**Title:** Development of rapid biosensors for the detection of arsenic in drinking water

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## Abstract

Arsenic pollution is one of the major public health problems in many parts of the world, especially in drinking water. Estimates have found that more than 100 million people worldwide suffer from arsenic poisoning in drinking water containing high arsenic levels. The situation is worst in countries like Bangladesh, India and Nepal. The situation is devastating in Bangladesh, which reflects the number of affected people. In the present investigation, efforts were undertaken to develop a column of beads with immobilised DNAprobes and arsenic-responsive DNA binding protein (ArsR) coupled to a visible reporter protein, i.e. mCherry. In the absence of arsenic(III), the fusion protein binds tightly to DNA, but on addition of arsenic, the protein dissociates from the DNA. A number of immobilization matrix ((alginate beads, ion exchange resin, and commercial streptavidin-coated beads) was tested in which the target DNA immobilized on a solid support so as to create a practical biosensor device which could be used in the field; on addition of arsenic-containing water, the red fusion protein would be released from the immobilized DNA generating a visible red colour in the water, indicating that the water is unsafe for consumption. Results showed that the columns of the tested matrices were able to demonstrate binding of DNA and subsequent arsenic-responsive unbinding of the red fusion protein, indicating the potential practicality of a device. Though results with alginate beads and NeutrAvidin Agarose Resin based on cell-free systems are promising and novel, further experiments are needed to establish the utility of cheap, reliable and rapid detection of arsenic in water. In addition, reusability of the column is a big concern, which needs to be resolved.