Belgian Society for Microbiology

Quarterly Newsletter of the Belgian Society for Microbiology
Issue no. 2, September 2011

Contents

Welcome

Concomitantly with the start of the new academic year, we send you Issue 2 of the E-Newsletter of the Belgian Society for Microbiology. Since the first E-Newsletter, the BSM board was further active in several respects.

The BSM Board has further worked on finalizing the program of the symposium (Brussels, 16th November 2011), the yearly most important activity of BSM.

This year's topic is "Live, death and survival of Micro-organisms" emphasizing that thanks to the continuous progress in microbiological sciences, strategies used by micro-organisms to live and survive in unfavorable conditions become more and more understood, and this from different viewpoints and for all types of micro-organisms (viruses, bacteria, fungi).

This increased insight in survival strategies of micro-organisms is of great importance, because a better understanding of these mechanisms will ultimately lead to a more efficient microbial control in medicine and elsewhere (e.g. food).

As indicated in the program, the morning session consists of 4 plenary lectures, while in the afternoon 2 parallel sessions (bacteriology, virology) are programmed with time reserved for short oral communications from selected abstracts.

Besides this, there will be also ample time to discuss during the posters session. As such this meeting is also meant as an opportunity to meet microbiology colleagues and to exchange ideas. More details of the symposium, and how to register, you will find on p 3.

We also started with a series of short overviews on historical data in microbiology (see p 4), and continue with the PhD corner, and report on FEMS sponsored activities.

BSM was also for the first time host of the FEMS Council meeting held in Leuven 16-17th September, which was attended by 37 delegates (22 different nationalities) representing different microbiological societies unified under the umbrella of FEMS, which altogether represent more than 30000 European microbiologists (see **http://www.fems-microbiology.org).** The aim of the meeting was to report on and plan future strategies in the area of Microbiology. BSM members have the opportunity to apply for FEMS grants.

Please don't forget to join or renew your BSM membership!

Jozef Anné, President BSM

Membership

Historically membership of BSM has been linked to the attendance of the yearly BSM symposium : the registration fee for the symposium was at the same time the membership or vice versa. While this has been a convenient system it poses several problems, the most important one that membership fees are only collected at the time of the symposium, which is typically in November or December. In addition, microbiologists who for one reason or another do not attend the yearly symposium are no longer a member of the BSM.

For these reasons, the BSM board decided in its meeting on 13/01/2011 to uncouple both and to collect membership fees before July 1st. Members who pay their fee before this date pay € 20 (as before) and will get free access to the annual symposium. Later payments for symposium pre-registration or for membership will be at € 25. On-site registration fee will be € 30. To renew your membership please visit the BSM website (**www.belsocmicrobio.be).**

News from FEMS

FEMS is the Federation of European Microbiological Societies, and its main mission is to advance and unify microbiology knowledge. FEMS brings together 46 member societies from 36 European countries, covering over 30000 microbiologists. Belgium is represented in FEMS by BSM, and our FEMS delegate is Jozef Anné.

Members of FEMS Member Societies can apply for research fellowships, an advanced fellowship (new as of 2006) and/or support when organizing a meeting. These benefits are restricted to members of FEMS societies only. For more information, go to the FEMS website (**http://www.fems-microbiology.org**).

Every other year FEMS organises the Congress of European Microbiologists – the 5th edition will be in Leipzig in July 2013.

Contact forum supported by the Royal Flemish Academy of Belgium for Sciences and the Arts
Organized by the National Committee for Microbiology and the Belgian Society for Microbiology

