

CANCER

There is a clear positive relationship between access to innovative medications and improved survival rates, according to an article in "Annals of oncology 2007". Yet developments in recent years have been concerned primarily with improving the quality of patients' lives and accurate diagnosis. Better diagnostic tools help doctors and researchers to identify illnesses and devise treatments suited to the patient. The occurrence of unwanted side-effects can be alleviated thanks to a better understanding of a person's ability to metabolise medications, having regard to genetic constitution. Another characteristic of these innovations lies in the method of administration, since some molecules are absorbed through the digestive tract and are tolerated better than a drip. At present, 70% of cancer products under clinical development come from biotechnology companies.

Advances between 2006 and 2008

Customised medicine

Biotechnology in healthcare involves new approaches towards therapy. It allows us to switch from disease-focused healthcare to treatment focused more on the individual, enabling one to target the right treatment at the right person more effectively. "Customised medicine" is based on the genetic predisposition, targeted screening, preventive vaccination before the onset of illness, diagnostics and tailor-made medical treatment, based upon patients' genetic diversity.

In the cases of some cancers, especially Myeloid leukæmia, medications have been developed for well-targeted treatment of the molecular abnormality at the source of the disease. Personalised therapy of Myeloid leukæmia is among the most effective at the present time. But for some time past, we have encountered resistance to these medications in a portion of patients. Laboratories are therefore working at second-generation molecules in order to combat this problem.

24% of proposed innovative medications concern targeted cancer therapies.

Biomarkers

Developing new medications entails being able to assess patients' responses quickly and accurately, depending on the pathology type or sub-type. Such assessment comes about through the appropriate use of the disease's biological markers: sensitive, reliable and whenever possible predictive as well: Biomarkers.

This tool enables doctors to identify the presence of a disease, to measure its extent and indeed to find out whether the treatment prescribed actually produces the desired effect. It also gives rise to numerous applications, such as toxicity studies, or the effectiveness of a medication by a simple dosing of a molecule, instead of for example observing a suite of complex symptoms.

Hence, the use of biomarkers in the context of cancer can avoid any need to prescribe ineffective chemotherapy.

Exploring the entire genome

Mutations that will on their own bring a high risk of the onset of cancer are rare, but are most commonly expressed through the existence of identifiable families (e.g. BRCA genes in the case of

breast cancer). It had been suspected for a long time past that more common genetic variations, which individually bring a lesser risk than those mutations that are frankly pernicious, were present in the population. Until last year however, efforts made to identify such variations had generally proved disappointing.

A conjunction of various circumstances has now made it possible to overcome these obstacles, enabling us to explore the entire genome in the search for associations.

- improved genotyping techniques have recently made it possible to describe over 500,000 different genetic variations in the DNA in a single operation.
- automation of these techniques and their implementation at large genotyping centres has led to a significant decrease in costs and the ability to apply rigorous control, thereby ensuring the high quality of data.
- the formation of international scientific consortia has brought together the thousands of biological samples needed, coming from either afflicted people (cases) or unaffected people (controls).

2007 produced the first results of some studies dealing with a genetic predisposition to cancer, making it possible to draw robust conclusions and to point the way for new directions in research. In fact, for each type of cancer (breast, prostate, etc.) it is possible to demonstrate the existence of multiple genetic variations, often promoting or protecting against the onset of the disease. Each variation, taken in isolation, will elicit only a modest effect. However, the collective impact of these variations in terms of public health is most probably significant.

These tools are capable of bringing rapid progress in our understanding of the mechanisms at work in cancer, and enabling us to arrive at practical applications in the fullness of time.

Lastly, given that epigenetic changes are by nature reversible, new intervention methods can be conceived using medications, or through the prospect of using reprogrammed cells coming from the patient him/herself, such as grafts to repair tissue.

In fact, epigenetic therapy is turning into a reality, and we can expect wide-ranging biomedical applications.

Prospects

Large-scale research programmes in the biomedical domain are opening the way to improvements in personalised medicine. This forms a major area of development for the biotechnology sector and for the pharmaceuticals industry.

Moreover, early diagnosis could be greatly improved through this research.

It will gradually be possible to determine the environmental factors that interact with predisposing genetic factors in common diseases, and to put an effective preventive system in place for those most at risk.

Lastly, thanks to the improvements in research technologies now available, the time required to put suitable products on the market will be divided by four.

Sources:

Inca (Institut National de lutte contre le Cancer) [National Institute for the fight against Cancer]

PACA Cancer Centre

Leem (Les Entreprises du Medicament) – The situation of Cancer: some key figures, after a study by Bionest partners, 2007.