Pre-concentration methods for detection of pathogens in microfluidic systems

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Motivation

→Detection of pathogens:

Environmental waters

Food products

Blood samples

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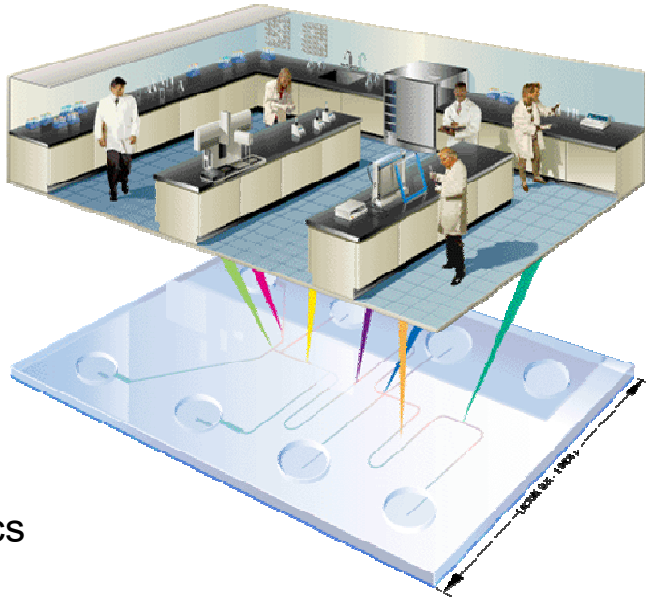
Microfluidic solutions



www.gene-quantification.de

→Advantages:

Point-of-care diagnostics

Quick

Affordable

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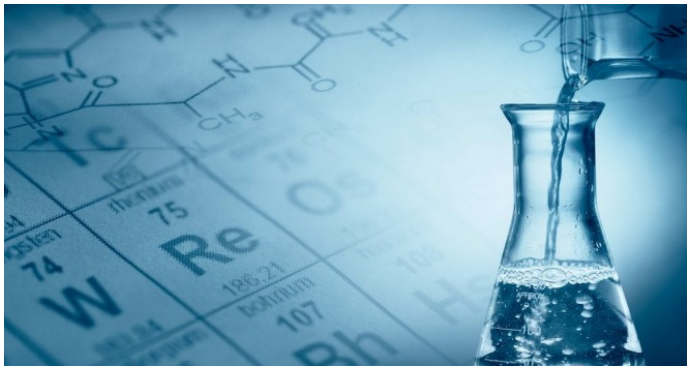
Sample pre-concentration



→Complex composition of bulk sample:

