



# Biuletyn Polskiej Federacji Biotechnologii

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# Czerwona biotechnologia

## Innovative approach to the noninvasive prenatal diagnosis

The research team of a chemical pathologist Y.M. Dennis Lo, from the Chinese University of Hong Kong, has recently managed to perform the analysis of fetal DNA obtained from the sample of mother's blood. Their achievement may lead to a breakthrough in prenatal screening, so far possible to be accomplished only through invasive procedures, such as amniocentesis or chorionic villus sampling.

Lo and colleagues demonstrated that cell-free fetal DNA is present in the plasma of pregnant women and can be used for noninvasive prenatal diagnosis (NIPD). The researchers performed sequencing of a maternal plasma DNA sample at up to 65-fold genomic coverage and showed that the entire fetal and maternal genomes were represented in maternal plasma at a constant relative proportion. Their early work had focused on the detection of paternally inherited fetal mutations in maternal plasma. Recent advances in single-molecule counting approaches have allowed the mutation dosage of the fetus to be analyzed in maternal plasma. These developments have been demonstrated as feasible for noninvasive prenatal diagnosis of several hemoglobinopathies, including  $\beta$ -thalassemia and hemoglobin E disease.

Whereas the results of their work are impressive, it should not be overlooked that this type of prenatal diagnosis approach is still very expensive nowadays, what makes it still impossible to be introduced on a regular basis. Nevertheless, Lo believes that the widespread use of this method will be possible relatively soon. In an article entitled Noninvasive prenatal diagnosis in 2020 he claims: "With the rapid reduction in the costs and the increase in throughput per run, I would predict that DNA sequencing would become the dominant technology used for the NIPD of fetal chromosomal aneuploidies from maternal plasma. By 2020, I would predict that a number of large-scale clinical trials testing the diagnostic accuracy of this technology would have been published (...)"

## References

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## One marker for multiple types of cancer

FSH (follicle stimulating hormone) receptor, a molecule absent from the majority of normal human tissues, has been detected in 11 types of cancer by a French-US team of researchers. This discovery can potentially make FSH receptor a universal cancer biomarker. The results of the research project were published on 21 October 2010 in *The New England Journal of Medicine*.

Nicolae Ghinea and his colleagues from INSERM (Institut National de la Santé et de la Recherche Médicale) studied biopsies taken, after surgery, from 1336 patients afflicted with cancer. The presence of FSH receptor was monitored in the tumours, which ranged from being at a very early stage to being at the later stages of disease development. The results obtained demonstrated the presence of this receptor in all the samples, regardless of the type or stage of the tumour. The molecule has been found in cancers of the prostate, breast, colon, pancreas, bladder, kidneys, lungs, liver, stomach, testicles and ovaries, even at a very early stage of the disease. The presence of FSH receptor was strictly associated with tumor's vascular network. By contrast, this receptor was absent in the other normal tissues of the organism, including the normal tissue of the organ that was carrying the tumour. Normally, FSH receptor is

present only in cells that are stimulated by FSH (granulosa cells in women and Sertoli cells in men). What is important, blood vessels that express FSH receptor are found at the periphery of the tumour. The receptor is specifically localized on the surface exposed to the blood (luminal) of the endothelial cells which carpet the vessel walls, making them an easy target for diagnostic and therapeutic agents injected in the blood. These two characteristics (absence from normal tissues and localization on the luminal surface of endothelial cells) make it a very promising biological marker and an interesting candidate for imaging and therapy.

Further experiments are required to confirm the detection of the FSH receptor by testing the imaging procedures currently used in hospitals (MRI, PET and ultrasound imaging). The researchers have already performed successful detection experiments through imaging in mice.

Source

Press Area of INSERM ([english.inserm.fr/press-area](http://english.inserm.fr/press-area)), 20th October 2010



### **Apple genome sequence deciphered**

In August 2009, a paper presenting complete genome sequence of apple has been published in "Nature Genetics". This complex work has been presented by an international team of researchers from Italy, France, New Zealand, Belgium and the USA. The apple variety analyzed in this study was *Malus domestica*, also called „Golden Delicious”.

The domestic apple is the main fruit crop of the world's temperate regions. Apple is a member of the plant family Rosaceae which includes many other economically important species, among others cherry, pear, peach, apricot, strawberry, and rose.

