

# WATER QUALITY OF THE FERVENÇA RIVER HYDROGRAPHIC BASIN: MICROBIOLOGICAL IMPACT OF ANTHROPOGENIC ACTIVITIES

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## INTRODUCTION

The basin of the Fervença River is located in the municipality of Bragança, NE of Portugal, within a mountainous region, covering several lands dedicated to agriculture and livestock.

The Fervença River is born in the Serra da Nogueira, it crosses the city of Bragança and flows into the Sabor River.

The quality of the river water can be evaluated as bathing water and irrigation water.

The microbiologic maximum permissible values (MPV) for the bathing water in Portugal (defined by Portuguese Decree-Law nº 113/2012 of May 23 which transposes the Directive 2006/7/EC of the European Parliament and Council of February 15) are:

*Escherichia coli* → 1000 ufc/100 mL  
Intestinal *Enterococci* → 400 ufc/100 mL

The microbiologic maximum permissible value (MPV) for the irrigation water in Portugal (defined by Portuguese Decree-Law nº 236/98, of August 1) is:

Intestinal *Enterococci* → 100 ufc/100 mL

**OBJECTIVE:** Verify contamination levels of *Escherichia coli* and intestinal *Enterococci* in several points of the Fervença river basin and infer about possible influence of anthropogenic activities such as agricultural, industrial and waste water treatment plant.