Chamber for target enrichment is necessary for higher detection sensitivity

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Sample detection

Currently used methods

→Flow cytometry
→qPCR
→UV-spectrometry

Target pathogens

→Salmonella

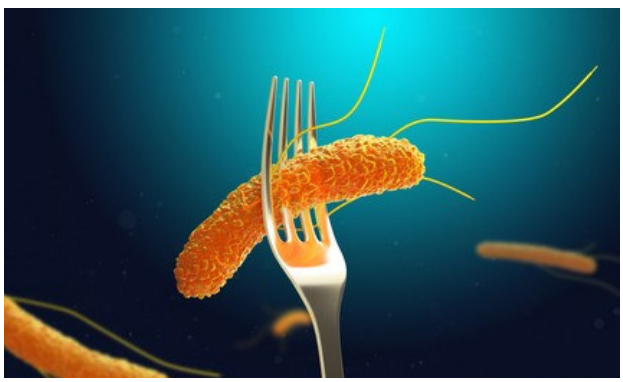

Image: shutterstock.com

→SARS-Cov-2

Image: www.unido.org

Target pathogens

→Human adenovirus

Image: www.rechargenews.com

→E-Coli

Image: savethewater.org

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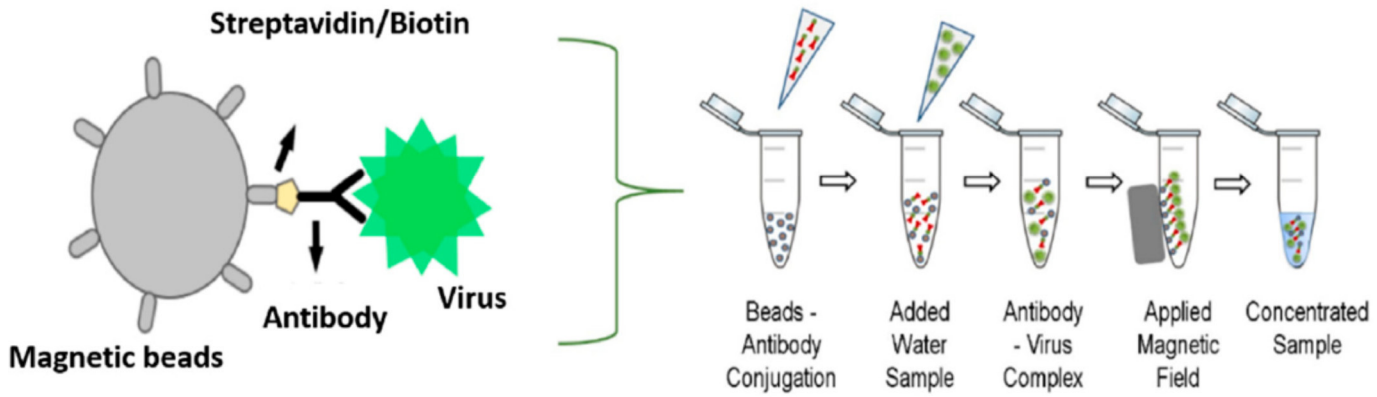
Immunomagnetic separation



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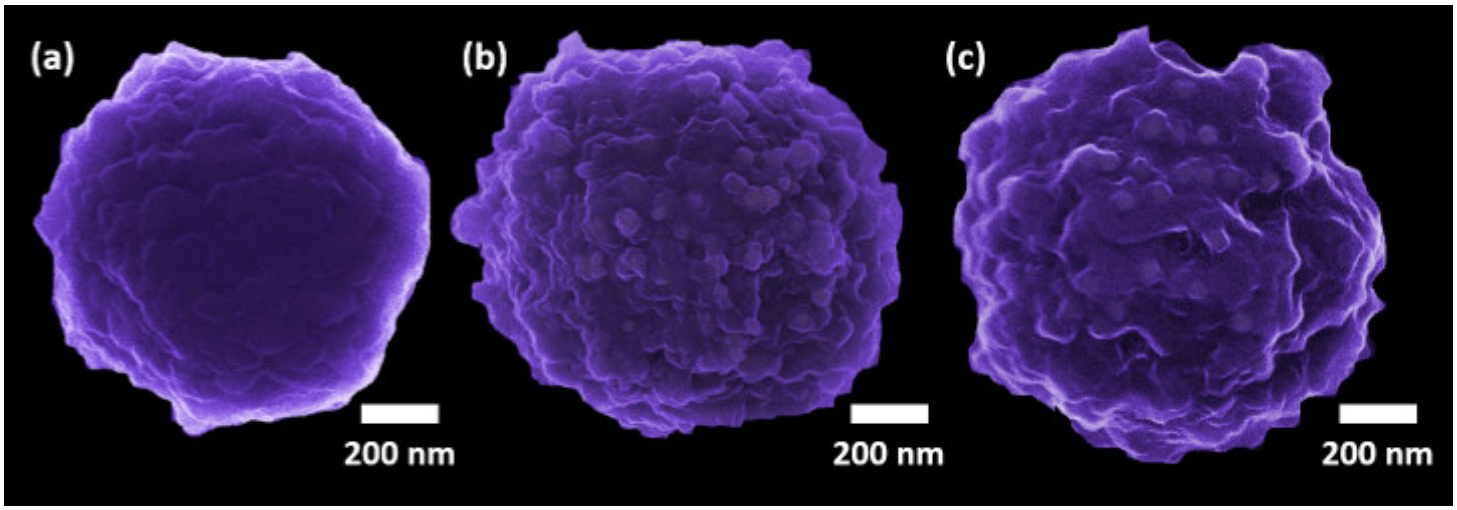
Beads functionalization

