Bi-directional translational research: how practical applications fuel fundamental research

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Translational research consists in translating fundamental research results as closely as possible to patients. Researchers or institutions sometimes underestimate these translational studies because it is thought that, although essential for setting up new investigation tools, they do not deepen fundamental knowledge.

However, users face specific difficulties due to biological, physiological and clinical constraints. In other words, new questions and scientific obstacles arise when research is applied to the real world. In order to address these new challenges, reverse translational research is required. This paradigm consists in understanding difficulties faced when accounting for the above mentioned constraints, expressing them in terms of scientific theories and solving them by defining new prisms through which reality is perceived.

Consequently, fundamental research is fueled by this renewed perception translational research induces.

In this talk, we illustrate this principle with the development of what is, to the best of our knowledge, the first fluorescence based calibration free micro pH sensor. The expressed need was to continuously monitor some physiological pH related constants inside the human body. The main clinical constraint was therefore the use of the sensor in a calibration free manner. We show how fluorescence pH measurement had to be rethought and how a new physical-chemical understanding of acid-base reactions at the sensor's surface had to be discovered to address this constraint.

More generally and to open discussions on translational and reversed translational research, we present how we developed bi-directional research actions between practitioners and technology researchers in eastern France.