Life, death and survival of micro-organisms

November 16th 2011

Academy Palace, Hertogsstraat 1, Rue Ducale – 1000 Brussels

08.30	Registration desk open – Poster mounting	
09.00	Welcome address	
09.10	**Kim Lewis,** Northeastern University, Boston, USA	
	"Persister cells, dormant variants highly tolerant to killing by antibiotics"	
09.55	**Frank Madeo**, Institute of Molecular Biosciences, University of Graz, AT	
	" Apoptosis In yeast: triggers, pathways, subroutines"	
10.40	Coffee break	
11.10	**Stacey Efstathiou,** Dep. Pathology, University of Cambridge, UK	
	"Understanding the molecular basis of herpes simplex virus latency"	
11.55	**Miroslav Radman,** Université de Paris-Descartes, Paris, FR	
	"New perspective on radiation resistance based on Deinococcus radiodurans"	
13.00	Lunch – Poster viewing & poster discussion groups	
	Parallel session 1 – Bacteriology	**Parallel session 1 – Virology**
14.30	**Stanley Brul,** Netherlands Institute for Systems Biology (NISB), University of Amsterdam, NL	**Stefano Aquaro,** Dep. Pharmaco--Biology, University of Calabria, Rende, IT
	"Bacillus subtilis; the awakening of sleeping beauty. Systems biology of spore germination and outgrowth"	*"Apoptosis and telomeres shortening related to HIV-1 induced oxidative stress in an astrocytoma cell line"*
15.10	Short lecture (5) of selected abstracts	Short lecture (5) of selected abstracts
16.30	General conclusions and presentation of awards for best posters	

Life, death and survival of micro-organisms

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Deadline for registration and abstract submission: 24 October 2011.

See http://www.belsocmicrobio.be for details about abstract submission and online registration

With support from :

2011 : 100th Anniversary of the death of Theodor Escherich , the discoverer of *Escherichia coli*

Introduction

The name *Escherichia coli* (*E.coli*) was coined only during the 1st International Congress of Bacteriology in Paris in 1930. However the bacterium was discovered, isolated and described already in 1885 by Dr. Theodor Escherich (1857-1911), who named his isolate *Bacterium coli commune*. Over the years, this bacterium has been of utmost importance in the medical (human and veterinarian) field, in bacterial genetics, in food and water microbiology, and it is a preferred tool in molecular biology and industrial biotechnology! This makes it all a bit surprising that relatively little is known about its discoverer, even among microbiologists.

Bacteriologist ànd Pediatrician : T. Escherich ‘s life in Munich and Würzburg

Theodor Escherich was born on 29 November 1857 in the small town of Ansbach, Bavaria, Germany, son of Ferdinand Escherich, a district medical officer of health and noted medical statistician, and of Marie Sophie Frieder, daughter of a Bavarian army officer. Theodor’s mother died when he was 5 years of age and the family moved to Würzburg in Germany. He was sent for his basic education as a boarder to the famous Jesuit school “Stella Matutina“ in Feldkirch, Austria. After his military service, he began his medical studies in Würzburg in 1876 and then attended a number of medical schools in Berlin, Munich, and Kiel in Germany. In 1881, he qualified at the University of Munich to practice medicine with top grades ; his MD thesis dealt with “Die Marantische Sinusthrombosis bei Cholera Infantum“ : the term “cholera infantum” had been coined in 1733 by the American physician B.Rush (1745-1813) for what is now known as infantile gastro-enteritis. Later in the 1940’s, it was shown that certain strains of *E.coli* are responsible for the disease. So in retrospect, Escherich’s first publication was dealing with a disease due to the microorganism he was later to describe!

A year later, Escherich was appointed First Assistant to Prof.Karl C.A.J. Gerhardt, a pediatric specialist, in the Dept. Internal Medicine, Julius Hospital in Würzburg, where he developed a keen interest in the diseases of children and in the emerging science of bacteriology. In 1884 he had the opportunity to travel to Naples, Italy, to study the then raging large cholera epidemic and to practice his bacteriological skills. A short stay in 1884 at the St.Anna Children’s Hospital in Vienna, Austria, convinced him to devote his career to pediatric medicine and to the bacteriology of mother’s milk and the intestinal infant microflora. In 1884,he moved to Munich to obtain his “habilitation” ; there he had access to Max von Pettenkofer’s Hygiene Institute, Otto von Bollinger’s Bacteriology Laboratory, Karl von Voit’s Physiological Institute and Franz von Soxhlet’s dairy facilities, allowing him to approach his research subjects in a multifaceted way. There he also learned the very new basic techniques of pure culture and bacterial characterization from Wilhelm Frobenius, one of Robert Koch’s pupils. Escherich demonstrated that breast milk and meconium were sterile and that bacterial intestinal colonization is linked to the infant’s environment within 3-24 hours after birth. He could isolate 19 different bacteria, bacilli and cocci, in pure culture and applied Christian Gram’s new staining technique and used anaerobic culture methods. During these studies, he described in detail *Bacterium coli commune* (now *E.coli*) - which he described as a “harmless parasite” - and *Bacterium lactis aerogenes* (now *Klebsiella pneumoniae*). In 1885 he was appointed at the University of Munich and presented (and published) a seminal paper at the Munich Society for Morphology and Physiology with all his findings, entitled : “The Bowel Bacteria of the Newborn and the Breast -Fed Infants”. In 1886, Escherich published his “Habilitation” thesis, which received wide acclaim. He then resumed his clinical work and continued as a lecturer in Pediatrics at the University in Munich.

