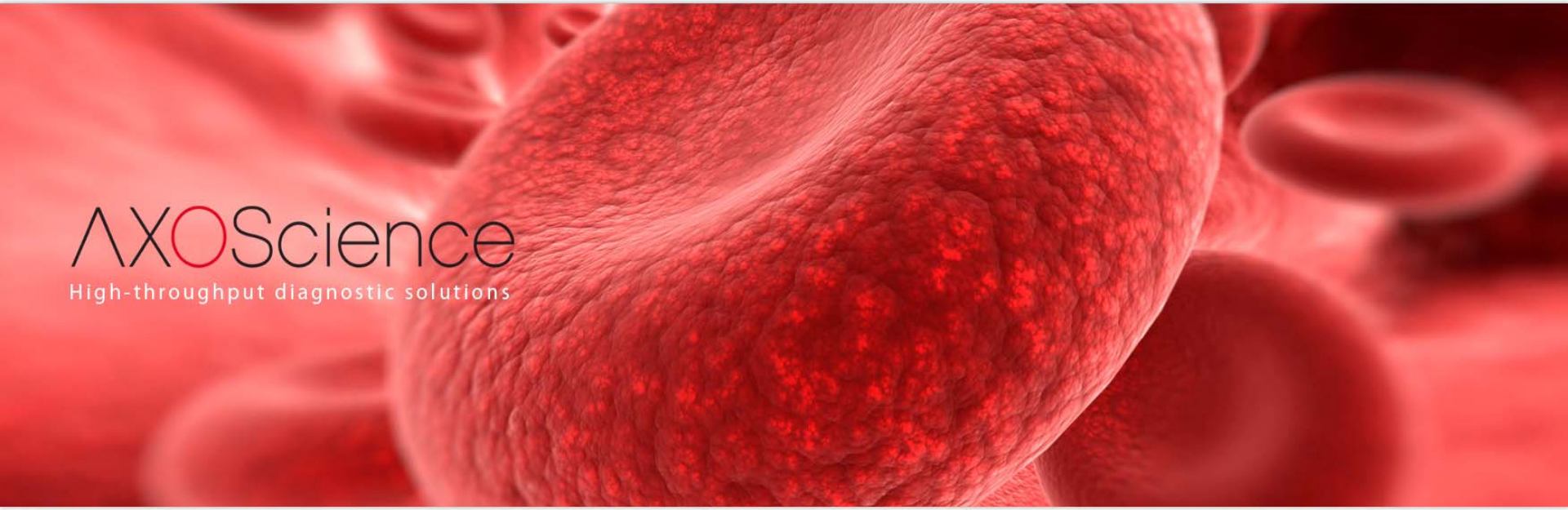
Strategy for IVD product development, validation and commercialization



Benjamin CORGIER, PhD
R&D-Innovation to Production Manager
AXO Science

AXO Science

SME based in Lyon (FRANCE)

- Spin-off of from CNRS-University Lyon 1
- Founded in 2010
- Headquarters and production unit in clean room
- Certified ISO:9001 andISO 13485:2003 since 2012

Multiplexed diagnostic solutions

- Patent: *HIFI Technology*
- Applications:
  - Rare blood group genotyping(CE-IVD)
  - Allergy diagnosis
  - Bladder cancer biomarker detection
  - Identification and characterization of pathogens
  - Biologic traces detection for forensic

Position of the company

- **50 % of the activity is about R&D and product development**
- **All the commercial profits are re-invested in R&D**

- **R&D project status:**
  - **2 projects led to commercial products:**
  - **3 are ongoing development project**
  - **2 in standby**

AXOScience
HIFI Blood 96™

Since 2012

STK Sperm Tracker

Since 2016

The Context around FAPIC project: Antibiotic resistance

- **WHO stated that**

- **Antibiotic resistance is one of the biggest threats to global health today. It can affect anyone, of any age, in any country.**
- **Antibiotic resistance occurs naturally, but misuse of antibiotics in humans and animals is drastically accelerating the process.**
- **A growing number of infections are becoming harder to treat as the antibiotics used to treat them become less effective.**
- **Antibiotic resistance leads to longer hospital stays, higher medical costs and increased mortality.**

- **World bank stated that Microbial resistance will**

- **Lead to a global economical threat comparable to 2008 financial crisis**
- **Increase poverty, especially in poor countries pushing more than 28 millions people in poverty towards 2050**

- **There is an urgent need to detect, screen and monitor resistances factors, from the very begining of the patient care strategy.**

