**Using thermoelectric heating-assisted electrohydrodynamic evaporation and centrigugation device to develop micro-concentrator to detect Salmollena in food samples using Raman tags**

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**Introduction** & **Aims**

This study is aimed to integrate thermoelectric heating unit with electrohydrodynamically enhanced micro-evaporation device to quickly concentrate food sample containing Salmollna using ionic wind-driven micro-centrifugal flows. Bound with Raman sensing nanobeads, limited copies of pathgens in food were concentrated to detect.

 Surrounding gas molecules near one metallic needle applied with high voltage can be ionized to accumulate. These discharged species finally repel each other to eject one gas stream i.e. ionic wind from the needle tip. Previously we use this ionic wind swiping across the top of one droplet to create centrifugal vortices to trap Raman sensing nanobead-bound bacteria samples. At the same time, ionic winds accelerate droplet evaporation to achieve 1000-fold concentration effect. Using this device single copy determination in 10 µL sample has been reported without any bacteria cultivation steps. In this study, thermoelectric heating unit is imbedded in the aformentioned ionic wind-based micro-concentrator to further improve drying efficiency to handle real sample of larger volumes.

**Methods**

We applied ac voltage 600 Vrms of high frequency (60 kHz) for safety concern on the discharge neelde of the ionic wind-driven micro-evaporation device containing a thermoelectric unit to concentrate Salmonella sample. The thermal convection in the sample droplet was accelerated to efficiently increase liquid evaporation rate. The food pathogens bound with sensing beads were using Raman microscope when dried down completely.

**Results & Discussion**

 The drying and concentration time of 100 µL sample of Salmonella was decreased from nearly two hours without using heating unit to about 30 minutes. Right after the concentration steps, Raman sensing nanobead-bound Salmollena were succesfully determined at the level of single copy (10 CFU/mL), close the requirement of detecting ready-to-eat food without any bacteria cultivation steps.

 We also demonstrated the feasiblity of using this device to detect ice cube and lettuce samples. The detection limits were found 2 CFU in these spiked samples, nearly matching the zero tolerance demanded by the regulatory authorities.

**References**

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