2011 : 100th Anniversary of the death of Theodor Escherich , the discoverer of *Escherichia coli* - continued

Pediatric bacteriologist : T.Escherich's period in Graz and Vienna

In 1890, at the age of 33, he was selected by the Austrian Ministry of Education to succeed pediatrician Prof. R. von Jaksch at the University of Graz as Professor of Child Health and to become director of the St.Anna Children's Hospital in Graz. In Graz, Escherich married Margarete von Pfaundler and established a happy family life. He also demonstrated a remarkable organizational talent in renovating the Hospital with new equipment and facilities. There he also developed interest in other infectious diseases, such as diphteriae, scarlet fever, tetanus, and tuberculosis, and in serum therapy. He returned to his early interest and demonstrated that *B. coli commune* is the cause of childhood urinary tract infections. Escherich 's fame as a brilliant teacher, clinician and researcher attracted several young -later famous- students, a.o. Clemens von Pirquet and Bela Schik, who later made career in the USA. In 1902, Escherich's successful career in Graz led him to be nominated as Chair of Pediatrics at the University of Vienna and Director of the prestigious St.Anna Children's Hospital in Vienna, the institute Escherich had studied about 20 years earlier. There he demonstrated again outstanding leadership in science and in clinical practice, but equally so in building new facilities and using novel equipment (such as an X-ray apparatus), in establishing a school for training nurses, and in cofounding Austrian learned societies in the medical and health sector. He became internationally renown and crusaded relentlessly against the high (23%) infant mortality rate at that time ; even as a young doctor he suggested that local authorities should be responsible for making milk safe by sterilization ; back in Vienna, he founded an organization to distribute safe milk and to provide medical and hygienic advice to young mothers! He was indeed far ahead of his time. He died quite suddenly on 15 February 1911 of a cerebrovascular accident at the age of 53.

T. Escherich and *E.coli* today

Escherich's name and fame remains reflected in "*Escherichia coli* " ; already in 1919 Castellani and Chalmers had proposed the designation *E.coli* ; this name was only officially sanctioned as the name of the common colon bacillus, discovered by T. Escherich, in 1958 !

As indicated above, *E.coli* keeps on attracting the interest of geneticists , microbiologists and biotechnologists , in a positive as well as in a negative way. Positively, it remains the "workhorse" for the industrial biotechnologist to produce a wide range of recombinant proteins on a large scale by fermentation. Negatively, a group of *E.coli* strains is characterized by the ability to produce 'verocytotoxins' or 'shiga-like ' toxins and are named veritoxigenic *E.coli* (VTEC); human pathogenic VTEC usually have additional virulence factors that are important for the development of disease in man and are called enterohemorraghic *E.coli* (EHEC). Recently, sporadic EHEC outbreaks (serotypes O157, O104, ...) made headlines all over the world , causing human deaths and (irresponsible) economic losses in the food and agro-sector.

It indicates once more that *E.coli* strains and serotypes need to be monitored carefully and to be studied further from every possible fundamental angle not only as to their negative health impact on society but also for their positive contributions as "workhorse " in industrial biotechnology.

Em. Prof. dr. ir. Erick J. Vandamme, Dept. Biochemical & Microbial Technology, Fac. Bioscience Engineering , Ghent University

Report on the First International Symposium on 'Microbial resource management (MRM) ' (Gent, 30/06 – 01/07/2011)

On last June 30th and July 1st 2011, the First international symposium on 'Microbial resource management (MRM) in biotechnology: Concepts & applications' was held at Ghent University (Bioscience Engineering Faculty) in Belgium.

