FREQUENCY OF HEAVY METALS AND BETA-LACTAM ANTIBIOTIC RESISTANCE OF *ENTEROBACTERIACEAE* MEMBERS ISOLATED FROM DIFFERENT AQUATIC ENVIRONMENTS

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Abstract
The frequency of some beta-lactam antibiotics and heavy metal resistance of members of the *Enterobacteriaceae* family was investigated in the surface water from the Oludeniz Lagoon (the Aegean Sea), the Sea of Marmara, the Golden Horn Estuary and the Istanbul Strait, Turkey. In all selected isolates, the highest resistance was found to Ceftazidim as 48 %. Fifty five % of the strains resistant to antibiotics were also resistant to heavy metal salts.
Keywords : Bacteria, Metals, Antibiotics.

Introduction
Metal resistant bacteria have developed very efficient and varying mechanisms for tolerating high levels of toxic metals and thus hold potential for controlling heavy metal pollution [1 - 5]. If a bacterial pathogen is able to develop or acquire resistance to an antibiotic, then that substance becomes useless in the treatment of infectious disease caused by that pathogen [6]. The study herein was planned in order to assess and compare the frequency of heavy metals and beta lactam antibiotics resistance of *Enterobacteriaceaea* members isolated from surface water of the Istanbul Strait, the Golden Horn Estuary, the Sea of Marmara and the Oludeniz Lagoon (the Aegean Sea), Turkey.

Materials and Methods
Antibiotic resistance was measured on Nutrient Agar plates supplemented with IPM, AMP, CTX, CRO, and CAZ. The bacteria belonging to *Enterobacteriaceae* were isolated using the MPN Method and membrane filtration techniques. $NiCl_2.6H_2O$, $CuSO_4.5H_2O$, $CdCl_2.H_2O$, $ZnSO_4.7H_20$ and $Pb(NO_3)_2$ were used for heavy metal resistance tests ([4], [7]).

Results and Discussion
In all selected isolates, the highest resistance was found against Zn amounting to 35 %. We hypothesized that bacteria resistant to high concentrations of heavy metal salts would have potential capacities to tolerate or possibly degrade a variety of toxic materials and thus, would be important in environmental pollution bioremediation. Also indirect influences of bacterial pollution and negative environmental conditionals may be assumed to be related to antibiotic-resistant strains. The fact that 55% of the bacteria resistant to antibiotics are also resistant to heavy metals suggests that transfer of resistance takes place via plasmids.

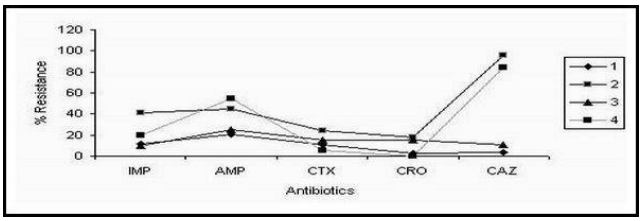

Fig. 1. Frequency of antibiotic resistance of *Enterobacteriaceae* which were isolated from the surface water of the Istanbul Strait (1), the Sea of Marmara and (2) the Golden Horn Estuary (3) and Oludeniz Lagoon (4), Aegean Sea, TurkeyIPM: Imipenem, AMP: Ampicillin, CTX: Cefotaxim, CRO: Ceftriaxon, CAZ: Ceftazidim

Resistant strains will be used in the further plasmid-curing assays with the aim to ascertain resistance to antibiotics and toxic xenobiotics mediated by chromosomally borne genes and/or transposable elements rather than by plasmids.

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