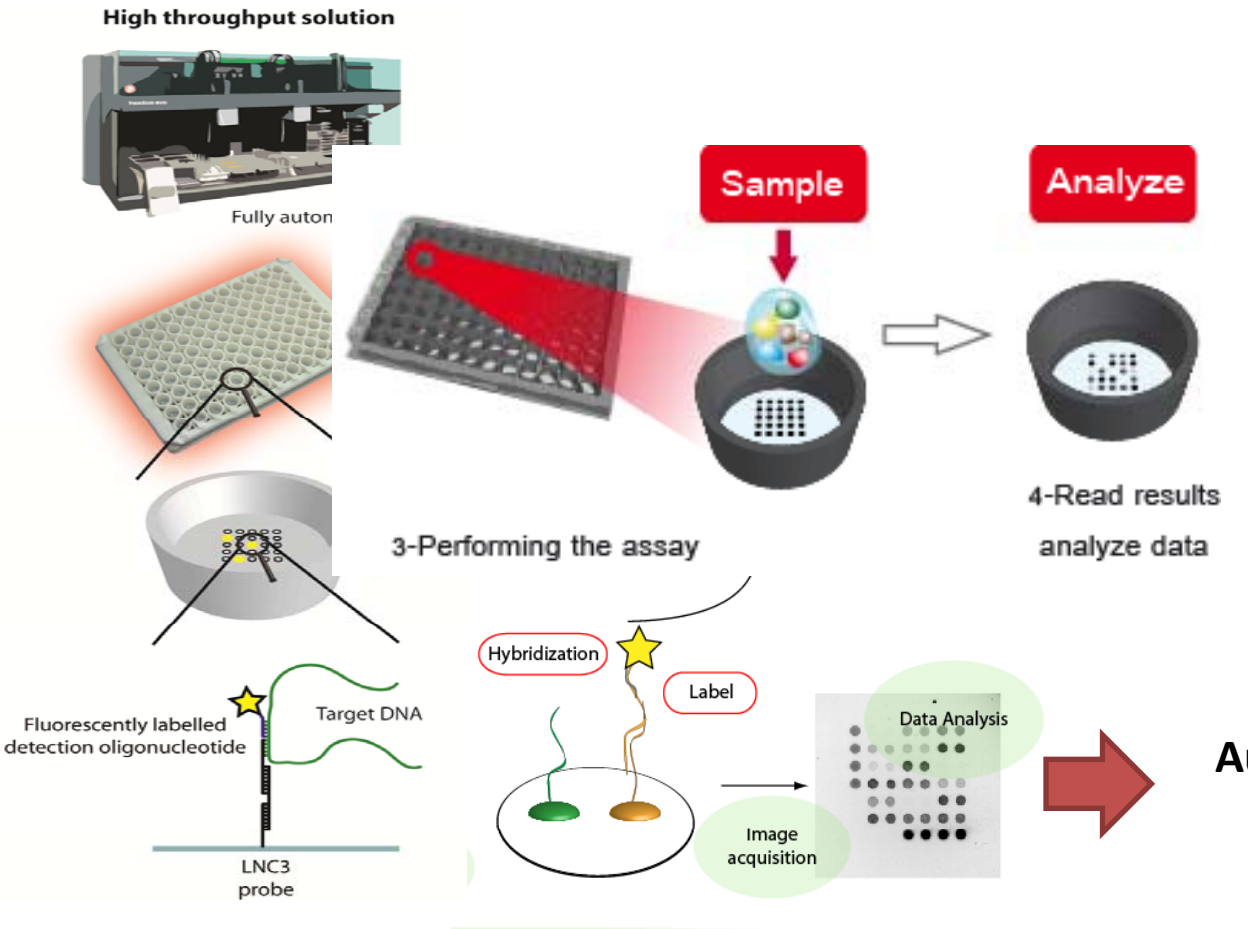
The Scientific and Technological Context

Today a huge knowledge regarding pathogens characteristics is available

- **Coming from Sequencing**
- **Stored in rich genome databases**

- **How to take advantage of this knowledge to tackle down the resistant pathogen threats ?**

FAPIC project



Automated Interpretation (Software)

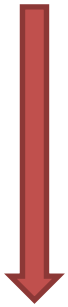
Steps of product development

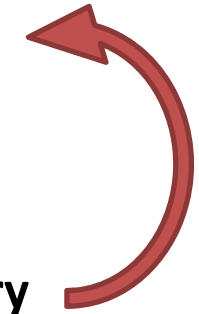
- **Development** (ISO 13485 Standard designated as EN ISO 13485:2003 is seen as the *de facto* standard for the medical device industry.
  - Proof of concept
  - Optimization
  - Validation of instrumentations (great task, which is getting more importance including all embedded **electronic** and **software**)

- **Produce Prototype batches**
  - **Performances evaluation**
  - **Performance validation** (crucial step, has to be done in close relation with marketing/customer requirement) compliant with the norms.
  - Procedure for validation of raw materials, procedure for validation of batch production
  - Industrialization transfer file
  - Routine production (from this step only minor changes in the product are allowed)
  - Commercialization
  - Customer feedback (improvement)

