What are the different biochip uses?

The **first "DNA arrays" technological application,** developed successfully, was the **"expression profiling"**. It is still today the most largely employed application and which is in full expansion since the multiplication of chips covering the whole genome of various organisms. Indeed, the transcription analysis makes it possible to establish the "expression profiling" of each gene according to one or more parameters (time, cellular standard...) and thus predicted not characterized gene function by comparing various transcriptomes (mutants or various cellular types). This biochip type allows a better comprehension of molecular and cellular systems and mechanisms responsible for diseases or disorders.

In the same way, with oncologic and pharmacological interest **to detect SNPs (Singlel-Nucleotide Polymorphism)** which are stable genetic markers allowing to analyze the genotypes associated with pathologies (genotypage: detection of polymorphisms between gene alleles or new mutations), biochip companies developed short oligonucleotide chips, enough specific to discriminate SNPs sequences differing from only one nucleotide.

Also recently, "CGH-arrays" appeared on the market to **accelerate CGH (Comparative Genomic Hybridization) technique use to detect DNA copy number variations** such as chromosomal amplifications and deletions of the areas **associated pathology or cancer development**. Indeed, “CGH-arrays” chart genomic rearrangements with a resolution much higher than traditional CGH technique. These arrays was used successfully in classification studies of cancer sub-types, gene identification with amplified expression of the tumors (breast, stomach cancers...) and in rearrangement analysis of constitutive genetic syndromes (congenital anomalies...).

After hard beginnings because of technological problems, the “protein arrays” are currently in full progression, biochip companies see in them a potential more important than “DNA arrays” and invest above. Indeed, the **proteins are the targets of therapy majority**. Their uses allow the **evaluation of the drug effectiveness and toxicity before clinical trials** and the **appreciation of protein differential expression in order**

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to identify new drugs but also **discover protein markers who indicate disease stages**.

Accordingly, **DNA or protein arrays contribute to the rise of pharmacogenomic**. Indeed, in many cases, doctors have an drug arsenal to treat a pathology. Those proved an effectiveness which varies from a patient to another. It thus rests to the expert to determine by successive tests which compound will be most effective for a patient. A fortiori, this information is highly required by the pharmaceutical companies. The pharmacogenomic will have as a role to give this information in advance starting from a genomic test of the patient. **Pharmaceutical companies intend to develop "genetically optimized" drugs thanks to biochips**.

Also, **“DNA arrays” concern the sectors of agri-food, defense and the environment** for their capacity **to detect and screen specific organisms and stems** carrying of molecular identification or "code-bar” markers. This is why biochips are under development or are currently marketed to detect the presence of micro-organisms virulent or characteristic of a certain medium condition (water treatment, pathogenic research, ...). In the same way, the **agri-food sector** is a biochip user with strong potential since they can accelerate the development of new transgenic plants but also **control the origin of genetically modified plants** or **diagnose the presence of bacteria in food**. All the market of food safety is thus concerned and awaits portable test instruments for the use throughout the production food chain. The **defense sector with the bioterrorism fear** of in urban environment planifies to use biochips in order to quickly detect organic elements and with low cost, in particular of the pathogenic agents diluted in the environment.

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