

# Nanomaterials and Photonic solutions: Novel 'at source' approaches to stop hospital derived priority substances reaching the sewer network



Hydro Nation Scholars Programme

Manuel-Thomas Valdivia

## My background

2008 – 2013 Chemical Engineering at Polytechnical University Brunswick, Germany

2014 – 2016 Water Quality Scientist at Scottish Water

2017 – 2020 Research Technician in the Division of Biomedical Sciences, UHI



Highlands and Islands Enterprise  
Iomairt na Gàidhealtachd 'n nan Eilean



Division of Biomedical Sciences

Environmental Research Institute

Prof Alistair Kean Medical Nanotechnology

Dr Szabolcs Pap Chemical Engineering, Material Science

Prof Ian Megson Pharmacology

Dr Mark Taggart Environmental Chemistry, Ecotoxicology

**POLYCAT UK**

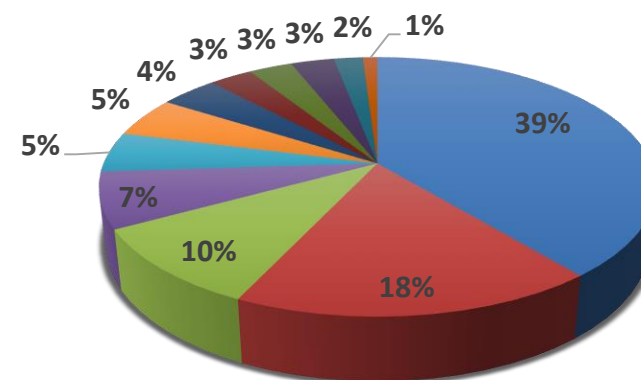
Raigmore Hospital



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Release of active drug ingredients into municipal sewers



- Antibiotics
- Antiviral drugs
- Analgesics
- Diabetic drugs
- Anti-epileptic drugs
- Chemotherapy drugs
- Others
- Anti-inflammatories
- Aperients
- Antiacids
- β-Blockers
- Psychopharmaceuticals

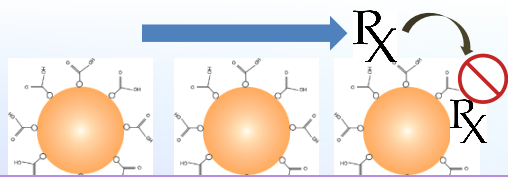
Little is known about specific 'drug cocktails' released at hospitals, their toxic effects on the environment, drinking water, human health

ng/L - antibiotics  
several mg/L - contrast media



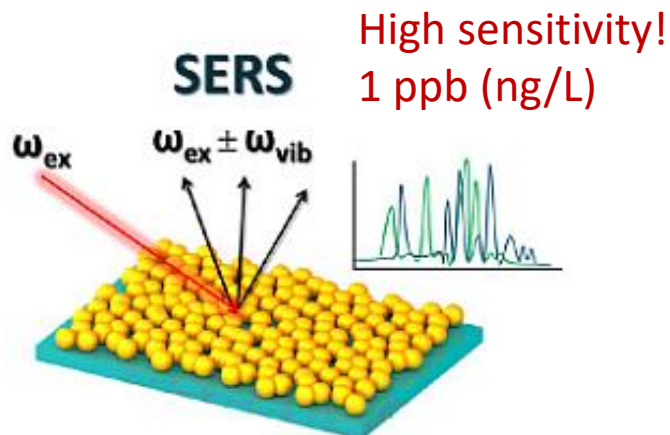
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Compound elimination  
Photocatalysis



Nanoparticles immobilised on surface

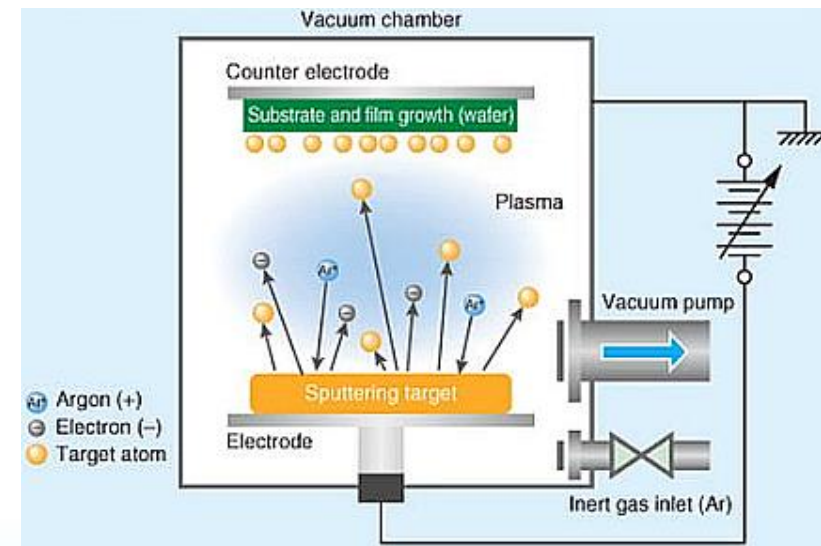
Compound detection  
Raman spectroscopy



High sensitivity!  
1 ppb (ng/L)

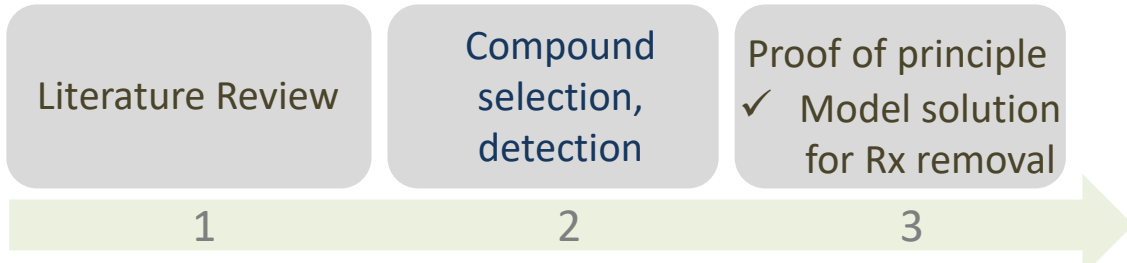


Surface modification  
Physical Vapour Deposition



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## 3-stage project plan



### What has been done



#### ✓ Pilot study completed:

Testing of existing filter technology for the removal of paracetamol and amoxicillin



Industry link established with **POLYCAT UK**

### Currently in process

#### Literature Review article:

*Significance of hospitals as point-sources for the release of active pharmaceutical ingredients into the water cycle;  
A global comparative overview and implications for human health*

### Outlook

Development of a sensitive multi-compound detection method (ng/L)

Comparison Raman spectroscopy vs Conventional LC-MS



# Thanks

For further information & updates, please  
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manuel-thomas-valdivia](http://www.hydronationscholars.scot/scholars/manuel-thomas-valdivia)



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