Dissemination of resistant bacteria via Lebanese estuaries

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Introduction

Environmental contamination with antimicrobial resistant bacteria (ARB) varies greatly from country to country. To evaluate Lebanese rivers as potential sources for ARBs into the environment and therefore identify risks to public health, contamination with ARB was evaluated using standard culturing techniques.

Materials & Methods

Sampling

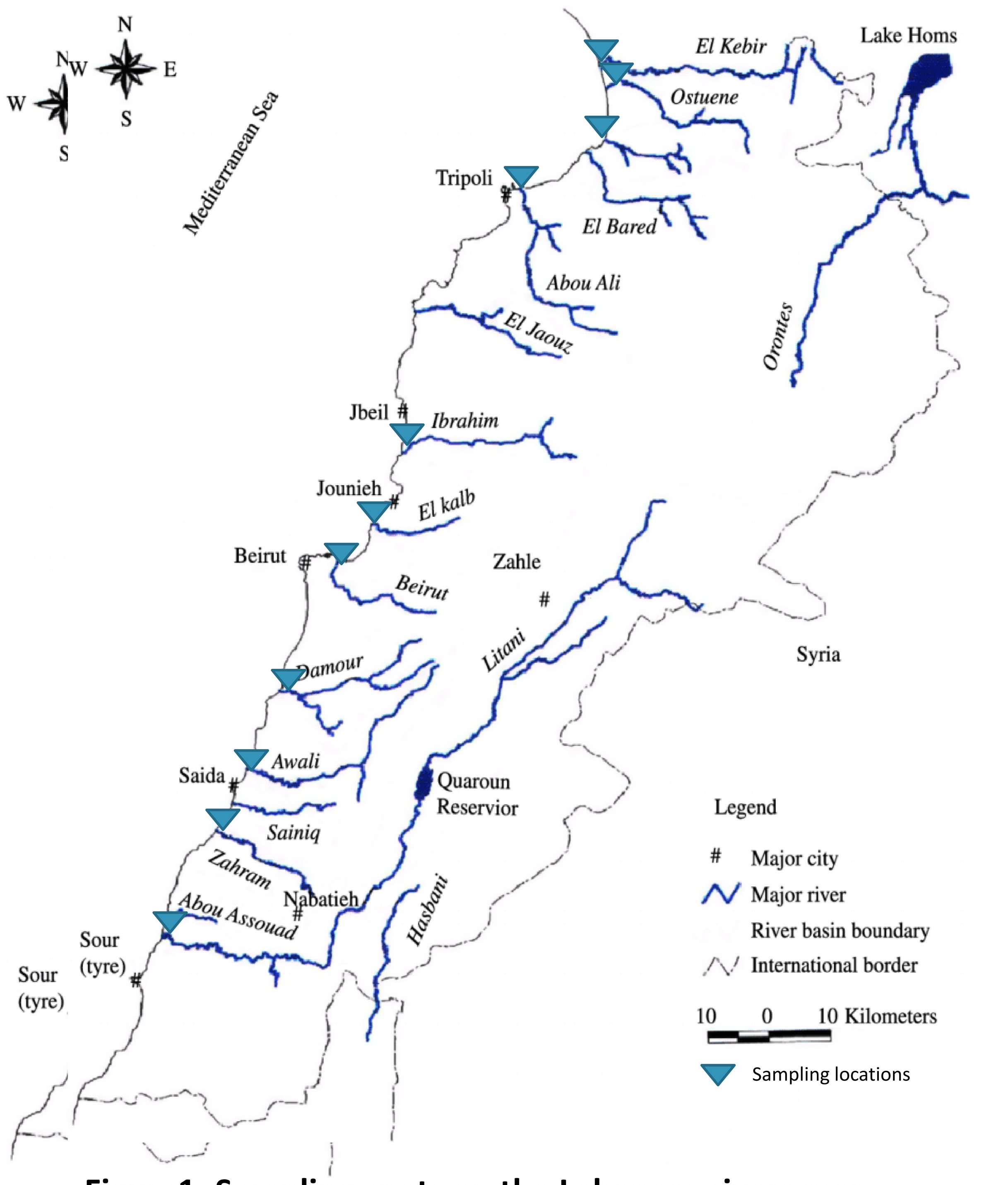

Figure1: Sampling spots on the Lebanese rivers map.

