**SCIENCE IN TEN MINUTES**

Chandra Emani\*

**Corn cobs and Nobel Prizes**

Ever heard of a “bubble-boy disease” where a newly born baby has to be kept in an enclosed space called a bubble that has sterile oxygen with no exposure whatsoever with the outside world? This unimaginable situation arises because the baby is born with a defective immune system. The baby has a defective gene for an enzyme in his blood called ADA (adenosine deaminase) and as a result, all the precursor cells in blood that make up our immune system are lost. Such an individual has no ability to fight any infection. Even a common cold would be fatal. There is no medicine or treatment option for this disease and even if we transplant some donor cells in him, they would be victims of the same defect. The only option for this baby to live is a technique called gene therapy that uses a virus that contains the normal ADA gene and that simply jumps around all the cells in the body literally transplanting all the cells with the information required to make immune cells. The incredible idea of the “jumping genes” came from the work of an amazing lady named Barbara McClintock and she was not even in the medical field. Barbara worked with corn, more precisely, corn cobs and the genetics involved in the development of corn or maize as it is conventionally known in scientific circles. In 1927, as a 25-year old graduate student in Cornell University, she observed that corn cobs that are mostly with yellow seeds, sometimes in breeding experiments, exhibit multiple-colored seeds that range from orange to beige to violet and red. This makes corn an ideal research material for geneticists who are interested to work out the details of varied substances that occur in a single organism, which in this case of a multi-colored seeded corn shows that each individual corn seed is a result of genes jumping around resulting in different compounds. Barbara figured that this is happening because of jumping genes (the technical term was *transposable elements*) that enables regions of genes in certain organism to literally clip off and jump to another region within an organism to create diverse products. This process can be controlled by researchers if they manage to locate the switches within the DNA that enable the jumping around process. What Barbara discovered and published in 1930s was mostly met with skepticism and even scorn by fellow researchers as they simply refused to believe that genes can jump around. Later research in 70s and 80s proved such switching systems existed in fruit flies and viruses thus sealing her place in plant as well as general biology. It is these jumping genes from a virus that were suggested as a cure for the bubble boy disease where a virus with the immune system genes is injected into a bubble boy and the gene jumps around recreating the lost immune system within him. So, basically you have a scientist that analyzed the workings of a mechanistic process in a corn cob phenomenon that were extended to a virus that became a treatment option for curing a fatal disease. After being marginalized in the scientific community for decades, at the age of 81, Barbara was duly recognized for her work and awarded the Nobel Prize in medicine and physiology. Her decades of perseverance in face of hostility were portrayed wonderfully in a book titled “A feeling for the organism” by Evelyn Fox Keller and a quotation from the book aptly captures the true spirit of science: “Good science cannot proceed without a deep emotional investment on the part of the scientist. It is that emotional investment that provides the motivating force for the endless hours of intense, often grueling labor.” Barbara had an emotional feeling for maize, her organism of research that yielded a benefit for human health. Salute the lady and her perseverance. Barbara died in 1992, aged 90, and she went home from lab and drifted to a peaceful sleep.

Speaking of corn, let’s talk about what a good ear of corn is worth in terms of the health benefits. For starters, it is a rich source of anti-oxidants and 2.5 cups of fresh corn contains about 12 grams of fiber that supports the growth of beneficial bacteria in our colon that breaks down the fiber to what are called SCFAs (short chain fatty acids). These SCFAs supply energy to our intestinal cells and keep them healthy, thereby help lower our risk of colon cancer. Corn is a versatile vegetable that contains several [vitamins](http://health.howstuffworks.com/vitamins.htm) such as folic acid, niacin, and [vitamin C](http://health.howstuffworks.com/vitamin-c.htm). The [folic acid](http://health.howstuffworks.com/folate.htm) is highly beneficial as it is an important factor in preventing [neural-tube birth defects](http://health.howstuffworks.com/alternative-treatments-for-birth-defects-ga.htm). Additionally, folic acid prevents [heart disease](http://health.howstuffworks.com/heart-attack.htm) by preventing the buildup of an amino acid toxin called homocysteine in the body that has been linked to higher rates of heart disease. So next time you eat a good old corn cob, know that you are guzzling down a medicine as well as a snack.

And finally, Michael Bishop, a small town college kid who went on to win a Nobel Prize in medicine for discovering cancer causing oncogenes once got a single sentence e-mail that read: “Dear Dr. Bishop, How do I win a Nobel Prize?” So the good old Dr. Bishop wrote a fabulous book titled “How to win the Noble Prize: An unexpected life in science.” Pick it up at your favorite bookstore and you will come out elated, amused and enlightened at how funny and fulfilling a scientist’s life can be.

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