BACTERIAL BIODIVERSITY OF THE DRINKING WATER DISTRIBUTION NETWORKS OF REGIDESO KISANGANI (RD CONGO)

E. MOLAMBOLE[1], K.E. MOKILI[1], M. KAZADI[2-3], and W. OLEKO[2-3]

[1]Institute of higher learning of the Medical Techniques of BASOKO (ISTM-Basoko), RD Congo

[2]University of Kisangani, Faculty of Science, Department of biotechnological Sciences, RD Congo

[3]University of Kisangani, Station control room of Biodiversity (CSB), RD Congo

ABSTRACT: In Kisangani, 100 taps two major networks (low and high pressure) water distribution REGIDESO were selected for bacteriological analysis.

From a quantitative point of view, the results of our study showed a high bacterial' biodiversity in the REGIDESO distribution network: the number of bacteria varies from 6,10 to 290,10e bacteria / ml in the circulating biomass and from 4 106 to 90,106 bacteria / cm2 biomass biomass fixed generally, bacterial densities are highest in the biofiim than in the aqueous phase.

The most identified genera Escherichia, Kiebsiella, Salmonella, Citrobacter Pseudomonas, Flavobacterium, Acinetobacter, Moraxella, Micrococcus, Alcaligenes, Corynebacterium Bacillus, Enterobacter.

Maintaining the quality of drinking water should be characterized by stability of bacterial growth. The treatment plant and water distribution in the DRC must control the sources of the reduction of microbial contamination and limit microbial degradation of drinking water.

KEYWORDS: biofilm, drinking water, distribution network, bacterial diversity.

1 INTRODUCTION

The access to drinking water is one on the human basic rights being recognized by the general meeting of the Plain Nation of then on July 28th, 2010. The Democratic republic of Congo (DRC) bas the important fresh water resources for her sustainable development, unfortunately the Congolese's do not have, ail, access to drinking water in sufficient quantity. About thirty years ago, remarked Fanny Gauthier (2001) that the drinking water delivery systems were regarded as inert units.

The main objective of these networks was the routing of water towards the consumers, in order to answer in quantity sufficient and any point of the network their request. The management of these networks consisted a long time of the management of simple tools for transport of water and the quantitative aspects were privileged compared to the qualitative aspects, thus involving over sizings of networks.

Today, this concept of quantity appears incompatible with the qualitative aim, fixed by the regulation, so that a water is in conformity with quality necessary for a water intended for human consumption.

In spite of the immense water resources soft of the Democratic republic of Congo (DRC), the country must take up a major challenge in the sector of water: to increase the low level of access to drinking water of its population quickly growing. Two decades of under investment, worsened by the destruction of the installations during the conflict, largely deteriorated the infrastructures and water the services of the country (Kazadi, 2012).

The rate of access to water has consequently known a dramatic decline compared to the level of years 1990 former to the conflict. The current rate in DRC is approximately 26%, one of weakest of sub-Saharan Africa (PARTOW, 2011),

REGIDESO is a public enterprise related to commercial technical, industrial and equipped with the legal personality. Created in 1939, it is currently governed by the general provisions of the law tallies applicable to the public enterprises and by its own statutes. Its mission is to study, install and manage the production and the water supply through the country. But, the challenge for this control consists in managing to mobilize the immense water resources in which the DRC abounds, to ensure their potability and to distribute them to the population.

However, the REGIDESO failed in its spot to produce a drinking water of quality following the lack of qualified operators, chemical products and spare parts available and reliable, associated with financial constraints, blocks any functionality and maintenance of the system. With that the lack of water is added led to frequent interruptions of the water conveyance and the escapes of the distribution network still pejorent the situation.

The objective of our research is to count, to specify the bacterial biodiversity in the distribution network of the REGIDESO and to determine the water quality used like drink water in the town of Kisangani in RD Congo.

2   METHODOLOGY

The study proceeded in the town of Kisangani in Eastern province. The bacteriological analyses of water were carried out at the laboratory of bacteriology of the Faculty of Science of the University of Kisangani.

The bacteria in the biofilm and the circulating water of the distribution networks were counted isolated after nutritive dilution starting from agar and the various kinds starting from the selective mediums.

By the technique of filtration on membrane, two culture media were used for the research of the indicator germs of fecal pollution; mediums MAC Conkey for the coliforms and Bile Esculine Azide for the fecal streptococci (entérocoques). The numeration of the colonies was made by the examination with the binocular magnifying glass desboites de Petri incubated while the identification was made using the classical gallery made up of five Kligler mediums, Citrate of Simons, Manitol, the ui'ea, SIM (SH2, Indo, mobility).

3   RESULTS

The result of our study showed a strong bacterial biodiversity in the distribution network of REGIDESO, The number of bacterium varies from 6,103 to 290,103 with an average of 50.l88bactéries/ml in the circulating biomass and 4,106 to 90,106 with an average 57.341.l76bactérie/cm2 in the fixed biomass. Generally, the bacterial densities are higher on the level of the biofilm than in the aqueous phase.

We think like Block and al., 1993; Were useful and al., 1995; Sibiile and al., 1997 that the bacterial densities are variable in a water distribution network according to the type of biomass considered.

Block, 1992 classifies these organizations in 4 groups such as des indigenous species, of the species not expected of the consumer, the harmful species and the species medical point of view.

The results of T-test show that the difference between the averages in number of the germs in the various sites are nonsignificant bus p-been worth is <to 95%.

During our study, several counted bacteries kinds were identified, as well on the level of the circulating phase, as on the level of the biofilm such as Acinetobacter, Alcaligenes, B acillus, Citrobacter, Corynebacterium, Enterobacter, Escherichia, Flavobacterium, Kiebsiella, Micrococcus, Moraxeila, Pseudomonas, Salmonella. All time the genre Pseudomonasdomine in all the sites and the two water phases (circulating and fixed).

The enumeration of the indicator germs of fecal pollution revealed that on the whole cf analyzed water of tap, the average of the colonies exceeds 65 by 100 ml. Any S the water provided by Régideso to the population of the town of Kisangani is except standards of WHO, is unsuitabie with human consumption and constitutes sources of several diseases of hydrous origins whose the area knows. The identified germs are: Citrobacter (52%), E. Coli (22%), Klebsiella (12%), Salmonella spp (8%), Enterobacter (6%) then Enterococus (i00%)

The water of tap which is very often disparaged by the populations does flot respect the recommendations of WHO as regards potability because of degradation of distribution network (pipelines) its quality leaves something to be desired.

4   CONCLUSION

At the end of this work and in consideration of the above mentioned criteria, one can say that in the town of Kisangani, the drinking water distribution networks of the REGIDESO cannot today any more be regarded as simple tools for transport of water to the consumers. They constitute a genuine biological engine, inside whose is set up a bacterial dynamics, and where a growth of the micro-organisms is observable.

Indeed, the use of disinfecting does not make it possible to in no case the total inhibition of the bacterial proliferation. We think that to limit bacterial reviviscence in water distribution network of the REGIDESO Kisangani, an action must be carrieci out on the cause of the presence of these micro-organisms and their multiplication. It is important that the persons in charge think of an optimization of the sectors of treatment.

A proposal would be the increase in the amounts of disinfecting out cf free chlorine but curiously, this increase would involve that of the formation of by-products with possible going beyond the standards of potability of water, and with the appearance of flavours ('4chiorine taste" of water) leading to complaints of the consumers. It is then necessary to change pipings of networks placed since the years 1959,

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