

# Monitoring of emerging micropollutants in hydric media in Bragança district

A. Nemoto<sup>1,2</sup>, M. Gonçalves<sup>2</sup>, A. Ribeiro<sup>1</sup>, P. Brito<sup>1</sup>, A. Queiroz<sup>1,\*</sup>

<sup>1</sup>Mountain Research Center (CIMO), Polytechnic Institute of Bragança, Campus de Sta. Apolónia, 5300-253 Bragança, Portugal;

<sup>2</sup>Technological Federal University of Paraná, R. Rosalina Maria Ferreira - 87301-899, Campo Mourão, Brazil;

\*amqueiroz@ipb.pt

## EMERGING MICROPOLLUTANTS

### POLLUTANTS

- Substances in different environmental matrices.

### EMERGING POLLUTANTS

- Compounds detected due to recent advances of analytical techniques and instrumental methods;
- These compounds were not considered as pollutants until now [1].

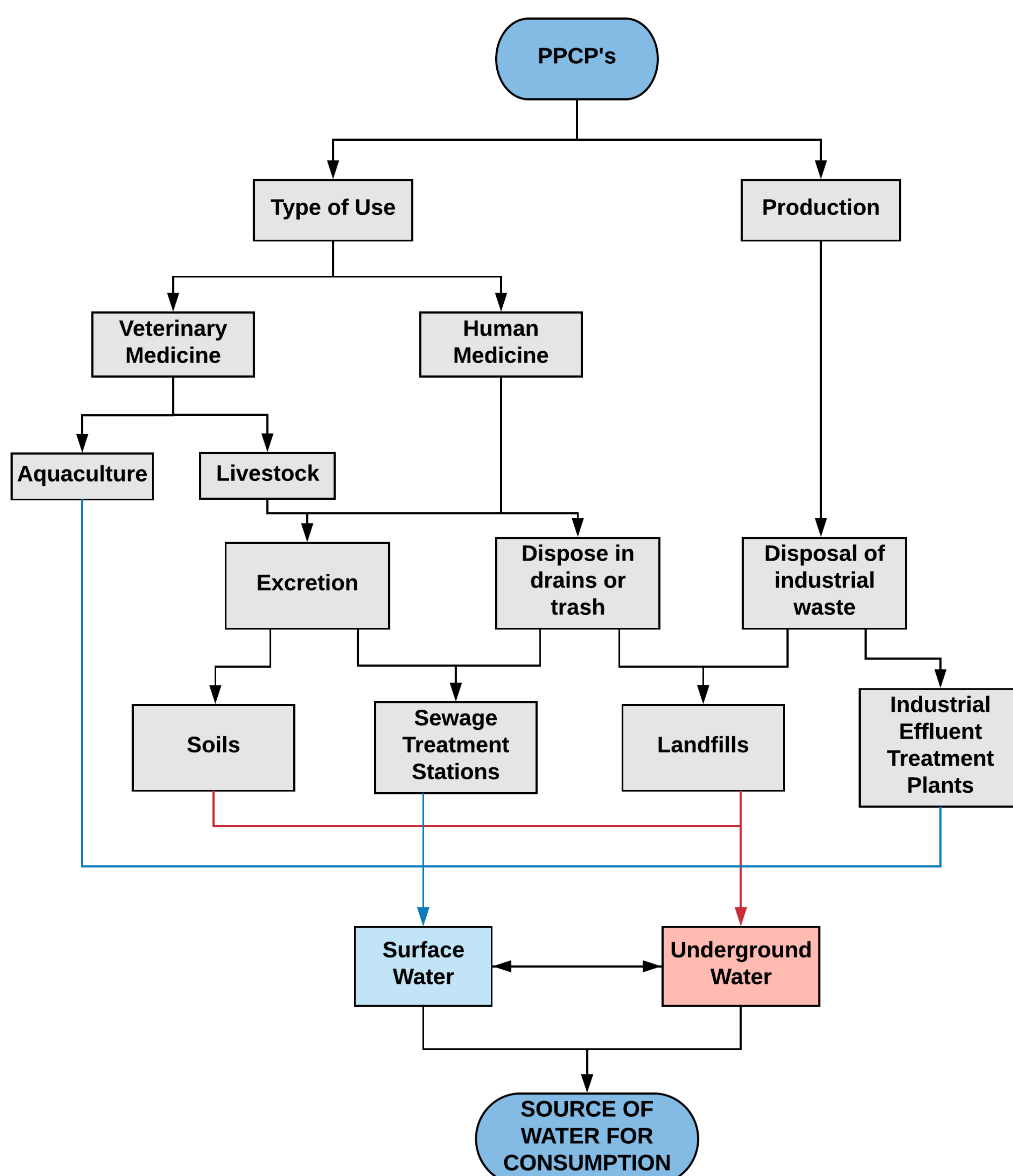
### EMERGING MICROPOLLUTANTS

- Very small concentrations ( $\mu\text{g/L}$  or  $\text{ng/L}$ );
