Stockholm Water Prize Laureate tackles the water quality challenge

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Dr. Rita Colwell, distinguished Professor at the University of Maryland and Johns Hopkins University's Bloomberg School of Public Health in the United States, was awarded the 2010 Stockholm Water Prize last September. The prize signifies the importance of her pioneering research on the prevention of waterborne infectious diseases, which has helped protect the health and lives of millions.

Dr. Colwell, widely recognized as one of this century's most influential voices in science, technology, and policy associated with water and health, has made exceptional contributions to control the spread of cholera, a waterborne pathogen that infects 3–5 million people and leads to an estimated 120,000 deaths each year.

Fig. 1 The 2010 Stockholm Water Prize Laureate, Dr. Rita Colwell, University of Maryland and John Hopkins University's Bloomberg School of Public Health

Receiving the prize at the World Water Week in Stockholm, the Laureate presented a strong message to the participants of the conference and the international water, sanitation and development community, urging them to consider the lack of access to safe drinking water as a threat to national and economic security.

“The public health problems we face in the twenty-first century are complex—we need to address them in a systems-approach as the magic bullet or the single unique solution doesn't apply anymore. The problems are very much integrated in that sense, and so are the solutions... By providing safe water we address and prevent many waterborne diseases simultaneously which contribute to the economic

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strength and national security of any country,” she said.

Working to prevent and eradicate disease should be an international and national priority according to the Laureate, as it impedes human development on many fronts. Waterborne diseases are the second most frequent cause of death of children under 5 and the morbidity and mortality of other millions.

“Infection by waterborne diseases, parasites, bacteria and viruses cause a reduced capacity for work and daily functions, which creates economic and social disruption and a reduction of a capacity of a country. Safe drinking water is absolutely critical to economic stability and national security.”

She warns that infectious, waterborne disease could spread as a direct result of climate change. “Cholera and many other pathogens, those that cause intestinal infections, are controlled by climate in their division, reproduction and multiplication. Due to increased water temperatures, we can probably expect these pathogens to spread across wider geographical distribution and over longer seasonality. This would perhaps cause more intensive infections.”

However, there’s room for optimism, as advanced ways of monitoring and controlling the spread of waterborne infectious diseases, such as the use of sensors on satellites that circle the globe, help monitor temperatures of water bodies, and the seasonality of the plankton that in many cases carry the pathogenic bacteria and viruses.

“Molecular biology provided us with genomics, molecular genetics and understanding of the genomes of pathogens, their interactions, how they exchange genes that code for certain properties. We have also utilized satellites with sensors to monitor temperature, chlorophyll presence in sea water, sea water height and vegetation. These are characteristics that are associated with waterborne and terrestrial diseases. These fascinating tools: molecular tools, satellites imaging, mathematics, computer data analysis, help us now to understand the transmission of waterborne diseases much better, predicting when the outbreaks will occur, and to pin point in time and space the treatments that should be applied in guaranteeing the safety of public health and control of those infectious diseases.”

Asked about the biggest challenges today in fighting cholera, she said the biggest challenge in fighting waterborne diseases is providing sanitation

and safe drinking water in developing countries. The appropriate solutions, according to her, can be found locally. Her vision is that it will be possible to provide improved quality drinking water using simple technologies from simple filtration to the most complex of safe water delivery systems.

“The most effective way to eradicate waterborne diseases is to provide safe water treatment. For developed countries, this involves sophisticated filtration, chlorination and distribution, but for developing countries and remote areas, we need to apply appropriate technologies which can be found locally, such as filtering using a cloth filter, or plastic fine mesh filter that removes particulates and organisms carrying bacteria that cause disease.”

1 Challenging dogmas

His Majesty the King of Sweden Carl XVI Gustaf presented the prize to Dr. Colwell during a Royal Ceremony at the World Water Week 2010. As the prize celebrated its 20th anniversary this year, the ceremony was also attended by a majority of the 20 previous laureates.

Dr. Colwell, 75, said the prize recognizes and validates an entire career of research she has done in the areas of water safety and health, specifically in the controversial but proven hypothesis concerning the distribution and transmission of cholera.

“We have demonstrated that cholera is a bacterium associated with plankton, and we’ve been able to demonstrate how to reduce the incidence of the disease by removing plankton and particulates from drinking water sources. The work we’ve done on cholera represents a paradigm for waterborne disease... we demonstrated that the bacterium is naturally occurring in the environment as opposed to the preexisting dogma—an absolute belief that it was transmitted person to person and doesn’t occur in the environment,” Dr. Colwell said.

2 A lifetime of scientific leadership

Dr. Colwell was born in Beverly, Massachusetts, in the United States in 1934. She has authored or co-authored 17 books and more than 700 scientific publications. Over the years, Dr. Colwell has worked

extensively to spread community-based water safety education and viable, low-cost technological innovations in communities throughout South Asia and in Africa. During the cholera pandemic in Latin America in the 1990s, Dr. Colwell's worked as national advisor to multiple governments. In Ecuador, her discovery of the presence of *Vibrio cholera* in the hospitals and in the shrimp industry saved countless lives. In Peru, she was honoured by the national government for her work to develop of drinking water criteria that helped guide policies to curb the spread of the disease.

Dr. Colwell has held many advisory positions in the US government, in non-profit science policy organizations, within private foundations, in the

international scientific research community. She was appointed by President Bill Clinton as the first woman to serve as Director of the National Science Foundation (NSF) from 1998 to 2004. In 2000, she was inducted into the United States National Academy of Sciences. A passionate educator, some of her major interests include primary and high school science and mathematics education, graduate science and engineering education, and the increased participation of women and minorities in science and engineering.

Interview by Rami Abdelrahman, Stockholm International Water Institute (SIWI).

For more information: <http://www.siwi.org/sa/node.asp?node=914>.