ID8- UNEXPECTED INTERACTION IN BIOLOGICAL CULTURES

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Abstract
The aim of this article is to show how, in the development of the RAMICA sensor, we find an unexpected interaction between the IDDEX nutrient () and the flexible translucent catheters we need to implement the cells separation in the RAMICA sensor.

Keywords - RAMICA sensor, biological culture, TYGON flexible catheter, Silicon flexible catheter, IDDEX nutrient, IDDEX biological cultures.

I. INTRODUCTION

The RAMICA sensor (http://ramica.cetmar.org/) has been developed to implement the 'IDDEX culture protocol' () in a buoy and to be done completely automatic. The IDDEX protocol separates the culture in 51 independent cells and, depending on the number of 'positive cells' it gives a Most Probable Number of bacteria in the water under control.
To be able to implement the separation, and posterior cleaning, of the cells, Ramica sensor uses a flexible catheter that is smashed in 52 points along the catheter. A light and a very sensible color sensor has been implemented in each cell. It is able to read the color of the liquid inside the catheter with very good precision.
We, all of the researchers in the RAMICA project, assumed that the catheter will not interact with the culture; that is: -the catheter could be cleaned after a culture, -the color of the culture could be read by the color sensor, -the transparency of the catheter remains unaffected by the cultures and along of the days.
But things seem not to be that way. The first estrange interaction was when cells change to positive (they become yellow) and, after a time, they turn back to white. See Fig 1.
The color sensor reads the light 'going out of the catheter'. Somehow, in the first hours the light crosses the catheter wall and 'reads' the color of the liquid inside it. After several hours the color of the liquid is supposed to be the same but the reading have changed.
Then we recover the liquid of a very contaminated culture and we discover that the color of the culture in the RAMICA catheter is not the same of the one in the IDDEX blister. See Fig. 2.
Other estrange result appears when trying to clean the catheter after a culture have been done. We make a great amount of water to pass through the catheter and then we pass water with hydrochloric acid (Clh) several times. We are sure there is not bacteria in the catheter. The water plus Clh changes to yellow. We suppose it is due to 'something' that remains attached to the inner wall of the catheter. The very strange result is that the Clh plus water color changes to yellow and the amount of yellow varies along cleaning processes as shown in Fig 3.

HYPOTHESIS

After recognizing that we are broken with that results, one possible theory to explain the results is that:
-1.- The IDDEX nutrient includes a colorant that is liberated when the nutrient is metabolized by the bacteria.
-2.- That colorant is made with nano materials.
-3.- When liberated from the nutrient that nano materials, after a time, attach to the inner wall of the catheter.
-4.- That nano materials attached to the inner wall of the catheter affect the transparency of the catheter wall.
With the previous assumptions:
It would explain why the color read by the color sensor changes. It also would explain the different color of the culture in IDDEX blisters and in the RAMICA catheter.
And also the yellow color in the Clh plus water liquid when performing repeatedly cleanings.

CONCLUSIONS

We do not have conclusions, neither definitive nor provisional.

FUTURE LINES

With the Colloid Chemistry Group of the University of Vigo try to modify the inner surface of the catheter to avoid these estrange interactions with the culture and the IDDEX nutrient.
While this line does not have results, trying to use pieces of glass catheter in the cells attached by elastic catheter in the parts it must be smashed to separate the cells.

Fig. 1: Evolution of 'positive cells' along the 18 hours of a culture. Every cell that turns to yellow -positive- does not change its color. If the sensor reads white, it means that the light going out the catheter is white.

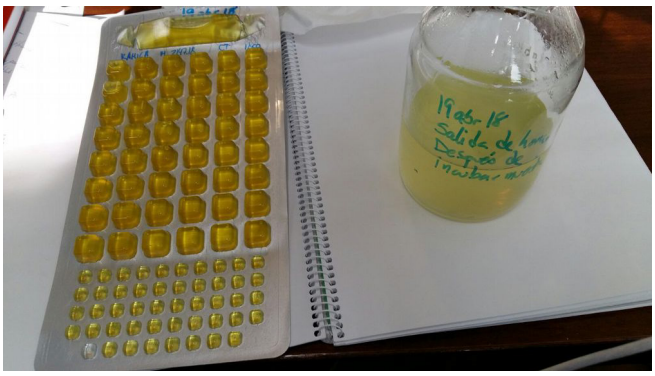

Fig. 2: The color in the cells of the IDDEX blister is clearly different to the color of the culture being done in a flexible catheter

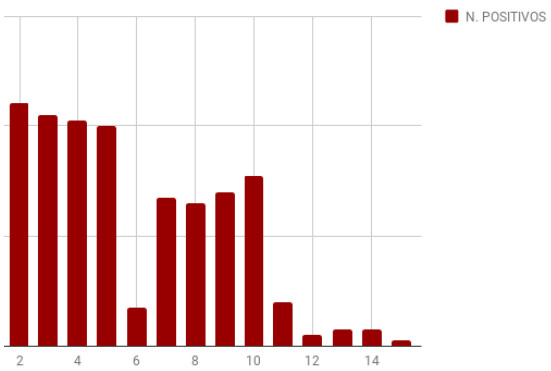

Fig. 3: Evolution of 'positive cells' while repeatedly cleaning the catheter. Positive cells only means that the color sensor reads yellow. We consider there are unless 3 different processes in the nutrient – catheter interaction