From Basic Research to Targeted Therapy

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"True success is not in learning but in its application for the benefit of mankind": this pronouncement was stated by Prince Mahidol to medical students more than eight decades ago and then was brought up to be the philosophy of Mahidol University.

As our mission covers not only medical care, teaching, training, but also are conducting research and innovation. Undoubtedly clinical researches play more or less a major impact to the development of medical care. In the contrary, majority of the findings in basic or molecular researches were not able to apply their results for the benefit of the community. However, with the curiosity and enthusiasm among scientists, some of them take many years or their whole lives just to discover one valuable thing.

Targeted therapy in breast cancer is one of the best examples of new modality of treatment derived from a great effort of a group of scientists led by Professor Axel Ullrich who just receives an auspicious Prince Mahidol's Award in the field of Medicine in 2007.

Professor Ullrich is an internationally renowned molecular geneticist and director of the Department of Molecular Biology at the Max Planck Institute of Biochemistry. For over 25 years, he has been a leader in gene-technology, translating basic science discoveries into medical application which can safe the peoples' lives.

At present, most of anti-cancer drugs are not specific in killing only the cancer cells but they will attack the rapidly dividing cells which the cancer cells usually characterize that way. As a consequence, other normal rapidly dividing cells in the body such as white blood cell, hair cells, mucosal cells of the alimentary tract, etc, will be interfered as well causing lots of major side effects or sometimes death to the patients.

What is targeted therapy? Basically it is a type of medication which blocks the growth of cancer cells by interfering with specific targeted molecules needed for carcinogenesis or cancer growth. These types of therapy is theoretically less harmful to normal cells but more specific by targeting only those cells which are having the codes or receptors. These main categories of targeted therapy or the new weapons are small molecules and monoclonal antibodies.

There are hundreds of small molecules and monoclonal antibodies that are under investigation and research but only a few are effective and approved by FDA and Herceptin or trastuzumab is one of those.

Professor Ullrich discovered and evaluated the biological and clinical significance of a breast cancer oncogene called HER2 or human epidermal growth factor receptor. He found that breast cancer with HER2 over-expression is associated with an aggressive character, rapidly spreading and reduced in survival rates. His laboratory then discovered several monoclonal antibodies against HER2 one of which was subsequently humanized and developed into Herceptin (Trastuzumab), as a weapon specifically against those aggressive staged cancers having positive HER2.

It is now evidenced that Trastuzumab in combination with other anti-cancer drugs increases response rate, time to progression and survival among breast cancer patients.

However, the results are not promising in all patients and some may progress in a later date. A clearer understanding of the mechanisms that contribute to trastuzumab resistance is needed to increase the magnitude and duration of response.

As Trastuzumab is a prototype of targeted therapy with clinical benefit, it becomes a model for other drug to cope with other types of cancers, such as Bevacizumab (Avastin) for colon cancer, Rituximab for lymphoma, Imatinib mesylate for gastrointestinal stromal tumor, etc.

In the near future, targeted cancer therapy will give doctors a better ways to tailor treatment based on the unique set of molecular targets produced by the patient's tumor. The treatment will be more selective and damage fewer normal cells, reduce side effect and improve the quality of life.

However, as these technologies are foreign based, the cost of treatment is undoubtedly very expensive, only few are economically accessible. National budget for cancer treatment will eventually inadequate. Our health care technology will become foreign dependent if no serious action is taking focusing on these research and development of our own.