Study of the Bacteriological Profile of the Drink Tchakpalo (Sugar Must) Sold In Cotonou Schools in the Republic of Benin

Dr AÏKOU Nicolas1 | AHOYO A. T.2 | DEGBE S. C3 | ADE S.4 | GNANGLE B. R.5 | AÏKO N. L. M.6 | AÏKO A. N. E.7 | EDO RH A. P8

1National University of Sciences, Engineering and Mathematics/ Department of Human Biology/ Laboratory of Clinical Biochemistry and Medical Microbiology, BENIN
2Abomey Calavi University, Senior Lecturer / General Medical Microbiology and Hospital Hygiene Abomey Calavi Politechnical School / Human Biology Engineering, BENIN
3Regional Institute of Public Health Ouidah BENIN
4Medicine Faculty, University of Parakou, Benin,
5Department of Clinical Biochemistry / Assistant, BENIN
6Department of Clinical Biochemistry / Assistant, BENIN
7Department of Clinical Biochemistry / Assistant, BENIN
8Full professor, Department of Biochemistry/ UAC, BENIN

Abstract
The objective of this study is to identify the germs present in the drink (sweet must) sold in Cotonou schools in the Republic of Benin. One hundred (100) samples of the sweet must drink were used for this study. All samples of the sweet must drink were taken from sterile 40 ml bottles. After carrying out the various bacteriological examinations, it emerged from the tests that the germs isolated belong to the genera Staphylococcus and Klebsiella. We obtained the following percentages: 52% Staphylococcus aureus; 28 % Staphylococcus sp; 12 % Klebsiella pneumoniae and 8 % Klebsiella oxytoca. It is therefore essential to raise awareness among the saleswomen on the respect of hygiene rules and standards.

Keywords: Profile, Bacteriological, Tchakpalo Drink, Sweet Must.

1 INTRODUCTION

Man has been using fermentation for thousands of years to obtain food with improved nutritional value (1). In Africa, certain cereals such as sorghum, maize and millet are often made into a drink that includes an essential alcoholic fermentation step (2, 3). Indeed, often linked to traditions of hospitality and conviviality, they are part of the way of life of most families.
and serve to seal relationships between individu-
als (4). The empirical technological process involves
a double fermentation: an alcoholic fermentation and
a natural lactic fermentation (5). In addition, the
production process suffers from a crucial lack of
precision measuring instruments, good practices and
hygiene standards (6).

Louis Pasteur’s work has revolutionized bacteriol-
ogy (7). Thus he demonstrated in 1859 that fer-
mentation processes are caused by microorganisms
and that this growth was not due to spontaneous
generation. Bacteria are ubiquitous and are present
in all types of biotopes found on earth. They can be
isolated from soil, fresh, marine or brackish water,
food, air, ocean depths, radioactive waste, the earth’s
crust, plants, on the skin and in the intestines of
animals. In humans it has been calculated that
10^{12}
bacteria colonize the skin, 10^{10} colonize the mouth
and 10^{14}
live in the intestine, which means that there
are ten times more bacterial cells than human cells in
the human body. There are about 40 million bacterial
cells in one gram of soil and one million in one
milliliter of fresh water (8). Thus the reservoirs of
microorganisms that cause infections are multiple.
They can be classified in two categories: environ-
mental and human. The environmental reservoir is
the place where the sweet must is prepared for
drinking, the field where cereals (maize, millet and
sorghum) are grown. The human reservoir, which
is the most important source, has a variety of ori-
gins : on the one hand, by the Tchakpalo (sweet
must) sellers, which causes their uncleanliness, for
example faecal contamination; on the other hand,
by the farmers, which causes the uncleanliness of
the granaries, using water from rivers and lagoons,
which the farmers use to water their fields; it should
be noted that it is in these same waterways that these
farmers do their washing, wash themselves, and do
all their needs (9, 10). In view of the place this
drink occupies in the batch of drinks we consume
daily; in view of the number of people who consume
it; in view of the praise it receives from the mass
media, an indispensable study has been carried out
on the bacteriological profile of the Tchakpalo drink
sold in schools in Cotonou (Republic of Benin). In
order to study the bacterial flora that this drink may
contain, various bacteriological tests were carried
out to determine the germs present in the Tchakpalo
drink (sweet must).

2 | PATIENTS AND METHOD

The SPACE-LABM laboratory in Cadjèhoun was
used as a study framework. The laboratory is mul-
idisciplinary and carries out research and service
work in the following fields: Biochemistry - Clin-
ical; General and Medical Microbiology; Hospital
Hygiene; Biomedical Waste Management; Hospital
Quality and Patient Safety.

This is a prospective study that lasted from October
2018 to March 2019. One hundred (100) 40 mL
samples were taken from different sites and analyzed
during this study. Various examinations were carried
out, including macroscopic examination and micro-
scopic examination: fresh and coloured. Biochemical
tests including catalase, staphylocoagulase, oxidase,
Dnase and Lemiron’s rapid gallery were carried out
to identify the germs present in this drink. The an-
tibiogram was carried out to observe the resistance
of the isolated germs.

