EFFECT OF ENVIRONMENTAL FACTORS ON SALMONELLA TYPHIMURIUM SURVIVAL IN MARINE WATER MICRO COSMS

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Abstract
The influence of temperature salinity and starvation on the occurrence of Salmonella typhimurium was investigated using laboratory (C52) and a local (H10) Salmonella strains incubated in marine water microcosms and exposed to natural sunlight (48h). Monitoring of growth and survival in microcosms showed a gradual decline in cultivability, respiratory and metabolic activities. For both strains we noted some biochemical and antimicrobial modifications. The virulence of Salmonella was maintained during seawater incubation for the two strains.

Keywords: Bacteria, Salinity, Brackish water, Mediterranean Ridge

Introduction:
Salmonella enteritis ser. Typhimurium is common etiologic agents of intestinal-based disease of animals and humans. Pathogenic microorganism such Salmonella are released directly or through wastewater to coastal areas [1]. Factors affecting the survival of allochthonous bacteria in marine environment include predation, osmotic stress, solar radiation, nutrient availability, bacteriophage, algae, and temperature [2, 3, 4]. Under unfavorable environmental conditions, Salmonella as other bacteria may react by modification of their physiological and structural characteristics and have a survival strategy, entering a viable but not culturable (VBNC) state [5, 6].

Material and methods:
Salmonella enteritis ser. Typhimurium C52 and wild strain isolated from clams (H10) cells were collected by centrifugation (3000 rpm/15 min) and washed twice. Strains were inoculated in sterile and filtered (0.2µm pore size membrane, Nucleoprep) seawater microcosms (final concentration 10⁸ cfu/mL). Microcosms were placed “in situ” in sea water under environmental conditions (sunlight, temperature) during 48h. The total number of cells (TC) and the altered cells (AC) were counted by using respectively the DAPI (4’, 6-diamide-2-phenylindole- Sigma) and the Live/Dead® BacLight™ kit. The respiratory (CTC) and metabolic activity (DVC) was performed during the experiment. The effect of sunlight on the virulence of Salmonella was studied using cytokotoxicity test [7] and amplification of Pathogenic Island.

Results and discussion:
The results of the evolution of cultivability and physiological states of Salmonella typhimurium C52 incubated in marine water microcosms (Fig.1) demonstrated that cellular activities, respiratory and metabolic activities decrease rapidly during the first 7 hours for the C52 strain (8.86%, 16.06% and 30.30% respectively). The H10 evolution during the first 7 hours is similar for the cultivability, but the percentage of respiratory (34.81%) and metabolic activities (50.58%) are largest than the C52 one. Whereas the rate of total cell count remains stable for the two strains. Results of the virulence test revealed the presence of two bands H1 and Hn, involved in the control system of variation phase in Salmonella strains and respectively amplify a region of 236 pb and 173 pb. One of these two bands is sufficient to detect Salmonella spp.

References