

Elimination of Antibiotics by Reverse Osmosis.

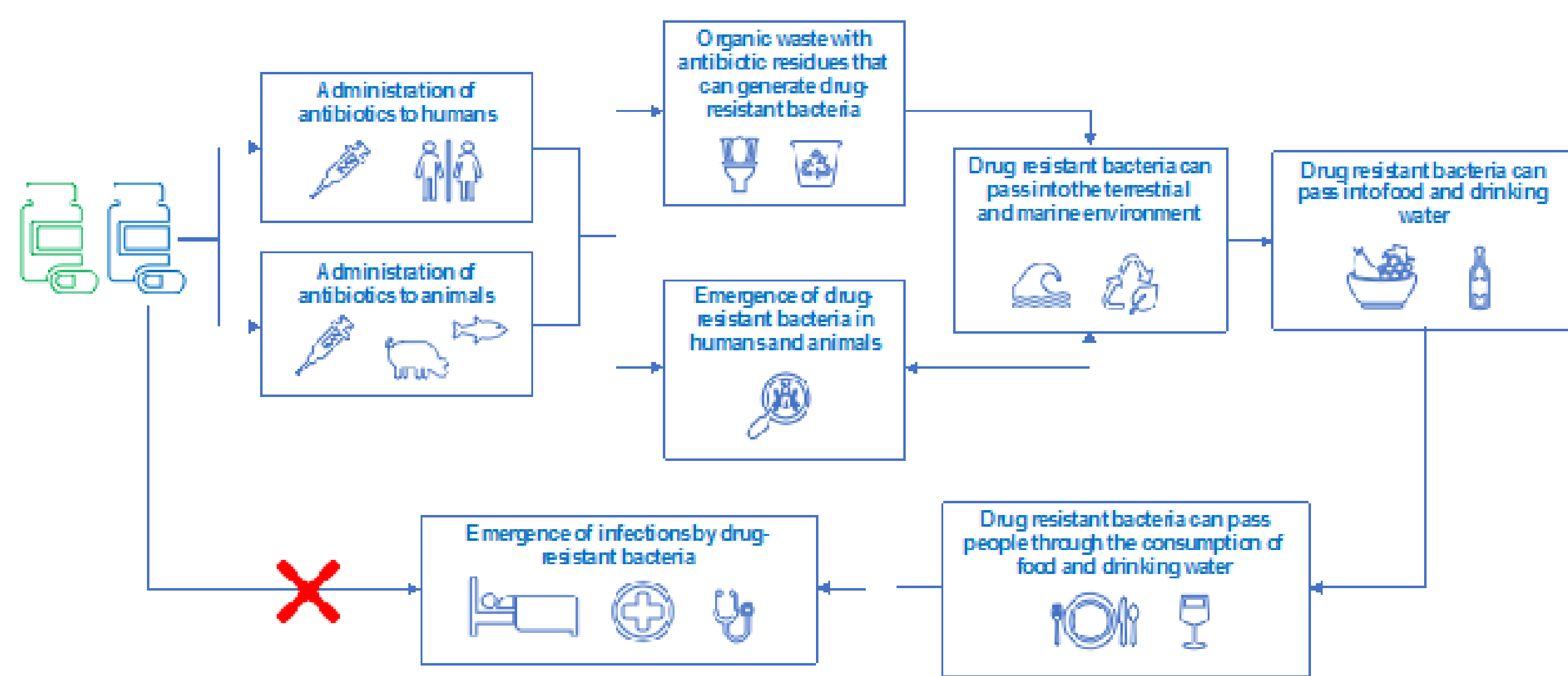
Doctorand: Miguel Sagaseta de Ilurdoz Cortadellas.

Thesis director: José Jaime Sadhwani Alonso.

PhD program: Calidad Ambiental y Recursos Naturales (DOCARNA).

Introduction

There are other ways to explain the entry routes of antibiotics to the environment that have an impact on human health.



Hypothesis

- ✓ Validate if RO membranes obtain elimination percentages higher than 90% in concentrations (in the order of ng/l) of the antibiotics: Ciprofloxacin (CIP), Levofloxacin (LEV) and Norfloxacin (NOR) diluted in 200l synthetic seawater.
- ✓ Check if RO membranes after being used for the elimination of antibiotics suffer any type of damage or condition that reduces their production of desalination water.