Target: Human adenovirus



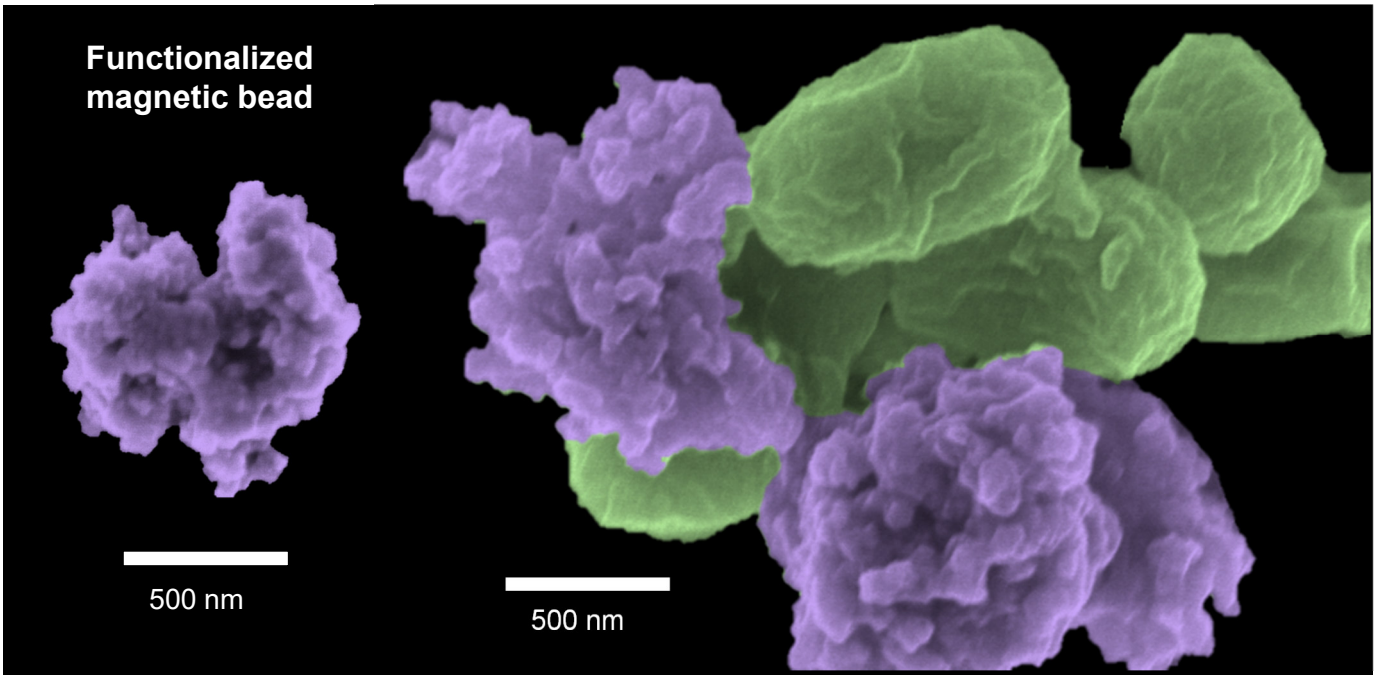
Functionalized magnetic bead

Bead exposed to wastewater

Bead exposed to control sample

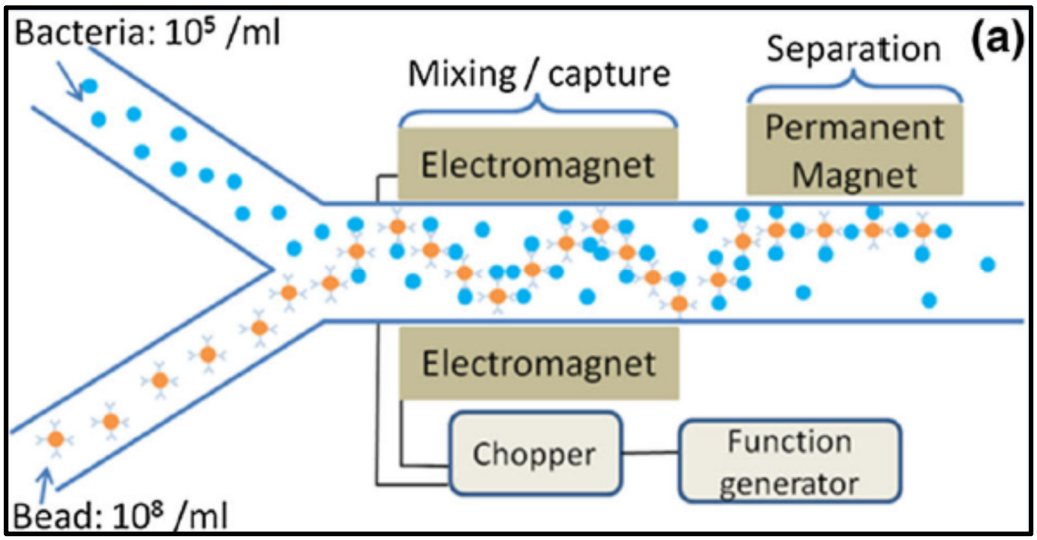
Beads functionalization

Target: E-coli bacteria



Bead exposed to control sample