Culture techniques

In order to measure the impact of interventions that are used to prevent or remove environmental contamination with ARB, 12 river's estuaries leading to the Mediterranean sea were sampled at the exact location in spring and winter. Samples were cultured on selective media with and without antibiotics (ceftriaxon, cefepime and imipenem on Mc Conkay agar and oxacilline on Mannitol salt agar)

Phenotypic identification of strains

The resistant isolates were accurately identified using API galleries and DNAse, catalase and coagulase tests.

Antibiotic susceptibility testing

Resistant strains were further screened for multiple resistance phenotypes against various antibiotics

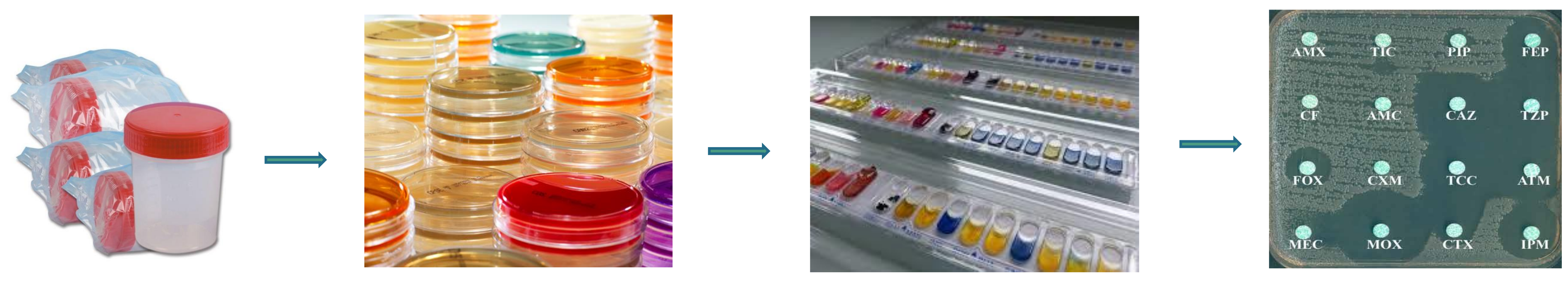

Figure 2: Experimental approach for the isolation and determination of resistant bacteria resulting from the indicated sampling locations .