Steps for Performances evaluation:

- **Declare the performances**
- **Write a plan of evaluation**
- **Perform studies of performance evaluations**
- **Validate the performance evaluations**
- **Modify/adjust performance evaluation during the process, if necessary**

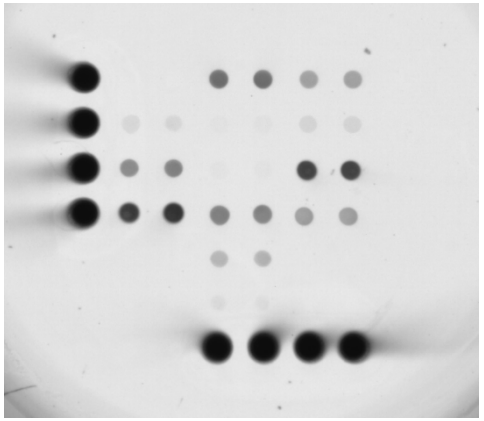




Performances can be validated and claimed

Particularity of multiplexing, regarding performances and QC

- Multiplexing provides many results, wich are somehow related, they’re never independant.
- The multiplex particularity is not detailed in the CE directive, **DIRECTIVE 98/79/CE**. (« the performances »)
- Two challenges appear :
- **Performances:**
- Performance of a single parameter, within a chip / regarding other parameters ?
- How to claim performances ? Globally for the chip, individually for each parameters, or both ?
- **Quality controls from batchs:**
- Considering that the assay is destructive for the device :
- how many tests should I run ?
- -consider the prevalence



Regulatory Requirements

IVD Medical device :

Directive 98/79/EC In Vitro Diagnostics Medical Device Directive

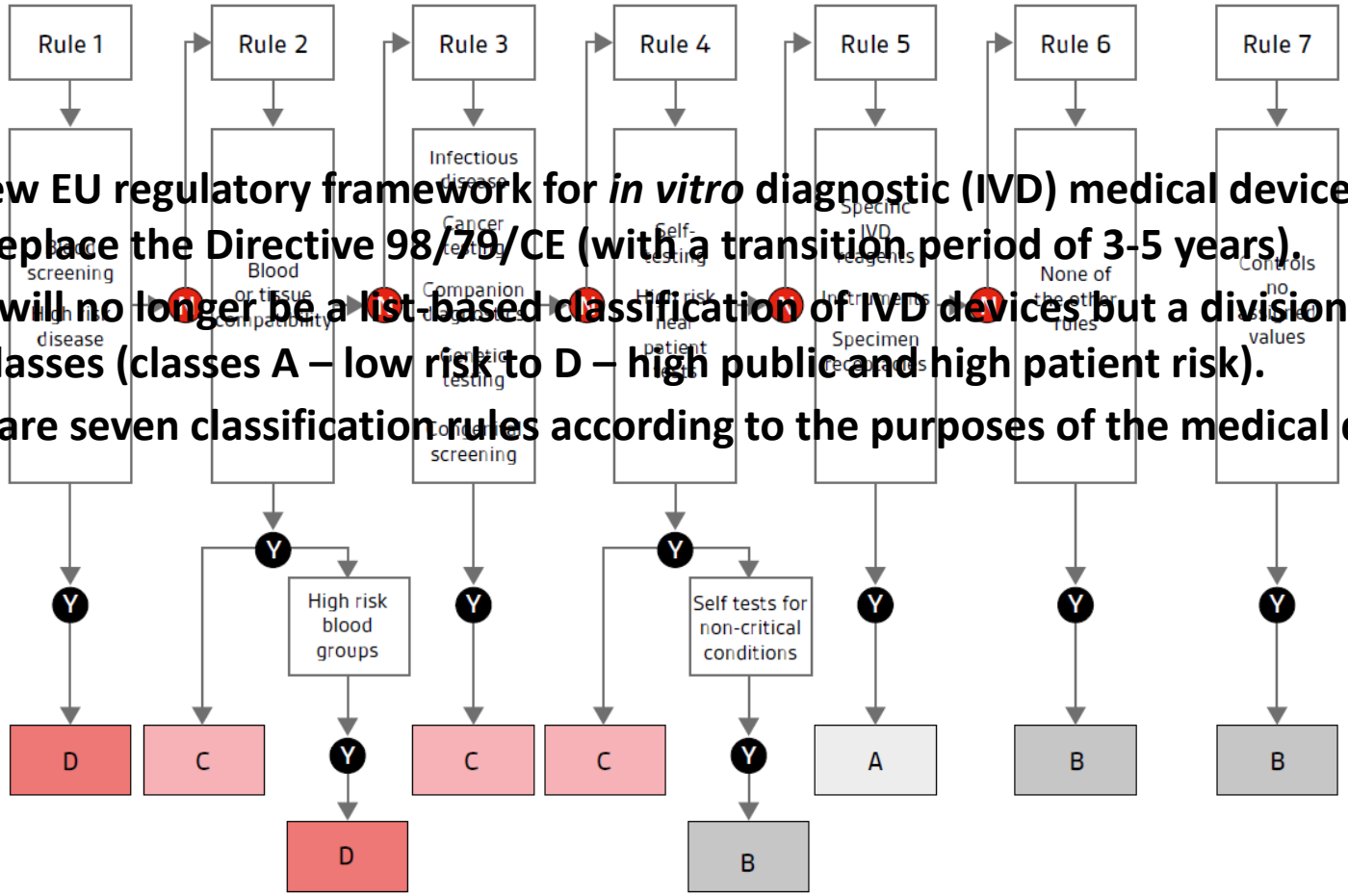
- **Software** is crucial in innovatives IVD devices.