1ª Phase: a review & selections

i. Bibliographic review.

More than 50 references have been reviewed in search of the concentration levels of antibiotics detected in different types of water around the world, as well as the elimination percentages obtained according to the technology used.

	Maximum Concentration Detected (ng/l)							
	CIP	ERY	LEV	MET	NOR	OFL	SMX	TMP
Total data	15	17	1	11	8	12	39	33
Maximum	20321	10025	14154	1834	2940	5286	11600	7900
Minimum	224	5	14154	0	<10	0	1	1
Mean	3775	1617	14154	477	976	913	903	933

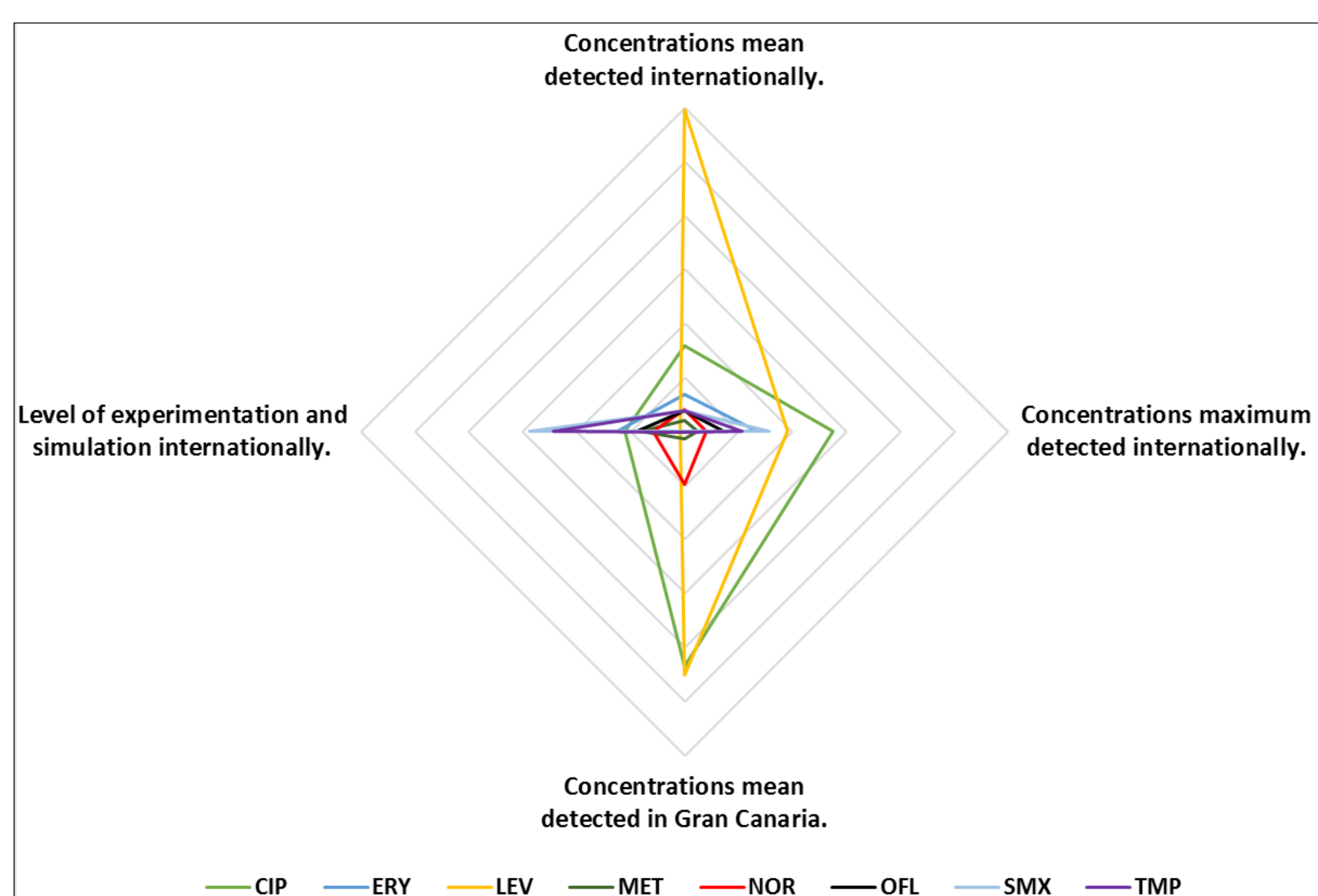
CIP: Ciprofloxacin; ERY: Erythromycin & Erythromycin - Agua; LEV: Levofloxacin; MET: Metronidazole; NOR: Norfloxacin; OFL: Ofloxacin; SMX: Sulfamethoxazole; TMP: Trimethoprim;

ii. Technology selection: RO.