Immunomagnetic separation



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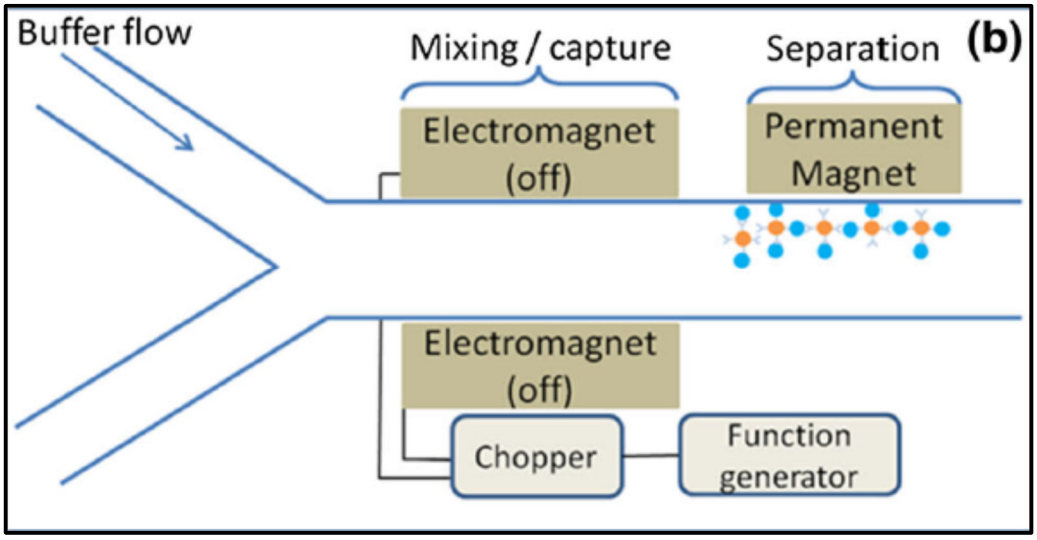
Immunomagnetic separation



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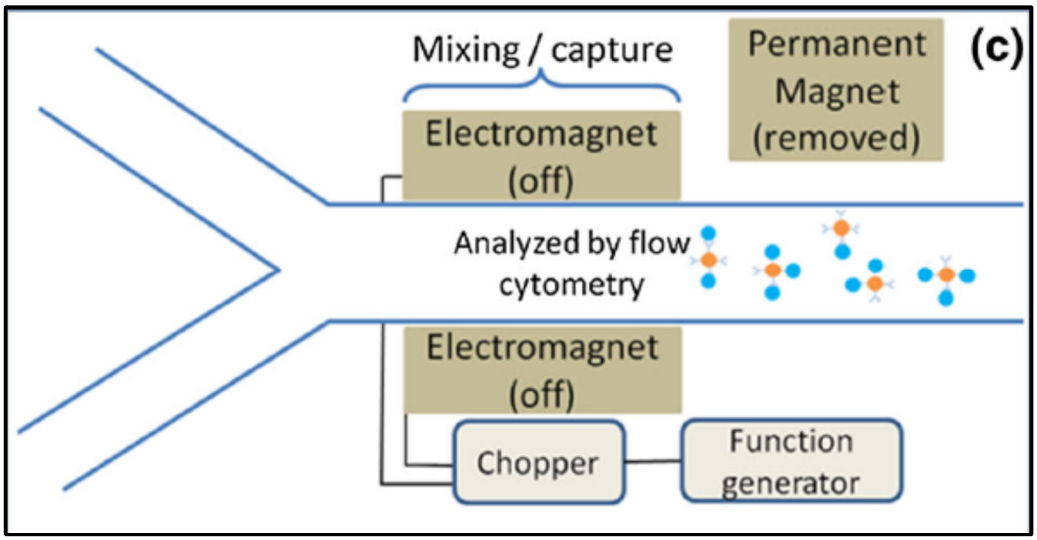
Immunomagnetic separation