The aim of the first international MRM symposium was to discuss about the latest breakthroughs on more fundamental concepts and on their applications in environmental technologies and nutritional/biomedical sciences. A microbial community consists of a multitude of functional biological entities, each with unique metabolic capacities. When properly organized, the assemblage of these biological entities represents a powerful resource. Especially for engineered systems, MRM is the ultimate objective, yet remains very challenging. Well-documented MRM concepts and tools should allow to steer complex microbial communities, leading to stable and reliable biotechnological processes.

The symposium has been also the occasion for the scientific farewell of Prof. Willy Verstraete. For this reason, it was organized a specific "Open panel expert discussion" moderated by Ken Timmis, in which Willy Verstraete challenged all the keynote speakers and the audience on the perspectives for microbial biotechnology in the future.

"The MRM concept was conceived at the ISME congress of Vienna some 10 years ago – said Verstraete. We had trouble to explain to the audience that microorganisms work in associations and that microbial teams can bring forward powerful processes provided they are well managed. We took the example of Human Resource Management. Immediately everyone grasped the MRM concept and it potential application."

Some ten years later, the symposium certified that this is a dynamic and expanding sector. Top scientists from 20 different countries presented their MRM applications for i) exploiting the water-energy nexus; ii) managing bacteria-host interactions in different ecosystems; iii) analyzing the microbial resources in a given environment to correlate biodiversity with functional stability; and iv) identifying the correct balance between removal and recovery of nutrients in wastewater.

After two days of intense work, a standing ovation sealed the scientific career of Willy Verstraete, who commented: "During the MRM symposium, professor Tom Curtis set out the excellent line of taught that nature has, over millions of years developed some billions of marvelous microbial machines. We can spend billions of money to make new microbial machines such as the so-called Genetically Modified Microorganisms; and for some purposes this can be warranted. Yet, we should also realize that by spending a few millions of research money, we can learn to assemble very effective combinations (teams) from the microorganisms that nature already provides. This is the real message of MRM: use the resource nature already has in stock and apply management to make them more effective and efficient. Hence there is a great future for microbial ecology and technology in fields such as environmental engineering, food and feed, bio-economy, and health."

Report on the First International Symposium on 'Microbial resource management (MRM) ' (Gent, 30/06 – 01/07/2011) - continued

He continued: "Looking back, I very much enjoyed unraveling the beauty and the challenges of microbial science and technology to students. Inversely, I think I gave to the field some insights and technical step stones, but particularly I provided the field of microbial ecology and technology with some great students which now lead the way to new endeavors." Among them, Prof. Nico Boon commented: "Nowadays, we are at a very important crossroad for microbial ecology wherein through the development of relationships between technologies and theories we will be able to elucidate the complexities of biodiversity within communities. This will allow the establishment of links between microbial community identification (working as whole entities) and their metabolic functions. Willy posed the first stone, now it's up to us build the house…"

Massimo Marzorati, PhD ; UGent, Fac. Bioscience Engineering ; LabMET.

PhD Corner

In this section of the newsletter we will highlight the work of a recently graduated PhD student who obtained his or her degree at a Belgian university. In this edition we will focus on the work of Leen Vranckx who obtained her degree at the KULeuven.
If you are interested to have your work highlighted in the next issue of this newsletter, send a one-page summary of your work to BSM.newsletter@gmail.com

Leen Vranckx graduated as Master in Bioscience Engineering at Katholieke Universiteit Leuven in 2005. Afterwards she started a PhD at the Department Microbiology and Immunology in the Laboratory of Bacteriology in the Rega Institute in Leuven with financial support of IWT. She obtained her degree on August 29th 2011 (tirtle of the thesis : Identification of *Legionella pneumophila* plasminogen activator as a possible virulence factor).

