The hardest part, he says, was designing a method for testing well water in the field. Arsenic is an extremely potent poison and can cause devastating effects when it comprises just one part in twenty million molecules of water - the concentration of a single murderer in all of New York City. After two years of work he had developed a reliable method and tested the well in his family's village. The results came in at more than three times the World Health Organization's designated safe limit.

With the help of his brother, a physician, and his chemistry mentor, he began working on a solution immediately and read through the available scientific literature. One study in particular caught his eye: arsenic levels had been shown to decline when allowed to flow over hydrous ferric oxide, or in layman's terms, rust. The arsenic molecules bound to it firmly leaving the water behind arsenic-free. Most promising of all was that the bond was so strong that the rust could be disposed of without any danger of the arsenic re-entering the soil. The only problem was that he would need a very high surface area of rust, much higher than a few rusted plates could provide.

If Dr. Hussam's filter was to be successful, it would also have to be practical. It could not depend on electricity as many parts of Bangladesh do not have a reliable source of power. It would have to be easy to install by people with little knowledge of how it worked. It would have to be operable for years without clogging or requiring a filter change. Most importantly, it would have to be inexpensive. Bangladesh is one of the poorest countries in the world, with nearly a third of its citizens living off of less than one dollar per day. A simple table-top Brita filter, which is not sophisticated enough to remove arsenic, could cost more than weeks' income.

Eventually, the solution came in iron turnings - those curly cues of waste iron and steel that result from lathing metal in machine shops. **Dr. Hussam experimented with more than two hundred different designs, varying everything from the chemical pre-treatment of the metal to the size of the buckets containing them.** Finally, after two years, he thought he had come up with a design that would work: a two-bucket system of layered charcoal, sand, and specially treated rust. Best of all, the data appeared to confirm its success. When asked what his emotions were during his "Eureka" moment, Dr. Hussam responded that though excited, "a scientist always has skepticism." The real question, he said, was how long it would work before it wore out.



Despite fears about its longevity, he began building and distributing the filter immediately. His brother, a physician in Bangladesh with a knack for chemistry, supervised the manufacture, quality control and distribution of the filter. A second brother, an economist at the Dhaka University, helped to secure funding from international aid groups. Together they distributed some 21,000 filters with another 10,000 to come - enough to help a quarter of a million people. Charles O'Melia, a Professor of Environmental Engineering at Johns Hopkins University and chair of the award's selection committee, said the extensive deployment of the filter was a key part in their decision. When asked what his reaction was to receiving the prize, Dr Hussam said that, although he knew he might have a chance, it truly came as a surprise. It solicited a deluge of emails and cards from old colleagues, including his former advisor whose address he had long lost and who was now living in a retirement home.

What is perhaps most surprising of all, however, was his decision to give the entire million-dollar prize away. $250,000 will go to funding further research, including for use in the United States where some twenty-five million people drink water with elevated levels of arsenic. $50,000 will go to the University that made his research possible. The remaining $700,000 will go to building more filters, especially for the poor who are unable to purchase them for themselves.

His decision to give the money away stems, he says, from the values his father taught him and what he regards as the Islamic vision of science: "I see absolutely no conflict between faith and science." But whereas many have written about the Islam and science discourse at the philosophical level of reason and revelation, for Dr. Hussam the harmony is straightforward. "The Islamic faith means helping people. The goal is the human good."

(Source: islamicamagazine.com)