Results

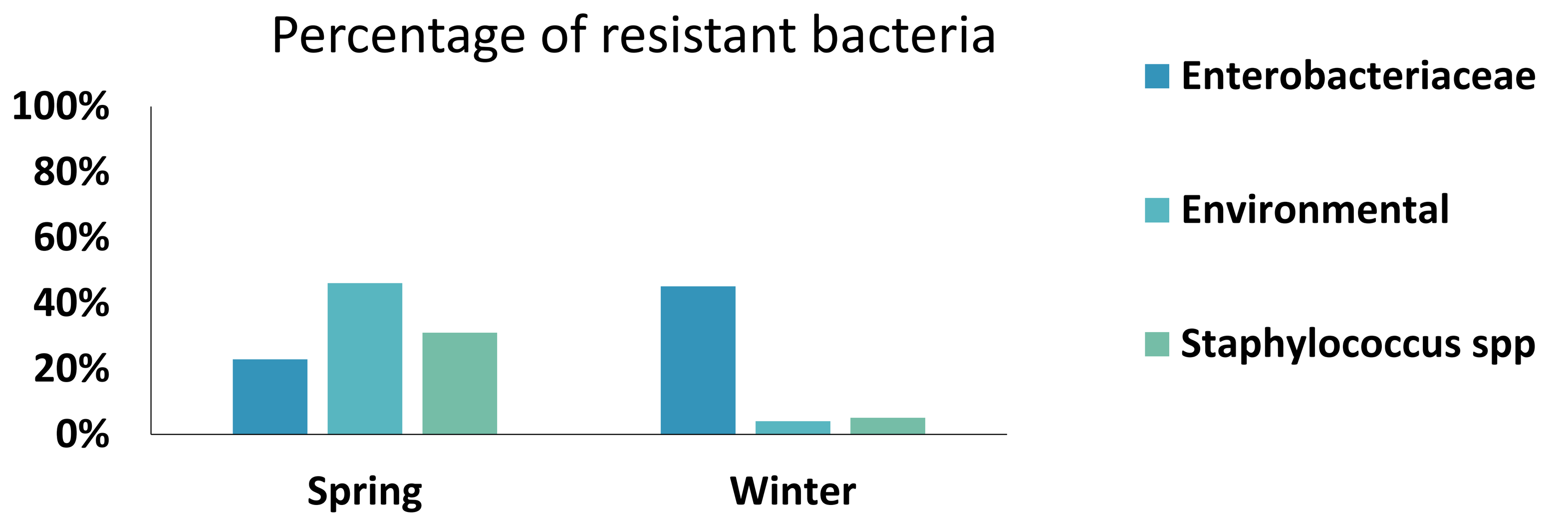

Figure 3: Isolated resistant bacteria in spring and winter respectively: 22.89% and 45.16% *Enterobacteriaceae, 46.12% and 4.04% environmental, and 30.97% and 5.09% Staphylococcus spp.*

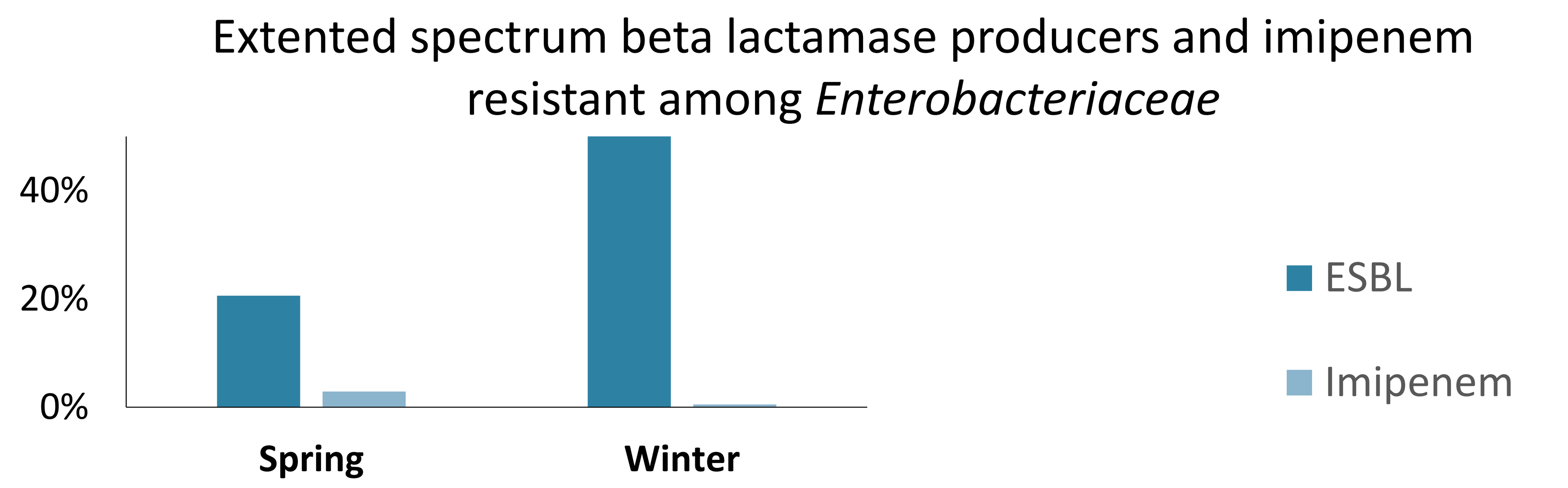

Figure 4: 20.58 *% and 91.76 % of Enterobacteriaceae* were extended spectrum beta lactamase producers while, 2.9 % were resistant to imipenem in spring, 0.5% were resistant to imipenem in winter.