- Persistent organic pollutants (POP's);
- Endocrine disrupting compounds (EDC's);
- Pharmaceuticals and personal care products (PPCP's) [2].

**Emerging Micropollutants** are a subclass of Pollutants and they can be classified as Persistent Organic Pollutants, Endocrine Disrupting Compounds and Pharmaceuticals and Personal Care Products (PPCP's). These compounds may cause undesired effects to health or to the environment when used in high quantities or wrong ways. Generally, a pharmaceutical drug is prescribed to cause the desired therapeutic effect. However after their use, even at low concentrations they can retain their physicochemical properties [1].

Because of these effects, among others, **PPCP's** are substances excreted in relevant quantities by the human body and are not effectively removed from water in sewage treatment plants [2].

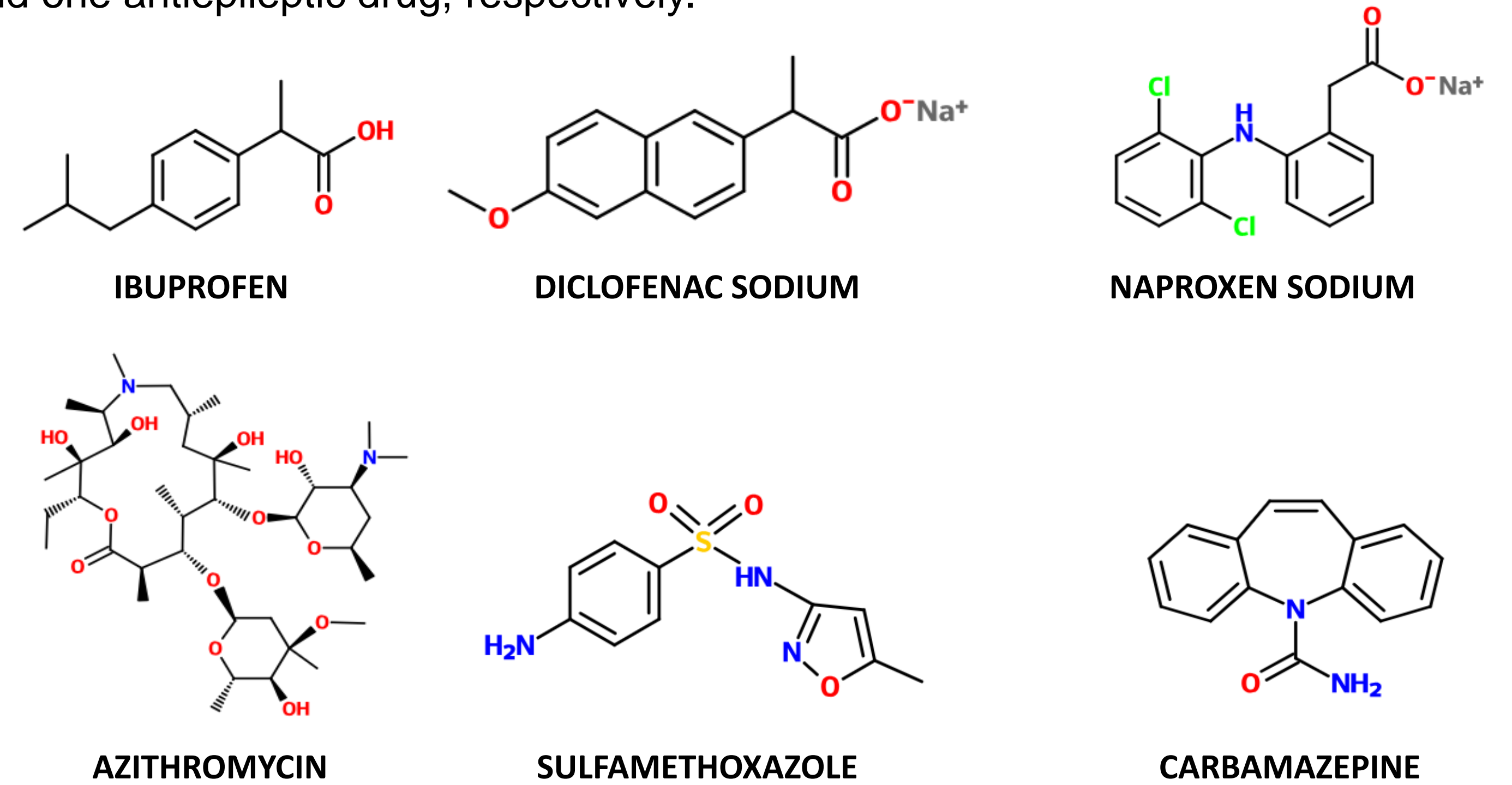
### MAIN SOURCES OF PPCP's CONTAMINATION



