New technologies in diagnostics

Claudio Galli, MD PhD
Associate Director, Medical Scientific Liaison Europe, Abbott Diagnostics

Putting Science Into Standards – Ispra, October 20-21, 2015
Diagnostics R&D focuses in critical areas

- **Primary targets**
  - Diabetes
  - Thyroid
  - Metabolism

- **Secondary targets**
  - Infectious diseases
  - Cardiovascular
  - Cancer

- **Tertiary targets**
  - Renal dis.
  - Neurodegen. dis.
  - Reproduction
  - Autoimmune dis.
  - Transplant

- **Unmet clinical needs**
  - Low
  - High
Cancer in Europe: incidence and mortality rates

Biomarkers discovery: the approach

Integrated systems biology approach

- Microarray databases
- Bioinformatics
- Literature mining
- Tissue proteome
- Relevant biological fluids proteome
- Cancer cell lines proteome
Biomarker discovery process

An example: breast cancer

- ~400 proteins (membrane, secretory, unclassified)
- “Top 100” (spectrographic analysis)
- 54 molecules not previously studied in serum of breast cancer patients
- Candidate for further analysis: ~10
Testing for HER-2/neu

Protein expression

IHC target= HER-2 protein
Subjective score 1+, 2+, 3+

Gene amplification

FISH target: = HER-2 gene (DNA)
Objective interpretation: Yes/No

 HER2 overexpression
 'HER2-positive (non-luminal)'
 HER2-positive
 ER and PgR absent

 'Basal-like'
 'Triple-negative (ductal)'
 ER and PgR absent
 HER2-negative

ESMO guidelines - E. Senkus et al, Ann Oncol 2015; 26: v8-v30
BRCA as a predictor for breast cancer

Integration of classical sequencing and LGRs to avoid false negatives

From: A. Kwong, Cancer Predict 2015; 208: 448-454
The oncogenic process

Cellular genomics
Microarrays

Genetic code

DNA damage

Event

SNP profile

Genetic mutations

Chromosomal changes

Tetraploid

Aneuploid

Microsatellite instability

Death

Repair

Cell death

Normal cells

Cancer
Microarrays: the future?

A microarray chip that assesses the mRNA expression of the 70 genes in triplicate. Manufactured by Agilent Technologies using the Agilent oligonucleotide microarray platform.

From: M. Buyse et al, J Nat Cancer Inst 2006; 98: 1183-1192
Diagnostic tests utilization

From M. Zhi et al, Plos One 2013; 8 (11): e78962
EDMA proposals with regards to clinical evidence

- **Study type:** Better separation between the requirements for general studies (applicable to more than 95% of the IVDs) and those which involve a risk to patients (less than 5% of the IVDs) (Annexes XII & XIII)

- **Concept of clinical benefit:** Criteria for assessment of clinical evidence based on the output of the diagnostic technologies, not on subsequent healthcare pathways or patient outcomes

- **Post-market assessment:** The Council text on continuous assessment must be clarified to enable a feasible and appropriate post-market surveillance system for IVDs.

- **Pre-market evidence gathering:** Information and data driven clinical evidence requirements, rather than process driven requirements

*From: EDMA position paper, August 25th, 2015*
The “four P” Medicine

- Predictive
- Preventive
- Personalized
- Participated
Thank you for your attention