## SAMPLES

10 water samples

Collected at 21 June, 2018

R1 - Castanheira Dam

R2 - Fervença river upstream from Castro de Avelãs Monastery

R3 - Fervença river downstream from Castro de Avelãs Monastery

R4 - Vale de Conde small stream before the industrial zone

R5 - Vale de Conde small stream after the industrial zone

R6 - Fervença river on the bridge near ESA - IPB Campus

R7 - Fervença river before the Living Science Center

R8 - Fervença river downstream from waste water treatment plant

R9 - Fervença river on the bridge nearby the Quintas da Seara area

R10 - Fervença river on the bridge nearby of Alfaião village

## ANALYSIS

MICROBIOLOGIC ANALYSIS

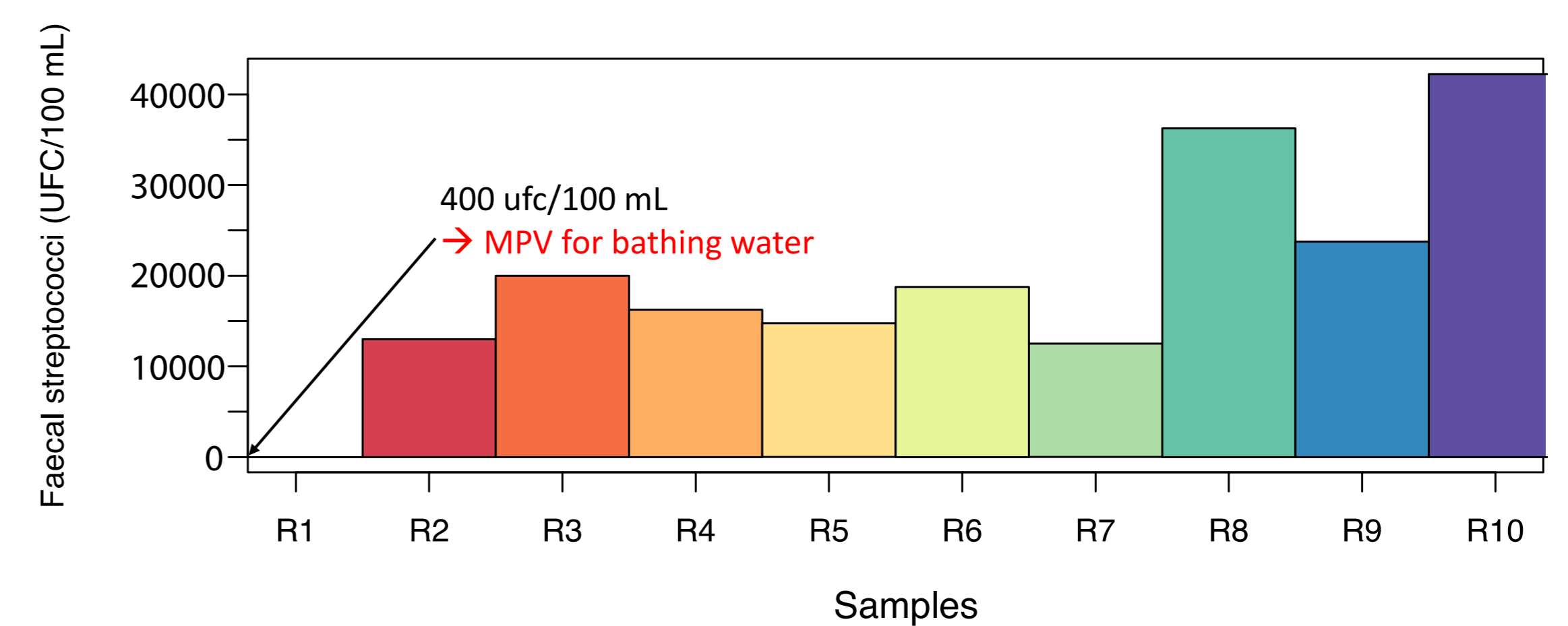
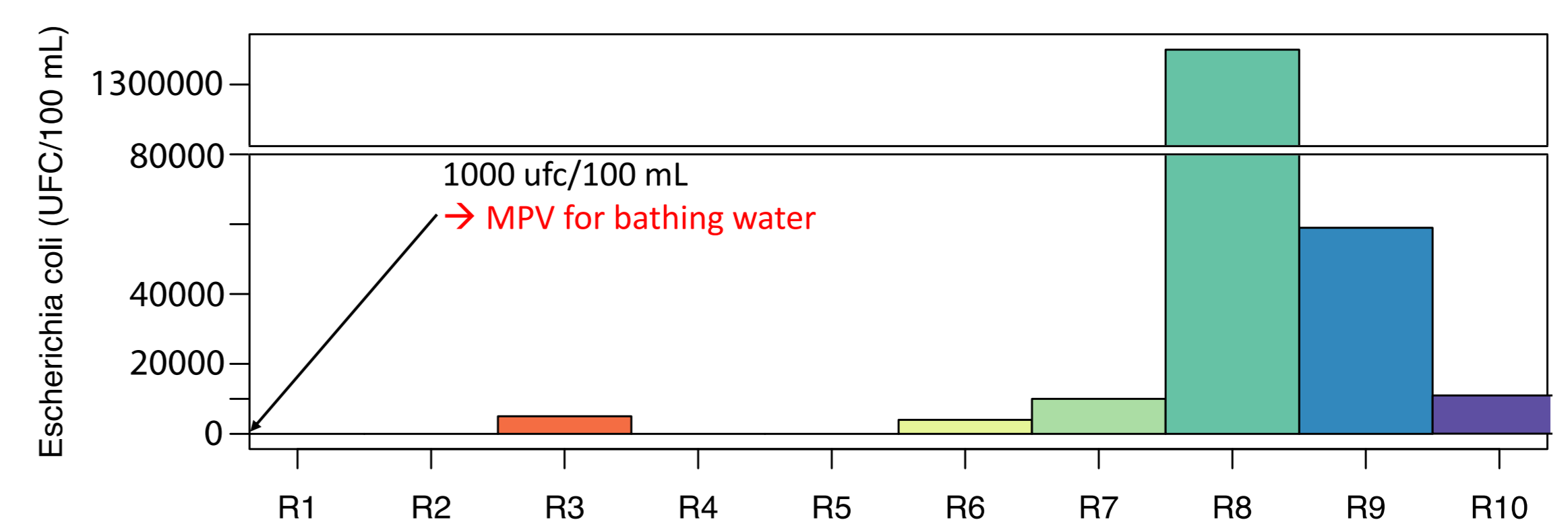
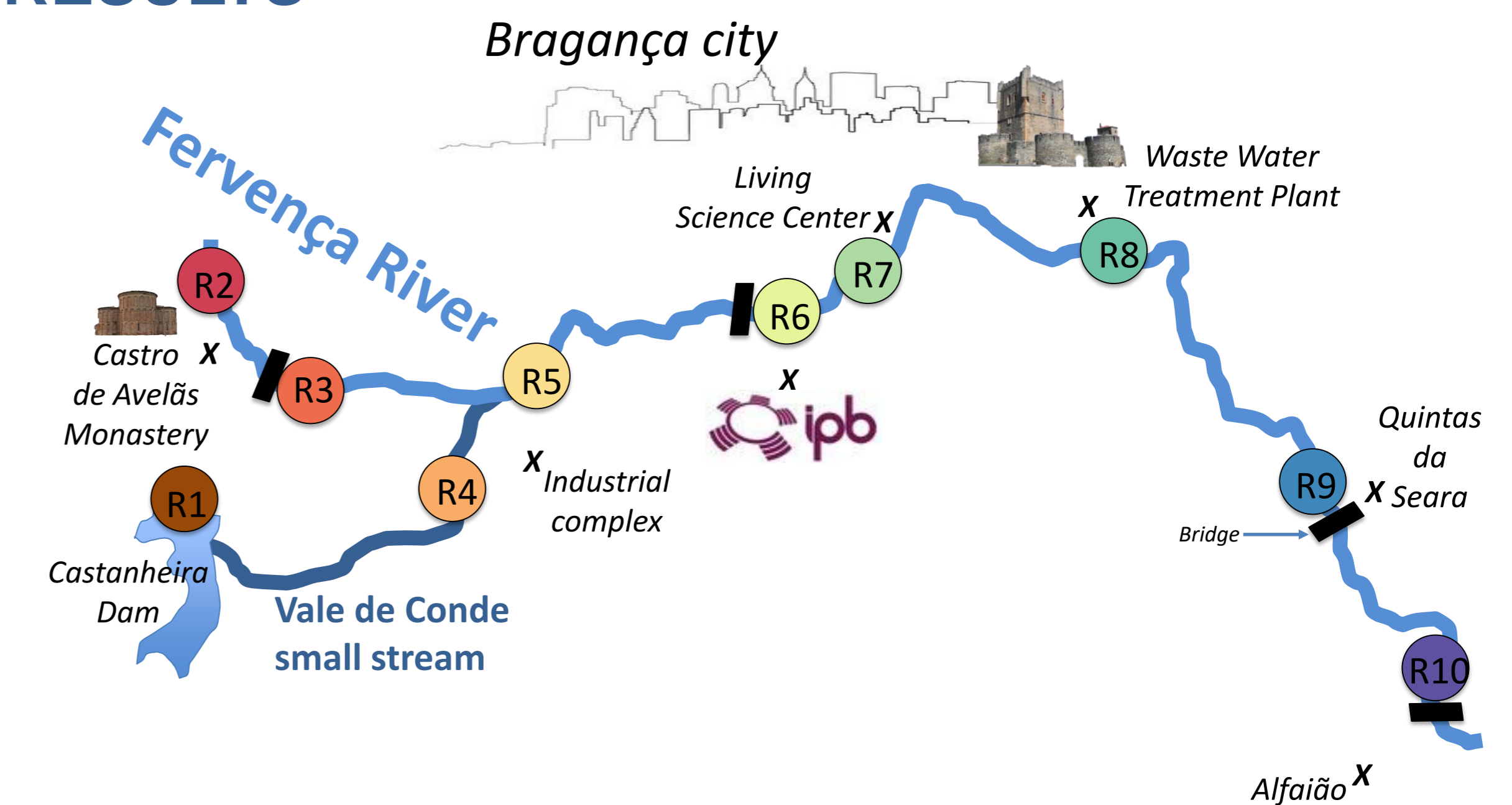
*Escherichia coli* (UFC/mL)

