damage. This, in turn, causes aging to accelerate. **E06** So is there any good news here? Is there any way to reduce the number of free radicals? Yes, and the key is oxygen. We know that animals with lower metabolic rates metabolize less oxygen. And less metabolized oxygen means a lower production of free radicals. Which means less cell damage. Make sense? So note that this is a second benefit of a lower metabolic rate. **(COACHING TIP 3) E07** So, scientists have learned in the last few decades a lot about why we age, but what can we do about it? Well, on one side, we have what might be called high-tech approaches, for example, the use of stem cells to act as a repair system for part of the body. Another approach is xenotransplantations, which uses animal tissues and organs to treat human beings. But both these approaches are controversial. On the other side, we have the natural approach–which is the approach I personally subscribe to. It's based on three common-sense ideas. First, eat a high-nutrition, low-calorie diet. That means lots of fruits and vegetables. Second, don't overeat—or as I mentioned before, reduce your intake of calories by about 30 percent. Third, supplement good eating with moderate exercise. Basically, the high tech approach becomes unnecessary if we just apply this more natural approach. **(COACHING TIP 4)**

HEAR the language page 108

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5 So if we reduce the amount of waste, then the cells will divide more slowly.

6 Also, CR doesn't just slow cell division, it lowers metabolic rate.

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8 In normal molecules, electrons are paired so that their electrical energies are balanced.

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10 Second, don't overeat—or as I mentioned before, reduce your intake of calories by about 30 percent.

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Mia: Really? Why not?

River: Well, I was really disappointed that she finished by talking about the "natural approach."

Mia: Huh?

River: You know, how if we use the natural approach to slow down aging, we don't have to use any high-tech solutions.

Mia: OK … ?

River: Well, taking the "natural approach" just seems like common sense. I mean, everybody knows that.

Hannah: I'm not so sure about that. I don't think it's common knowledge at all. I mean, that part about overeating having a connection to aging was news to me, and I consider myself pretty well informed.

Manny: Actually, I think people already know what they should do. But like me, they just don't.

River: Why's that?

Manny: Well, in my case, I don't have the time or the money to eat a super healthy diet. And I'm definitely not going to cut it back by 30 percent. I'd be hungry all the time!

Hannah: So what then? I mean, if you don't live a healthy lifestyle, your body will just break down faster, and you'll have to get a new heart some day.

Mia: Sorry to change the subject. But can I clarify something from earlier in the lecture?

Hannah: Uh-huh.

Mia: So, has the Hayflick Limit theory been disproved? I'm talking about the interpretation that your life span is predestined.

Manny: By "predestined" do you mean … ?

Mia: Already decided. Like, the idea that at the time you're born, how long you're going to live is predestined.

River: I didn't take it that way. I think newer research shows that you can slow down the rate of cell division, and therefore, what'd she say about the clock?

Hannah: "Slow the hands of the clock."

River: Right. And live longer.

Mia: Well, I guess that's a good thing.

River: Yeah.