- Interpretation software **standard (EN 62304) Medical device software — Software life cycle processes**
- This standard defines the life cycle requirements for MEDICAL DEVICE SOFTWARE. The set of PROCESSES, ACTIVITIES, and TASKS described in this standard establishes a common framework for MEDICAL DEVICE SOFTWARE life cycle PROCESSES.

- The acceptance criteria of the products have to be precisely defined and documented.

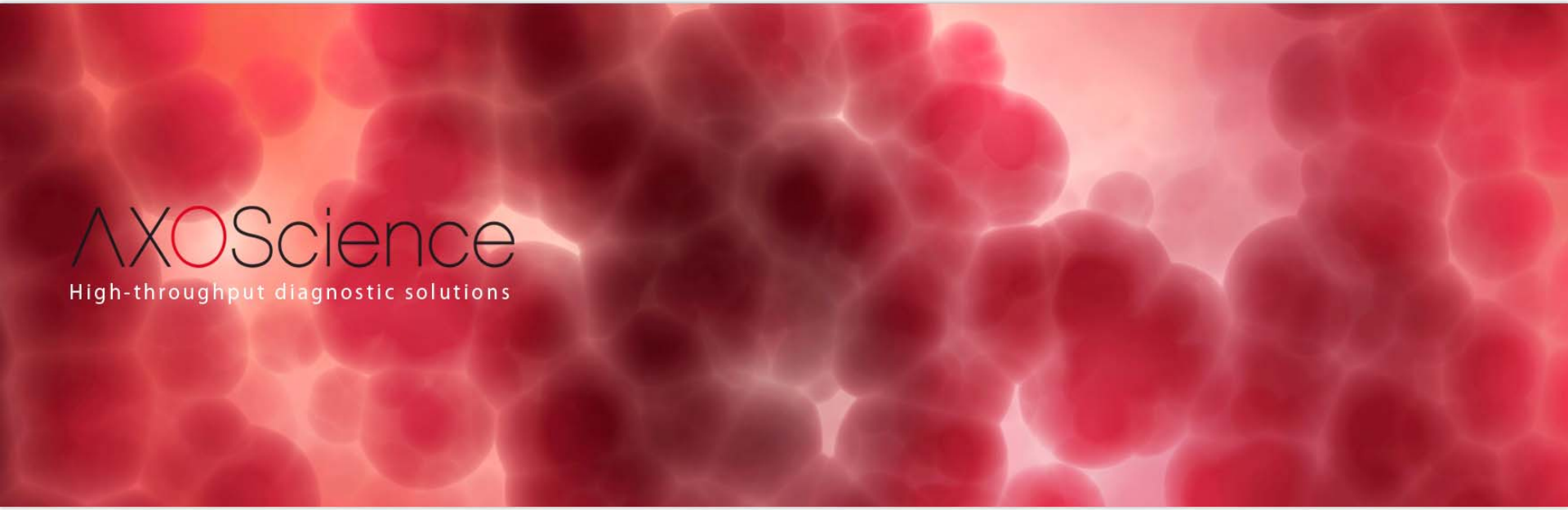
- **Quality Controls for batch releases:**
- **ISO 2859-1:1999(en)**
- Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
- This part of ISO 2859 specifies an acceptance sampling system for inspection by attributes. It is indexed in terms of the acceptance quality limit (AQL).

CE-IVD products
New Classification



- **The new EU regulatory framework for *in vitro* diagnostic (IVD) medical devices will soon replace the Directive 98/79/CE (with a transition period of 3-5 years).**
- **There will no longer be a list-based classification of IVD devices but a division into risks classes (classes A – low risk to D – high public and high patient risk).**
- **There are seven classification rules according to the purposes of the medical devices:**

Thanks !



Question ?