The choice of RO is justified because when compared to other alternatives, it presents magnificent percentages of antibiotic removal in different types of water. The data of the elimination percentages consulted in the international literature review establish ranges from 93% to 99.99%, repeating values higher than 99% regularly.

iii. Antibiotic selection: LEV, NOR & CIP.

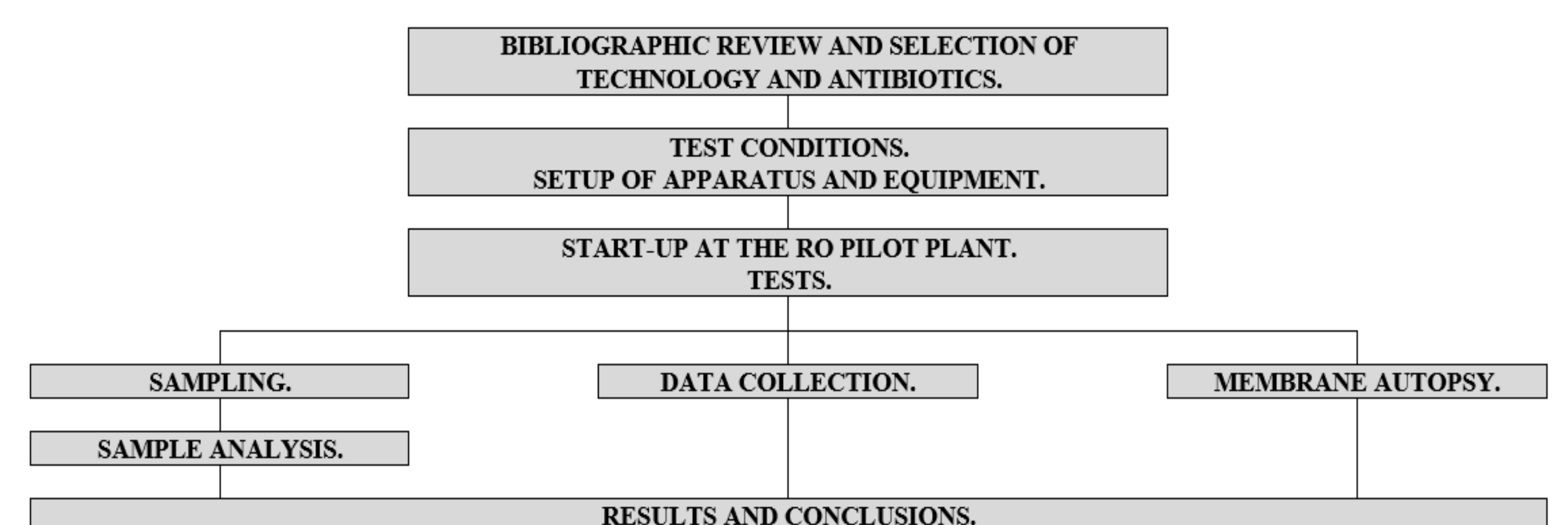
Analyzing all the data, it was concluded that the antibiotics LEV, NOR and CIP meet the study requirements. This is based, on the one hand, in the degree of experimentation and simulation at the international level. On the other hand, in the concentration detected on the island of Gran Canaria and in the world.



Objectives

1. Confirm the efficacy of Reverse Osmosis (RO) membrane processes for the elimination of emerging pollutants in seawater. Specifically, for pharmacological products: antibiotics of wide human use.
2. Analyze the condition of the RO membrane after being used for removal of antibiotics, other purpose for which they were designed.

