

How to Live Forever

3-5 PM, 56-114

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This course has two major objectives: to improve your general understanding of biology, and to teach you ways of approaching the problem of aging.

Day 1: Introduction

Required introductory ~~silliness~~ material. Once that is done with, we will discuss the causes of biological aging, the present approach to medicine, and its benefits and drawbacks in the context of aging.

Day 2: DNA and Cancer

DNA tells our cells how to function. When it gets messed up, bad things tend to happen. We will look at the ways our DNA tends to be damaged, and what effects that damage can have. The main undesirable consequence of DNA damage is cancer, so it will be a major focus. We will go into how cancer works, and the benefits and drawbacks of various approaches to dealing with it.

Day 3: Mitochondria, Free Radicals

We will have introduced mitochondria on day 2, when we cover their role in cancer. On day 3 we will cover their role in energy production, and how accumulated damage to the mitochondria decreases energy as we get older. The role of free radicals (produced primarily as a bi-product of energy generation) in the aging process will be a major point of emphasis.

Day 4: Sirtuins, Calorie Restriction

The sirtuins, a family of genes that regulate longevity and repair in a wide range of organisms; approaches to aging based on increasing their activity. Calorie restriction, its effects on lifespan and general health, and its possible mechanisms.

Day 5: Nutrition and Drugs

Effects of the intake of various essential nutrients and antioxidants on the aging process; effects of different calorie sources. Drugs targeting various aging-related pathways.

Day 6: Junk

Junk: stuff that gets into your body and won't go away. Its role in the aging process, and ways of dealing with it. Effects of asbestos, and possible effects of nanomaterials.

Day 7: Nanotechnology

MEMS (microscopic electromechanical systems) and nanite (machines built on the nanometer scale) based therapies are, at present, among the more speculative approaches to treating diseases, including aging. We will explore potential directions they might take.

Day 8: Prosthetics, Cybernetics and Tissue Engineering

When part of the body stops working, sometimes the best approach is to fix it. Sometimes it's better to just replace it. What currently exists in the field of prosthetics (crude artificial replacements), cybernetics (more advanced artificial replacements) and tissue engineering (organs and tissue grown in the lab).