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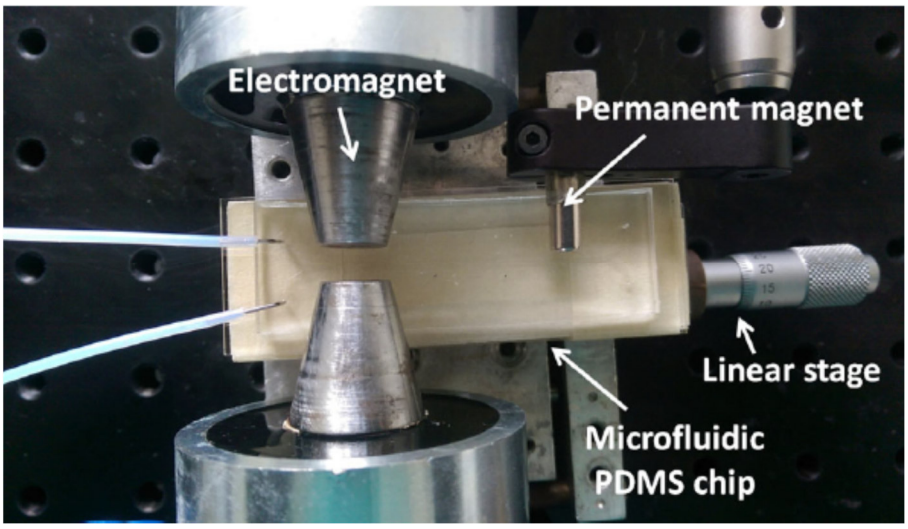
Immunomagnetic separation



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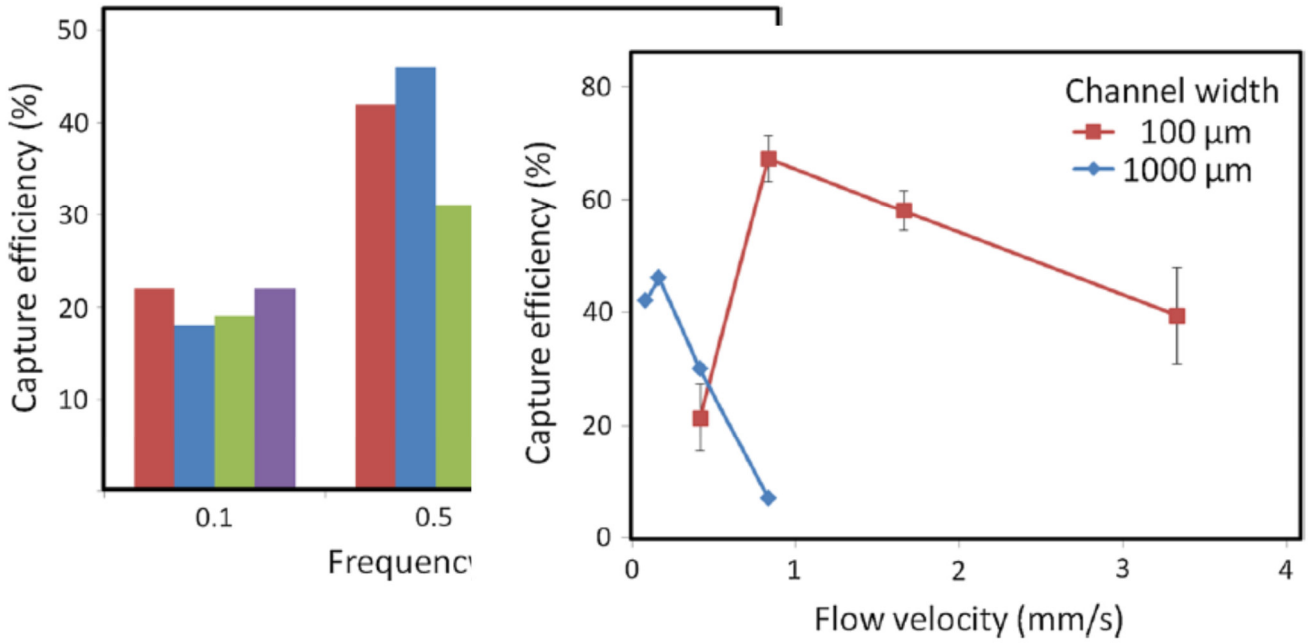

Application to environmental waters

chemosensors

MDPI

Article

Functionalized Surfaces as a Tool for Virus Sensing: A Demonstration of *Human mastadenovirus* Detection in Environmental Waters

Juliana Schons Gularte [1,2,*], Roana de Oliveira Hansen [3], Meriane Demoliner [1,2], Jacek Fiutowski [3], Ana Karolina Antunes Eisen [1,2], Fagner Henrique Heldt [1,2], Paula Rodrigues de Almeida [1,2], Daniela Müller de Quevedo [4], Horst-Günter Rubahn [3] and Fernando Rosado Spilki [1,2]