Methodology



2ª Phase: Experimental & Analysis

➤ ULPGC infrastructures:

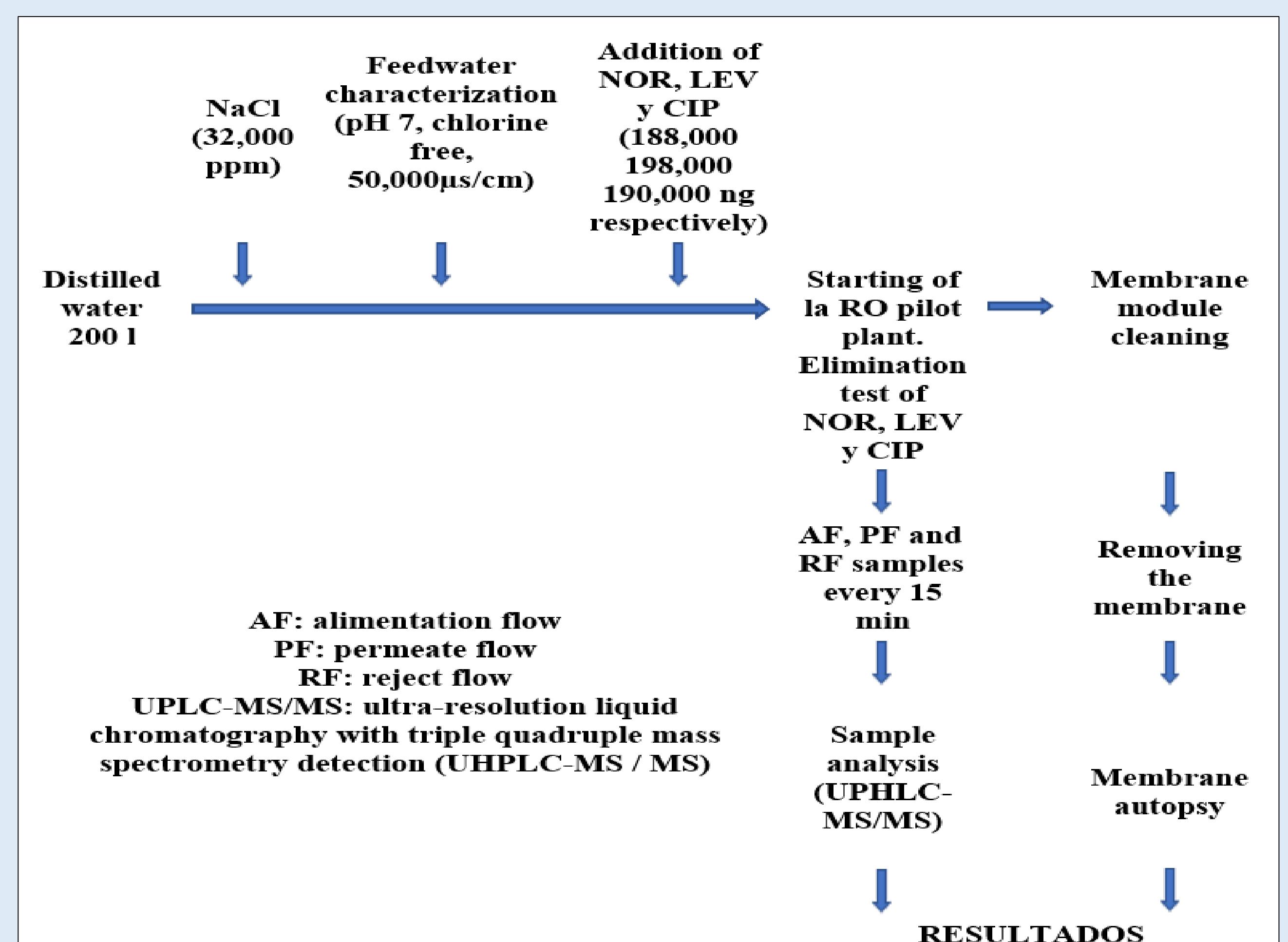
- Tests: Laboratory of Environmental Technologies.
- Samples analysis: Laboratory of Environmental Chemical Analysis.

➤ Principal equipment:

Activity	Equipment	Descriptions
Test	RO Pilot Plant	Gunt Hamburg, model CE530
	Membrane	CSM 2521-SHF
Samples Analysis	Chromatography Solvent Manager	Acquity Ultra Performance LC.
	Binary Solvent Manager	
	Column Heater/Cooler	
	TQ detector	



➤ Test Conditions:



3ª Phase: Results & conclusions

The results and conclusions are pending completion of the tests, the analysis of samples and the autopsy of the membrane.