Assessment of *in-situ* abundance dynamics of enterobacteria and total heterotrophic aerobic bacteria in groundwater in the equatorial region of Central Africa

Moïse Nola[1]*, Jean Samuel Eheth[1], Mireille E Nougang[1], Marlyse L Moungang[1], Olive V Noah Ewoti[1], François Krier[2], Nour-Eddine Chihib[2], Pierre Servais[3], Jean-Pierre Hornez[2] and Thomas Njiné[1]

[1]University of Yaounde 1, Faculty of Sciences, Laboratory of General Biology, PO Box 812 Yaounde, Cameroon
[2]Université des Sciences et Technologies de Lille 1, Laboratoire ProBioGEM, Bâtiment Polytech' Lille, Bd Paul Langevin – Cité Scientifique, 59655 Villeneuve d'Ascq cedex France
[3]Université Libre de Bruxelles, Ecologie des Systèmes Aquatiques, Campus de la Plaine CP 221, Boulevard du Triomphe, 1050 Bruxelles, Belgique

Abstract

The main purpose of this investigation was to assess, *in situ*, the hourly abundance dynamics of enterobacteria and total heterotrophic aerobic bacteria (THAB), over a daily period, in 3 wells in Yaounde region, Cameroon. Sampling was done weekly, for 4 months. Water samples were collected in sterile glass bottles and incubated *in situ* for 2 h, 4 h, 6 h, 8 h, 10 h and 12 h. Isolation and enumeration of enterobacteria and THAB were performed on MacConkey agar (Bio-Rad) and standard agar (Bio-Rad) media, respectively, using the plate count method. Using a linear regression model, ln(number of CFUs) was plotted against time. The slope of each regression line was considered as the apparent increase or decrease in cell number. Concentrations of THAB and enterobacteria varied from 9.90 to 14.19 and 4.09 to 9.59 ln units·mℓ^{-1}, respectively, in W1, from 9.90 to 14.25 and 3.00 to 5.39 ln units·mℓ^{-1} in W2, and from 9.90 to 14.00 and 6.55 to 11.51 ln units·mℓ^{-1} in W3. For the first 6-hour incubation period at all of the sampling points, the cell apparent growth rate (CAGR) varied from 0.023 to 0.262 h^{-1} for THAB and from 0.001 to 0.315 h^{-1} for enterobacteria; cell apparent inhibition rate (CAIR) varied from 0.015 to 0.615 h^{-1} for THAB and from 0.015 to 0.604 h^{-1} for enterobacteria. In the second 6-h incubation period, the CAGR varied from 0.010 to 0.822 h^{-1} for THAB and from 0.015 to 0.771 h^{-1} for enterobacteria; the CAIR varied from 0.015 to 0.260 h^{-1} for THAB and from 0.007 to 0.338 h^{-1} for enterobacteria. The values of physico-chemical parameters recorded before incubation displayed temporal and spatial variation over the sampling period. Bacterial abundance dynamics in some cases was significantly correlated to some of these abiotic factors. The abundance of the microorganisms decreased initially but later increased.

Keywords: enterobacteria, THAB, growth rate, inhibition rate, groundwater, chemical