## EXPERIMENTAL METHODOLOGY

### SELECTED PPCP'S TO THIS STUDY

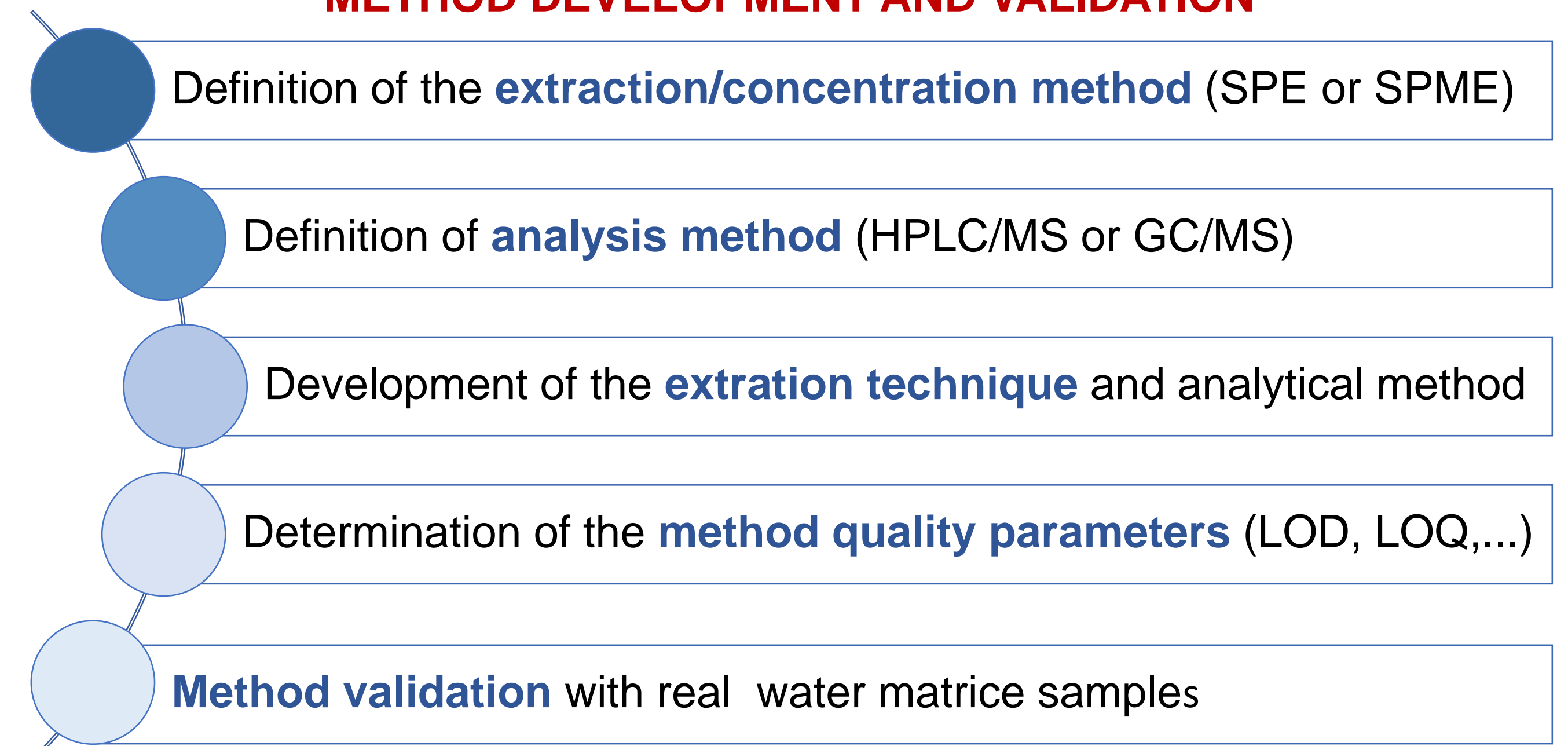
After a preliminary screening, six pharmaceutical drugs were selected for this study: **ibuprofen**, **diclofenac**, **naproxen**, **azithromycin**, **sulfamethoxazole** and **carbamazepine**. The first three are anti-inflammatory, followed by two antibiotics and one antiepileptic drug, respectively.



