In a collaboration between Semmelweis University Budapest and Charité Universitätsmedizin Berlin, Balazs Györffy along with a number of other scientists and informaticians have been working together to create a new test that will decrease the cost and time of determining the correct course of systemic therapy for breast cancer patients.

Assessing the recurrence of breast cancer online

Breast cancer is the most common cancer among women, and in 2008 was the cause of 458,503 deaths worldwide. As with many cancers, early diagnosis and appropriate treatment can be one of the most crucial factors in survival rate, and so any advance in the speed of attaining the necessary information to begin systemic therapy for a patient could be extremely important.

There are currently three main treatments available for breast cancer patients: surgery, radiotherapy and systemic therapy (which essentially includes all drug-based therapies). Surgery is nearly always used as a starting point, so the more difficult question is working out which drugs to administer to each individual. This systemic therapy is divided up into a further three categories: chemotherapy, hormonal therapy and therapies targeting HER2 (a protein that causes higher aggressiveness of cancer in approximately 30 per cent of cases).

When surgery has been completed, the patient will be handed over to pathologists who will then assess her and deduce the best type of systemic therapy to implement. This currently involves carrying out a set of separate tests. Firstly, they will ascertain whether or not the cancer has spread to the lymph nodes; if it has, then the patient is lymph node positive and will have to receive chemotherapy. Then, the tumour is tested to see whether it contains oestrogen receptors, in which case it is called ER positive and can be treated with hormone therapy using drugs such as tamoxifen. The doctors will
test to see if the tumour is HER2 positive, in which case targeted therapies using drugs such as herceptin will be prescribed. Finally, the risk of distant recurrence can be measured by a panel of genes - patients in a high-risk group should also receive chemotherapy.

Györffy tells how he and his team were inspired to start working in this area, and the differences that their new test could provide. “The three separate tests that are currently carried out to assess what systemic treatment a patient should receive can take over a month to give results,” he says.

“The overall cost is approximately $5,000. After having done some work with microarrays in the past, we realised that this technology could be used to create a huge shortcut in terms of time and money. That is how we ended up creating this integrated test that combines all three tests, takes only two days to complete and costs about $1,000.”

These particularly impressive statistics are made possible by utilising DNA microarray technology, a technique that allows the expression levels of hundreds of thousands of genes to be measured simultaneously. Once this microarray has been created for a patient, the data contained on it is converted into a computer file, which is then uploaded on to a specially designed website. The programme on the website then serves to normalise the array, check its quality and then generate a diagnosis for each of the three questions.

This website can be found at www.recurrenceonline.com and a sample file can be used to demonstrate how the results would be represented to the oncologist.

Györffy explains how else the new way of testing is able to provide benefits in the decision-making process for treatment choice. “Over 76 per cent of patients are ER positive, and over 66 per cent of those patients are lymph node negative,” he says.

“For these patients, the question has to be raised - should they only receive hormonal therapy or should they also be receiving chemotherapy to prevent recurrence of the cancer in future? To try to answer this, we have developed a ‘recurrence risk’ that is computed by our online analysis tool that divides patients into groups that have high or low risk of recurrence.

“This score is based upon studies that have shown that the analysis of the expression of specific genes can help predict distant recurrence in breast cancer patients who are lymph node negative and ER positive.

“Due to the fact that it is known that only about four per cent of patients in this group will actually benefit from chemotherapy, this prediction of recurrence could prove to be particularly useful for people deciding whether or not to go through with it,” he continued.

“The side effects of chemotherapy are numerous, can be extremely debilitating and are sometimes permanent, so the decision is not one to be taken lightly or as a play-it-safe precaution. The score predicts the likelihood of patients being in this four per cent group, and thus could be an invaluable diagnostic tool.”

Talking about the future, Györffy is keen to get the project into mainstream use as soon as possible. “We now need to go through the process of prospective validation – the process by which all drugs or tests must go through before being approved by medical authorities - and so we are now looking for partners to get involved by actually treating patients based upon the results of our analysis. This process will probably take several years, depending on how many patients we can get.”

The microarray technology platform itself has only very recently been approved for basing diagnostic medical decisions upon and so this could be one of the first of many exciting new projects that arises in this area.

Hopefully, this particular one will be helping to save the lives of breast cancer patients in the near future. ★