PT007 Design of materials to capture and enrich bacterial samples

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Background: Diseases arising from pathogenic infections cause immense loss of life and illnesses globally besides having severe negative social and economic impact. Current methods of diagnosing such infections rely mostly on culture-based assays which are complex, time consuming and expensive. Other related problems include low detection limits of diagnostic methods, thus requiring methods to concentrate and enrich the samples being analysed.

Objectives: It is imperative that novel diagnostic methods which are simple, accurate, quick and cost-effective are developed. An approach to develop such a diagnostic platform is by including an enrichment step to concentrate the microorganisms present in the biological samples and then the detection of specific pathogens.

Methods: To capture and concentrate bacteria from samples, collagen nanoparticles were synthesised and then incubated with those samples. Collagen binds to bacteria leading to enrichment upon elution. In addition, magnetic particles were added to the collagen nanoparticles in order to facilitate the recovery of the nanoparticles from the samples.

After enrichment of a given sample a specific detection method utilizing voltammetric biosensors was used. Electrodes to be used can also be functionalised to specifically capture bacteria and avoid the adhesion of unspecific molecules to the electrode which could affect the accuracy of the read-out.

Results: Bacteria bind to the collagen-magnetic nanoparticles and these nanoparticles can be recovered using a magnetic field.

Polypropylene - which is the substrate being used for the electrodes construction – was functionalised by physical treatments including plasma, UV and ozone to ultimately produce an anti-adhesive surface.