3 | RESULTS

Tables 1, 2, 3, 4 and 5

4 | DISCUSSION

The objective of this study is to carry out the various
bacteriological examinations that contribute to the
determination of the germs present in the drink of
Tchakpalo (sweet must) in order to evaluate the quantity of these germs in the drink and to determine the antibiotic resistance profile.

From the analysis of Table 1 on the distribution of samples according to the sampling sites, we note a predominance of sampling in the zones of Cadjéhoun 30% and Agla 25%. We recall that these zones are floodable during the rainy season.

The majority of the sweet must samples have a light brown color, i.e. 90.0%; all the sweet must samples have a fermentation odor; 76% have a very sweet taste; and note that all the samples have a cloudy state.

### TABLE 1: Distribution of samples according to the results of the macroscopic examination

| Samples | Macroscopic examination | Number | o/o  |
|---------|-------------------------|--------|------|
| Color   | 10                      | 10,0   |
| -Dark brown | 90                    | 90,0   |
| -Light brown |                     |        |
| -Smell of Fermentation | 100              | 100,0  |
| -Taste  | 10                      | 10,0   |
| -Aigre  | 14                      | 14,0   |
| -Slightly sweet | 76              | 76,0   |
| -Well sweetened |                    |        |
| Aspect  | 100                     | 100,0  |
| -Trouble| 00                      | 0,0    |
| -Clear  |                         |        |

### TABLE 3: Fresh state

| Samples | Microscopic examination | Number | %  |
|---------|-------------------------|--------|----|
| Presence of yeasts | 100               | 100    |
| Presence of bacterial flora | 100          | 100   |
| Total   | 100                     | 100    |
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TABLE 4: Distribution of samples according to Gram staining results

| Samples                     | Number | %  |
|-----------------------------|--------|----|
| Cocci Gram positive         | 54     | 54 |
| Cocci Gram negative         | 0      | 0  |
| Gram-positive bacillus      | 0      | 0  |
| Gram-negative bacillus      | 13     | 13 |
| Cocci + and/or bacilli      | 33     | 33 |
| Total                       | 100    | 100,0 |

TABLE 5: Antibiotic resistance profile of isolated bacterial species

| Bacteria                | Phenotypes        | Isolated germs |
|-------------------------|-------------------|----------------|
| Staphylococcus sp       | CTXS CLOS CS FEPS AMCS OX EN | 28% |
| Staphylococcus aureus   | CTXS CLOS CS FEPS AMCS OX FR | 52% |
| Klebsiella oxytoca      | LS TES FEPS ES CPRS DOS DXTS | 8% |
| Klebsiella pneumoniae   | LS TES FEPS ES CPRS DOS DXTS | 12% |

appearance Table 2. In the fresh state, the presence of yeasts and the presence of bacterial flora are observed in all samples Table 3.

Gram staining shows the presence of Gram-positive cocci observed in a high proportion of 54%, Gram-negative bacilli 13% and samples with Gram-positive cocci and/or Gram-negative bacilli at 33%. No Gram-negative cocci or Gram-positive bacilli were found Table 4. Biochemical identification tests revealed the presence of Klebsiella including Klebsiella pneumoniae and Klebsiella oxytoca which are Enterobacteriaceae. Likewise the presence of Staphylococcus aureus, Staphylococcus sp Figure 1

All strains isolated from Enterobacteriaceae show no resistance to antibiotics; however, strains isolated from Staphylococci show resistance to the same antibiotic as Nitrofurantoin but in small quantities Table 5. The presence of germs is a public health problem, and appropriate measures must be taken to prevent the population from being contaminated by bacteria with potentially endemic diseases such as Salmonella, Shigella or even vibrio’s. These appropriate measures must be limited to the strict respect of cleanliness and hygienic conditions by the sellers of these drinks and even the growers of these cereals on the measures of conservation of these cereals (maize, millet and sorghum) so that each and every one is in good health. Otherwise the drink would be unfit for consumption and its sale should be prohibited.

5 | CONCLUSION

At the end of this work, the germs isolated from samples of Tchakpalo (sweet must) drink are enterobacteria including Klebsiella pneumoniae, Klebsiella oxytoca and staphylococci including Staphylococcus aureus, Staphylococcus sp. These identified pathogenic germs pose a public health problem. The presence of the germs may be due to the uncleanliness of the vendors, the serving bowls, the environment in which these drinks are sold, the substandard hygienic conditions put in place during the manufacture of the sweet must and even the origin of these maize, millet and sorghum cereals. Appropriate measures must be taken in order to prevent the population from being contaminated by bacteria and the occurrence of diseases with endemic potential such as Salmonella, Shigella and even vibrio’s. However, it is recommended that women pasteurize the drink and strictly observe cleanliness and hygienic conditions.

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