The analysis demonstrates that Golden Delicious has over 57 000 of genes – this is the biggest number of genes among all plants with sequenced genome. The results of apple genome sequencing show that relatively recently (>50 million years ago) a genome-wide duplication (GWD) has resulted in the transition from nine ancestral chromosomes to 17 chromosomes in the tribe Pyreae. Phylogenetic reconstruction of the tribe Pyreae and the genus *Malus*, relative to major Rosaceae taxa, identified the progenitor of the cultivated apple as *M. sieversii*, native to the mountains of southern Kazakhstan. The sequencing

outcome demonstrates the expansion of gene families reported to be involved in fruit development, which may explain the formation of the pome, a Pyreae-specific false fruit that develops by proliferation of the basal part of the sepals.

The availability of apple genome sequence gives a valuable resource for future research. It will facilitate the identification of genes which provide desirable characteristics of the fruit. It will also allow to analyze which genes and gene variants provide disease or drought resistance to the plant. For apple breeders this means that they will be able to improve the plants through more informed selective breeding in order to obtain disease resistant apples and to increase their health-benefiting qualities.

### References

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### **36th FEBS Congress**

The Federation of European Biochemical Societies (FEBS) has announced the 36th FEBS Congress that will take place in Turin, at the Centro Congressi Lingotto, between 25th and 30th of June 2011. The main theme of the conference is Biochemistry for tomorrow's medicine, as a global view on the important contribution of biochemistry and molecular biology to the advancement of biomedical research. The Congress will bring together the experts in the most advanced sectors of the fields of science, particularly the sciences devoted to human medicine. The rich and multidisciplinary program of the Congress will focus on today's prospects for the improvement of health conditions, prevention and treatment of human diseases, in particular those representing the major causes of morbidity and mortality.

The FEBS Congress represents a platform for networking of scientists from Europe and the whole world, giving the possibility for scientific exchange based on the newest developments in biochemistry and molecular biology.

Another important issue of the FEBS Congress is the young scientist community integration during the satellite event Young Scientist Forum, which will take place on 23-25 June. This initiative, together with the main FEBS Congress, will encourage the interaction of young scientists with peers in the field and with the whole scientific community. Moreover, in frame of the Congress, on the 28th of June, a special session called Science & Society: Session on genetic diseases will be held. FEBS Congresses provide opportunities for the presentation of original communications, demonstrations and symposia. Featuring around 2000 attendees and a showcase of the newest advances in biochemistry, the annual FEBS Congress is one of the largest bio-congresses in Europe. The deadline for abstract submission is 31st March 2011. The regular registration is open until 31st May 2011. Information about the program, plenary lectures, symposia, workshops and poster

sessions are available on the website: [www.febs2011.it](http://www.febs2011.it).

### **2011 International Conference on Food Engineering and Biotechnology**

The Asia-Pacific Chemical, Biological & Environmental Engineering Society (APCBEEES) and the Institute of Electrical and Electronics Engineers (IEEE) invite in May 2011 to Bangkok for the International Conference on Food Engineering and Biotechnology (ICFEB).

The aim of the ICFEB conference series is to gather specialists with different background in order to give them the opportunity to expose and discuss innovative theories, frameworks, methodologies, tools, and applications. There is a wide variety of scientific fields in the scope of this meeting: from the basic research in biochemistry, molecular biology and nanobiotechnology to bioinformatics and technological aspects of food engineering such as food microstructure development and characterization, mathematical modeling and software development for food processing purposes or application of artificial intelligence in food engineering research and in industry. It is noteworthy that one of the members of the conference Program Committee is Prof. Bogdan Zygmunt from the Faculty of Chemistry at the Gdansk University of Technology.

More information about the prospective presentations, keynote speakers and registration is available on the website [www.icefb.org](http://www.icefb.org)

### **Conference "Non-coding RNA, Epigenetic Memory, and the Environment"**

On 14 and 15 April 2011 the conference Non-coding RNA, Epigenetic Memory, and the Environment will take place in London, UK. The event will cover all major aspects of small RNAs and chromatin in epigenetics and inheritance. The conference is organized by Eric

Miska (University of Cambridge, UK) and Abcam company.

The keynote speaker of the conference – Emma Whitelaw from Queensland Institute for Medical Research, Australia – is going to give a speech on the ENU (N-ethyl-N-nitrosourea) screen for modifiers of epigenetic reprogramming. Recently she has published a series of articles concerning the influence of parents' and grandparents' environment on their children's genetic material. Among other invited speakers are distinguished scientists from the leading research centers in the United States, United Kingdom, Austria and France. In the recent years the non-coding RNA (ncRNA) became a very important direction in biotechnology research. ncRNAs appear to regulate important processes, among others the immune response, stress response, signal transduction, translation and RNA splicing. Moreover, some reports show that these small molecules may play an important role in carcinogenesis, Alzheimer's disease, autism and other diseases, which is why the topic of the conference may be interesting to many researchers working in different fields of biomedicine.

