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Opinion

Being a Microbiologist Two Centuries After Pasteur

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Recently we celebrated Louis Pasteur's two-hundred birthday, the pioneer of modern microbiology. Of course, many things have changed in science since then. Great advances were witnessed during this time, and these are becoming faster and faster [1,2].

At the end of the XXth century, when I was a medical student, clinical and research laboratories in my country used completely manual testing for the identification and susceptibility testing of microorganisms.

No doubt, new technologies like automatized microorganism identification and susceptibility testing, molecular biology and matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) [3] added big benefits for microbial study and to medical diagnosis. This was particularly useful for rapid diagnosis and for detection of difficult or impossible to culture microorganisms.

Nevertheless, we still perform bacterial, fungal and viral cultures but we are kind of expecting that "machines replace humans".

In the era of robotics everything is faster, which is good, but not everything is perfect. We must always keep in mind that the result of a machine has to be interpreted and validated by an expert human being.

A couple of years ago I heard an outstanding medical microbiologist saying at a conference that automatization is great for those laboratories that do not have a microbiologist among it staff. This is a terrible message to transmit.

It is not true that when a machine identifies *Acinetobacter baumannii* with 99% confidence from the blood of a newborn we must trust it closed eyes. In fact, this actually happened and when a clever technician saw the result he took the Petri dish with the culture and started from the beginning. Macroscopically it suggested Gram positive cocci, and this was confirmed by Gram stain, a method developed in 1884, easy and quick to perform [4]. As many other methods developed soon after Pasteur's validation of the "Germ theory" [1], the use of Gram stain to start the identification of bacteria should be the rule and not the exception. Regardless of whether we are going to use polymerase chain reaction (PCR) or MALDI-TOF or other sohphisticated atuomatized methods, the systematics of bacterial identification beginning with a few basic and quick methods (colony morphology, catalase, oxidase, indole production) is today as valid as it was in the XIXth century [5]. Actually, conventional microbiology is based on putting into evidence microbial physiology and biochemical reactions derived from metabolism. So, in addition to microscopic and macroscopic morphological characteristics, we need a deep understanding of microorganisms' behavior.

When we just take a result proposed by a machine and we do not correlate it with its physiology and metabolism we can make huge mistakes. For instance, if we obtain as a result *Pseudomonas aeruginosa* and the bacterium is a strict anaerobe, the result needs profound analysis.

Furthermore, when we are working at a clinical laboratory, results must be confronted with the patients' clinical presentation. To illustrate again this with a true case, some weeks ago we studied the vaginal discharge of a woman who had not have sexual intercourse

in the last six month. We used a kit based on amplification and hybridization of several genital pathogens and we identified *Neisseria gonorrhoeae*. Probably several explanations come to our minds for this result, but what we know is that it is extremely rare, if not impossible, that an adult who is not having active sex gets gonorrhea.

In brief, get as much actualized as you can but if you are in trouble, go back to the basics.

Bibliography

1. S Opal. "A Brief History of Microbiology and Immunology". *Vaccines: A Biography* 10 (2009): 31-56.
2. R Kolter. "The History of Microbiology-A Personal Interpretation". *Annual Review of Microbiology* 75 (2021): 1-17.
3. G Vrioni., *et al*. "MALDI-TOF mass spectrometry technology for detecting biomarkers of antimicrobial resistance: current achievements and future perspectives". *The Annals of Translational Medicine* 6.12 (2018): 240.
4. N Tripathi and A Sapra. "Gram Staining". Stat Pearls, Treasure Island (FL) (2022).
5. Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 7th edition., Burlington, MA, (2016).

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