Application to environmental waters

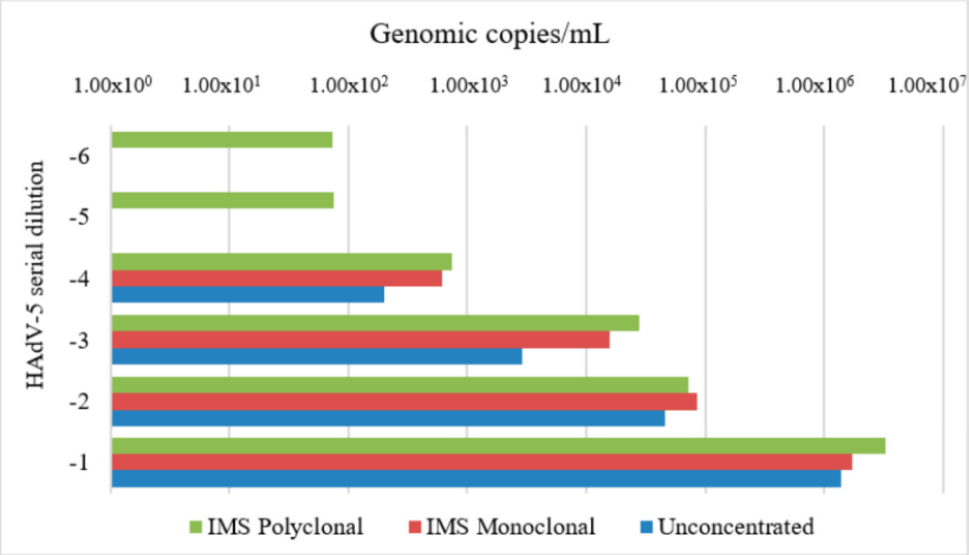

Figure 4. Averages of qPCR results to standard HAdV analyses of unconcentrated and concentrated samples by the IMS method.

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Application to environmental waters

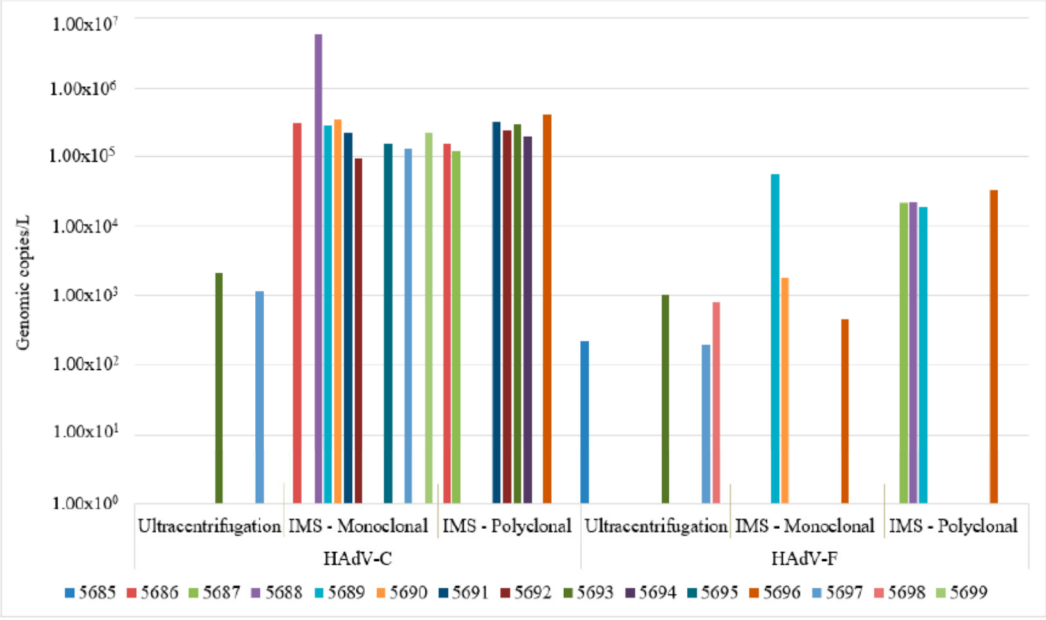

Figure 7. Results of HAdV-C and -F in water samples comparing ultracentrifugation and IMS methods detected by qPCR.

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Conclusions

Immunomagnetic separation:

- Improved pre-concentration
- Suitable for environmental samples
- Compatible with several detection methods
- Suitable for lab-on-chip applications

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Fernando Spilki

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