SimPlate, Total Coliform and *E. coli* Color Indicator (CEc-CI) from BioControl Systems, Inc. (AOAC® Official Method 2005.03); used for the detection and quantification of the Total Coliform and *E. coli* populations.

Intestinal *Enterococci* (UFC/mL)

B.A.G.G. Broth Base (Buffered Azide Glucose Glycerol Broth Base) from HiMedia Laboratories Pvt. Ltd.; used for selective cultivation and detection of faecal *Streptococci* (group D) from clinical and sanitary samples.

## RESULTS



### Possible influence of anthropogenic activities

*Escherichia coli*:

- relevant contaminations in R3, R6 and R7
- high increment in R8 with decrease in R9 and R10

Intestinal *Enterococci*:

- relevant contaminations from R2
- high increment from R8
- other possible source of contamination in R10

## CONCLUSIONS

The Fervença river basin has water quality problems considering its possible use as bathing or irrigation water. Anthropogenic activities are factors conditioning water quality at the microbiological level since, from the point R2 the Intestinal *Enterococci* microbiological levels were superior to the MPV values defined in the Portuguese legislation, which present a potential threat in terms of public health.

Also, *Escherichia coli*.

contaminations are a concern, mainly downstream of the waste water treatment plant (sample R8).

**RECOMMENDATION:** Implement measures to reduce contamination of livestock activities in the Fervença river hidrographic basin; the waste water treatment plant has a lifetime more than 20 years and should be subject to evaluation, considering the under-dimensioning in relation to the population and economic activities evolution of the municipality of Bragança.