The registration deadline for the conference is 1st of April 2011. For more information and detailed program go to [www.natureevents.com](http://www.natureevents.com) or [www.abcam.com](http://www.abcam.com).

#### **IV Congress of Polish Biotechnology and IV EUROBIOTECH 2011 in Cracow**

New editions of two important Polish biotechnology events have been recently announced. This time two scientific meetings that have been so far held separately: the Congress of Polish Biotechnology and the Central European Congress of Life Sciences – EUROBIOTECH will be organized as a joint event by the Jagiellonian University, the University of Agriculture in Krakow, the Polish Federation of Biotechnology, the company Targi w Krakowie and the Biotechnology Committee of the Polish Academy of Sciences. It will take place on 12-15 October 2011. An international character of the IV Congress of Polish Biotechnology and EUROBIOTECH 2011 will create an excellent platform for presentation of recent achievements and future trends of biotechnology in Poland as well as other countries. Leading scientists will be invited to give the most updated lectures on a wide variety of biotechnology related topics. Apart from Polish participants, the organizers expect foreign scientists and students, especially from Slovakia, the Czech Republic, Hungary, the Ukraine and Lithuania. The accompanying exhibition will gather companies from different sectors of biotechnology,

creating an opportunity to exchange ideas and to establish cooperation between business and science. Contrary to the past EUROBIOTECH editions, each of which was dedicated to one particular field of biotechnology, the upcoming congress is called Four Colours of Biotechnology. It will cover almost all aspects of biotechnology, including the energy from renewable resources, biomasses and biofuels, pharmaceutical biotechnology, gene therapy and personalized medicine, nutrigenetics and nutrigenomics, biomaterials, recently emerging nanotechnologies and bioinformatics, and agrobiotechnology. Moreover, the topics of biotechnology in education, society, business, politics and legislation will also be included. IV Congress of Polish Biotechnology will be opened with the plenary lecture entitled The amazing ribosome delivered by the winner of the Nobel Prize in Chemistry – Professor Ada Yonath – from the Weizmann Institute of Science in Rehovot, Israel. Professor Ada Yonath is a crystallographer best known for her pioneering work on the structure of ribosome. She is also the recipient of 30 honorary doctorates and international and Israeli awards, including the Wolf Award in Chemistry (2007).

More information about the congress can be found on the <http://eurobiotech.krakow.pl> website.

#### **New „Nature Middle East” website**

Nature Publishing Group (NPG) launched a new Nature Middle East website dedicated to the research conducted in Arab countries. This is a unique online platform which provides Arab scientists with the opportunity to cooperate and exchange ideas and information. Moreover, everyone visiting the website has access to the editor's blog called House of wisdom with posts concerning a wide variety of topics – from environment, health and research to the science journalism in general.

The portal is being edited by a new media and science enthusiast – Mohammed Yahia. The portal site especially focuses on the scientific news and events taking place in Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, the Palestinian territories, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen. The website is sponsored by The King Abdullah International Medical Research Center (KAIMRC), Saudi Arabia. The articles are published both in English and Arabic. More information about the new NPG portal can be found on [www.nature.com/nmiddleeast](http://www.nature.com/nmiddleeast).

## **Semiconductor based DNA sequencing platform**

Life Technologies Corporation announced that it has launched the Ion Personal Genome Machine (PGM) sequencer, the first product to use semiconductor sequencing technology.

Ion Torrent, a business unit of Life Technologies, has invented and brought to the market a fundamentally new semiconductor device that enables chemical signals to be directly translated into digital information. The company invested 1 trillion dollars in creating this new DNA sequencing platform. Dr. Jonathan M. Rothberg, founder of Ion Torrent, claims that the Ion PGM sequencer gives results very fast, and he compares this new technology to the introduction of digital cameras. Contrary to the DNA sequencing technologies which use dyes to label nucleotides, that are then optically detected, the Ion PGM directly detects electrical signals on a disposable chip. Because this is direct detection – no scanning, no cameras and no light is required – the incorporation of each nucleotide is recorded very quickly. The recommended applications of this chip are: sequencing or resequencing of microbial genomes, preliminary library assessment and QC, and targeted amplicon sequencing.

### Source

The Life Technology website:

[www.lifetechnologies.com](http://www.lifetechnologies.com)

and Ion Torrent website [www.iontorrent.com](http://www.iontorrent.com).