The contributions of joshua lederberg to the microbial world

Science, Biology

Joshua Lederberg was born in New Jersey in 1925. His parents were recent immigrants from Israel and soon after his birth moved to Washington Heights in New York City. When he graduated high school, from Stuyvesant High school, he sought to continue his education. In 1941, when he was just sixteen years old, he attended Columbia College. In his three years at Columbia College he received a bachelor's degree in Zoology with a pre-medical emphasis. After he received his B. A. , he went on to Columbia University Medical school and studied with other physicians and surgeons for two years. During his time at Columbia University, he studied under F. J Ryan in the department of Zoology. But after a little while he decided to move to Yale University in Connecticut. At Yale he studied as a research fellow in the department of Microbiology and Botany. His research was spent studying the Jane Coffin Childs Fund for Medical Research. He did this for one year as a graduate student with his professor E. L. Tatum. With it now being 1948, he was awarded his Ph. D. After receiving his PH. D. in Microbiology, he was hired on at the University of Wisconsin as an assistant Professor of Genetics. After a few years he became a professor and then the chairman from 1957 to 1958. While here Lederberg discovered that you can duplicate bacterial colonies on filters so that you can study them further. He then left there to go to Stanford university's school of Medicine, also working in the department of genetics.

While at Stanford Lederberg Studied a couple different things. He was working on his bacterial studies and learning how they replicate and the process of exobiology. Lederberg was also one of the first ones to develop a computer system that could make decisions for itself based on algorithms.

He was very involved on the Space Science board of the national Academy of Sciences. In 1958 Joshua Lederberg was awarded a Nobel Prize for his discoveries. In one of his statements on it he said something along the lines of him just studying and exploring what was not really understood yet and happened to bump into a myriad of different things that ended up making him famous in the Microbial world. His studies focused on genetic recombination in bacteria and he studied these by looking at salmonella. He used penicillin and streptomycin to see if the bacteria had any resistance to antibiotics. The resistance to streptomycin showed Lederberg which strains were fertile and able to mate. Around the same time period Lederberg worked with Esther Zimmer and developed something called the Replica plating. This procedure allowed them to be able to see which mutations were able to resist bacterial viruses or antibiotics. We were now able to see this without exposing the mutants to any harsh drugs, any selective agents or another phage. They were able to accomplish this by moving the bacteriophages, using a sterile method, over a couple different plates and the ones that grew on the secondary plates were resistant colonies.

In 1951 Lederberg was able to come up with a third way to test genetic transfer in bacteria. This is separate from his finding on them mating and from the findings of another about the mechanisms of transformation. This new discovery was to be called transduction. They used a bent metal tube with a filter at the crook that would not allow anything through with salmonella on one end and wanted to see if the genetic material would go

through. DNA and RNA were too large to go through but they found that the salmonella gene had found its way through.

With further testing they found that it was the bacteriophage that had brought the bacteria through the filter with the goal to infect their new hosts. This discovery gave is the insight that cells without a nucleus transfer fragments of their DNA and not segments. His findings in the genetic world also gave way to a deeper understanding of how microorganisms inherit different mutations, how diseases have evolved, and what causes drug resistance. His work also allows us the possibility of gene therapy and genetic engineering.