The main **extraction techniques** for micro contaminants in environmental matrices are Solid Phase Extraction (SPE), Solid Phase Micro Extraction (SPME) and Liquid-Liquid Extraction (LLE). Due to the large amount of organic and toxic solvents used in LLE, the SPE AND SPME techniques are actually preferable [2].

Due to the very low levels of PPCP's concentration in water matrices, Gas Chromatography-Flame Ionization Detection (GC-FID), Gas Chromatography-Mass Spectrometry (GC-MS), High Performance Liquid Chromatography-Diode Array Detection (HPLC-DAD) or High Performance Liquid Chromatography-Mass Spectrometry (HPLC-MS) are instrumental methods of analysis normally used [2].

### METHOD DEVELOPMENT AND VALIDATION



### LITERATURE REVIEW (SUMMARY)

COMPOUND	LOQ (ppb)	MATRICE	METHOD	REFERENCE
IBUPROFEN	170	Effluent	SPE-HPLC-DAD	[3]
DICLOFENAC	0.0229	Raw sewage	SPE-HPLC-MS	[2]
NAPROXEN	0.12	Wastewater	SPE-HPLC-DAD	[4]
AZITHROMYCIN	0.013	Wastewater	SPE-LC-MS-MS	[5]
SULFAMETHOXAZOLE	0.00625	Raw sewage	SPE-HPLC-MS	[2]
CARBAMAZEPINE	0.00071	Pool water	SPE-GC-MS	[6]

## REFERENCES

- [1] A. Viali, "Avaliação da eficiência de remoção de hormônios em estações de tratamentos de efluentes", Concluding Work, Juiz de Fora Federal University, 2014.
- [2] F. Queiroz, "Desenvolvimento e validação de metodologia para determinação de fármacos e perturbadores endócrinos em amostras de esgoto utilizando extração em fase sólida e cromatografia líquida acoplada à espectrometria de massas", Master Thesis, Ouro Preto Federal University, 2011.
- [3] R. Colaço, "Determinação de diclofenaco e ibuprofeno em matrizes aquosas por EFS-CLAE-UV", Master Thesis, Paraná Federal University, 2013.
- [4] L. Madikizela, L. Chimuka, Water SA 43 (2017) 264-274.
- [5] I. Senta, I. Krizman-Matic, S. Terzic, M. Ahel, Journal of Chromatography 1509 (2017) 60-68.
- [6] A. Lempart, E. Dudlek, M. Dudziak, Proceedings 2018, 2(5), (2017) 177-185.