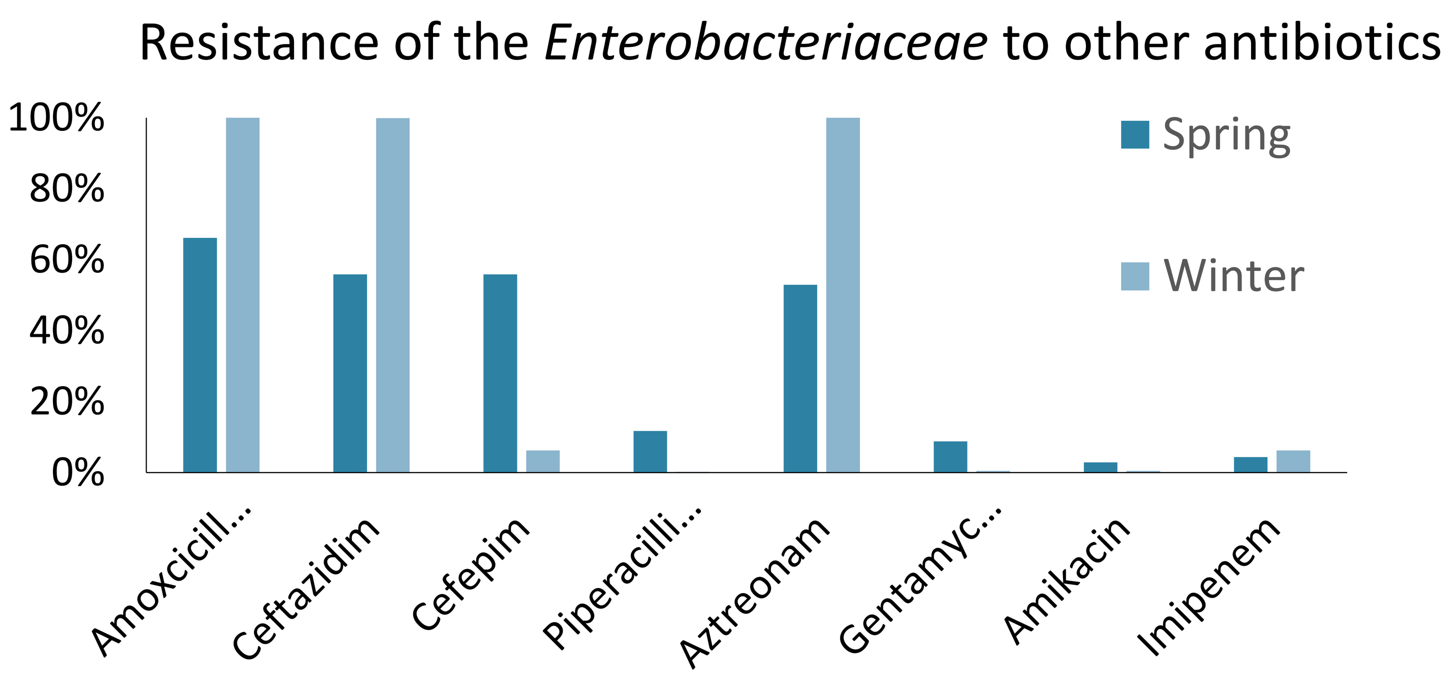

Figure 4: Resistance in spring and winter respectively were as follows: 55.88 % and 100% to ceftazidim and cefepim, 11.76 % and 99.9% to piperacillin-tazobactam , 4.4 % and 0 % to imipenem, 8.8 % and 0.5% to gentamycin, and 2.9 % and 0 % to amikacin.

