Antibiotics changed our world. Before their discovery, bacterial infections were a leading cause of death. Today, we consider many of those same infections to be easily treatable by a course of antibiotics. We regularly conduct life-saving procedures, surgeries, and chemotherapy treatment because of the protection that antibiotics give us. Most people take them for granted.

However, antibiotics are a double edged sword. They cure millions of people every year, but they also face a growing problem. Bacteria are becoming resistant to the drugs that we designed to kill them. How does this happen, and what can be done to mitigate this growing issue?

To better understand how we can stop this threat, we need to know how antibiotics work. We also need to understand how bacteria become resistant to them. The youtube channel "In a Nutshell" explains how antibiotics kill bacteria in their video called "The Antibiotic Apocalypse Explained."

[insert audio from Kurzgesagt - In a Nutshell's video *The Antibiotic Apocalypse Explained*, timestamp 1:07-1:40]

If only it were that easy forever! Though we have developed incredibly complex and efficient ways to kill bacteria, they continue to outsmart us. Bacteria have several modes of resistance that they can transfer amongst themselves. Resistance arises through a process scientists call selective pressure. This process is explained in a youtube video called "What causes antibiotic resistance?" by TED-Ed:

[insert audio from TED-Ed's video *What causes antibiotic resistance?* Timestamp: 1:40-2:20]

Our widespread use of antibiotics in both human and agricultural settings has encouraged rapid mutations that give rise to resistance. Resistant bacteria in animals can be transferred to humans through poor sanitation and handling. Some types of bacteria are resistant to multiple drug types, and no new types have been discovered since the 1980s. So we clearly have an issue! We need new antibiotics and stronger guidelines around their use. The video "How can we solve the antibiotic resistance crisis" by TED-Ed discusses a major roadblock on the path to new antibiotics:

[insert audio from TED-Ed's video *How can we solve the antibiotic resistance crisis?*Timestamp: 4:36-5:10]

Going forward, policymakers and prescribers across the world must practice antibiotic stewardship. They must only prescribe antibiotics to patients who need them. Patients must take their entire course to reduce the risk of resistance. Funding must be subsidized by the

government to encourage new antibiotic development. The prophylactic use of antibiotics as growth promoters in agriculture must be banned. Infection prevention through better sanitation and public health must become a worldwide priority. Otherwise, we may find ourselves right back at square one.