Legionella pneumophila (*L. pneumophila*) is a Gram-negative bacterium that can cause a severe pneumonia known as Legionnaires' disease. This bacterium lives widespread in water and multiplies in unicellular organisms such as amoebae. In man-made water systems, conditions such as stagnant water with a temperature of between 20 and 40 °C prevail. These conditions promote the growth of *L. pneumophila*, resulting in high, health-threatening levels of bacteria. By inhaling fine, contaminated water droplets generated through faucets, showers, whirlpools, air conditioning systems and cooling towers, *L. pneumophila* can enter the lungs. Macrophages take up foreign particles, such as bacteria, in order to destroy them. But *L. pneumophila* bypasses this destruction and can even multiply in these human host cells. We identified a gene in *L. pneumophila*, which was expected to encode an outer membrane protein with a possible role in virulence. The aim of this PhD project was to characterize this protein and to determine its role in the virulence of *L. pneumophila*.

Proteins important in the virulence of *L. pneumophila* are often involved in mechanisms to survive and multiply in host cells. However, we could not detect an effect of this outer membrane protein on the infection of human host cells by *L. pneumophila*. Computer models predicted that this protein exhibit plasminogen activator activity, converting plasminogen to plasmin. Experiments confirmed this prediction and therefore the protein was named Lpa after *Legionella* plasminogen activator. Plasmin is an important protein in the human plasminogen system, which is responsible for breaking down blood clots. Besides the activation of plasminogen, Lpa interfered also with inhibitors of the plasminogen system: inhibitors like alpha$_2$-antiplasmin, PAI-1 (plasminogen activator inhibitor type 1) and TAFI (thrombin activatable fibrinolysis inhibitor) were cleaved and as such inactivated by Lpa.

Together, these interactions resulted in an increased amount of active plasmin. Besides the degradation of blood clots, plasmin is also responsible for the degradation of tissue barriers. Therefore, the role of Lpa in the spread of *L. pneumophila* was investigated.

Not only replication within human host cells, but also spread of *Legionella* over the lungs and to other organs is important in the development of Legionnaires' disease. A bacterial infection is often accompanied by the formation of fibrin in order to limit the spread of bacteria to the site of infection. A second obstacle to the spread of *L. pneumophila* is the extracellular matrix, the connective tissue in the lungs. Experiments showed that Lpa could break down both fibrin and extracellular matrix. Moreover, the degradation was strongly promoted in the presence of plasminogen which was converted to plasmin by Lpa.

In conclusion, we have showed that the interference of Lpa with the human plasminogen system, arms *L. pneumophila* with the tools to escape from fibrin clots and to penetrate tissue barriers, allowing the bacteria to colonize the whole lung tissue and to spread over the human body.

For more information you can contact jozef.anne@rega.kuleuven.be or consult the following publication: Vranckx *et al.*, 2007. *Legionella pneumophila* exhibits plasminogen activator activity. Microbiology, 153: 3757-3765.

Call for contributions

With this quarterly newsletter the BSM board wants to improve its communication with BSM members and we hope to bring you useful microbiology-related information on a regular basis.

Of course this is only possible with your contributions and we would like to invite you to submit these contributions to BSM.newsletter@gmail.com (preferably as a Word document).

What can you submit ? Basically anything that is microbiology-related : vacancies in your lab, announcements of seminars, a summary of important/interesting research findings etc. If you want to discuss whether something would be suitable for inclusion in the newsletter prior to preparing the text, feel free to contact us as well.

VISIT US AT : http://www.belsocmicrobio.be/

Composition of the BSM Board

President & FEMS representative : Jozef Anné (KULeuven)
Treasurer : vacant
Secretary & representative in the International Union of Microbiological Societies (IUMS) : Paul De Vos (UGent)
Members : A. Alaoui (ULB), Spriros Agathos (UCL), Alfons Billiau (KUL), Tom Coenye (UGent, liaison with Dutch Society for Microbiology), Pierre Cornelis (VUB, liaison with ASM), Herman Favoreel (UGent), David Gillan (UMons), Isabelle George (ULB), Natalie Leys (SCK-CEN), Max Mergeay (SCK-CEN), Jozef Vanderleyden (KULeuven)

Contributed to this issue: Jozef Anné , Tom Coenye, Massimo Marzorati, Erick Vandamme, Leen Vranckx