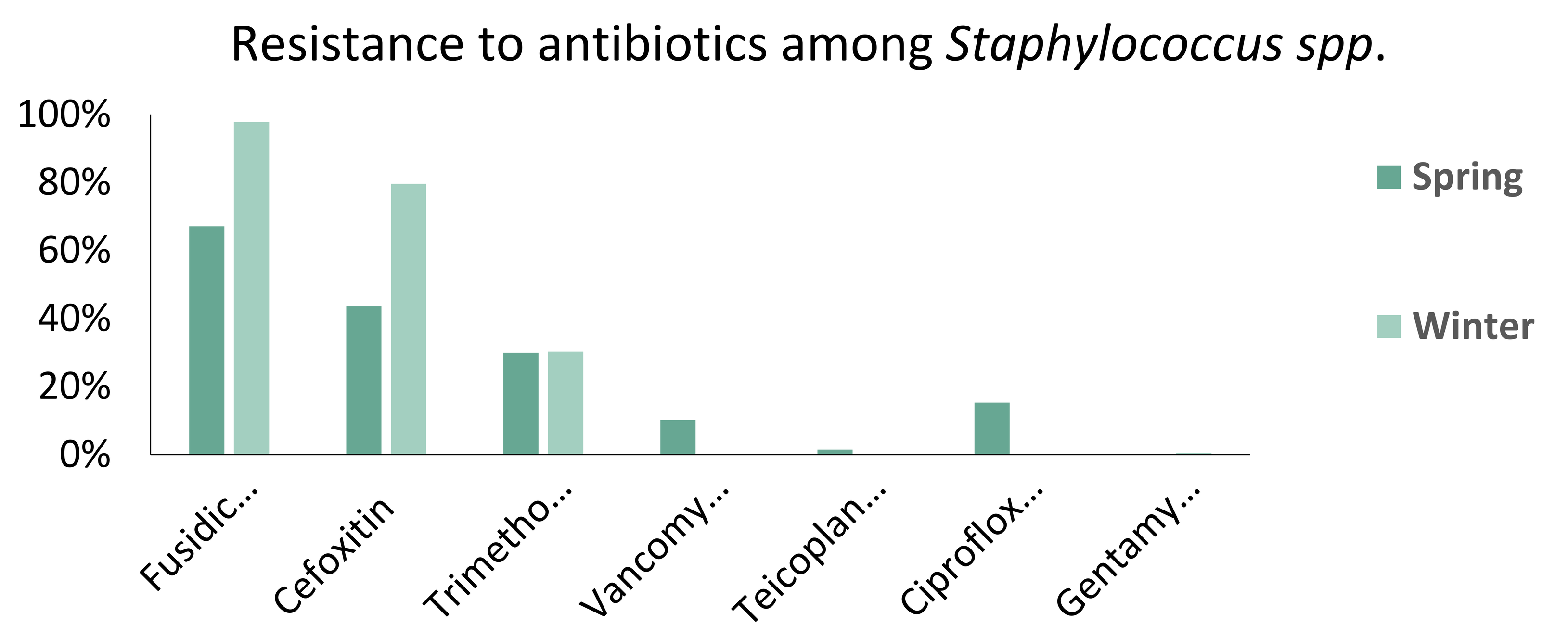

Figure 5: Resistance in spring and winter respectively were as follows : 67.15% and 97.77 % to fusidic acid, 43.8 % and 79.5 % to cefoxitin, 29.93 % and 30.3 % to trimethoprim-sulfamethoxazole, 15.33 % and 42.42 % to ciprofloxacin, 10.22 % and 7.01 % to vancomycin, 1.46 % and 0 % to teicoplanin, and 0 % to gentamycin.

Conclusions

There is a significant difference in the number of resistant bacteria isolated during spring and winter; with more resistant isolates and significantly higher rates of ESBLs during winter season. Results have to be interpreted by river to accurately identify potential reservoir for antimicrobial resistance and contamination of the Mediterranean sea.

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