

This research is as vital as understanding the human genome

Exploring the human microbiome

During the International Forum for Laboratory Medicine, being held at MEDICA 2018, one seminar (on 12 November) will focus on infectious diseases. Professor André Gessner, from the Medical Microbiology and Hygiene Department at Regensburg University, will lecture on 'The human microbiome, an explosive 'climate' topic,' he explained to EH reporter Walter Depner.

WD: Generally you know the kind of audience you face during gatherings of specialists in your field. However, there's no certainty about who will be among the MEDICA delegates attending your lecture. Could this make your job difficult or perhaps more exciting?

AG: I have given many lectures to heterogeneous audiences and find the challenge of explaining complex relationships in the most comprehensible way to be very exciting and positive.

Often, I have received very stimulating questions – especially from colleagues in other fields.

About three years ago, at the University of Regensburg, you lectured on *The Intestinal Microbiome as the Centre of Health and Illness*, and included in the invitations physicians, chemists, nutritionists, microbiologists, dieticians, technical consultants and health journalists – a very heterogeneous

audience. Could that experience help with the Düsseldorf seminar?

Yes, certainly. The conference is a good example for what the participants see as a successful interdisciplinary forum.

Modern medicine and healthcare demands an interdisciplinary approach. Do such events, as in Regensburg and now Düsseldorf, help to reach this goal?

The challenge is to transmit the latest scientific knowledge, with a critical appraisal, in such a way that it is well understood and to 'condense' without over-simplification, which distorts the information. For me it is important to stay realistic and above all not to raise hopes among physicians and their patients too early that cannot (yet) be fulfilled.

There is considerable focus on the role of microbial intestinal flora as a basic component for staying healthy. You have described mod-

ern, high-throughput sequencing technology as a source of dramatic knowledge growth. Why?

Without high throughput sequencing technology, together with appropriately qualified bioinformatics, microbiome analysis would be impossible. It was this technology that first made this enormous knowledge growth possible – currently more than 65,000 publications in just over ten years.

MEDICA'S LABMED FORUM

● Monday, 12 Nov 2018
10.45 – 11.15 a.m.

The human microbiome – diagnostic and therapeutic aspects

Speaker: Prof. André Gessner, Director of the Institute for Medical Microbiology and Hygiene at Regensburg University

Are their approaches going in the right direction?

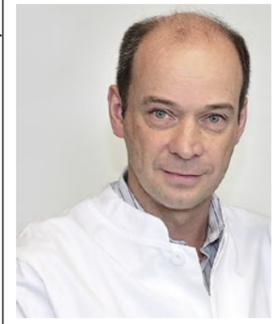
The technological potential in analysis is developing rapidly. Here we need improved standardisation of analyses, quality controls and hope to gain ever increasing 'read lengths', that is to say DNA sections that can be sequenced in one piece, lower sequencing error rates and naturally lower costs for examinations.

Especially important here is also a significantly better comprehension of the functional relationships between microbiome and various diseases, so that rational new therapies can be developed in the future.

Along with interdisciplinary scope, the internationality question plays an important role. What is the state of cooperation, exchange in research, teaching and practice?

Microbiome research is particularly characterised by numerous already well-established international cooperation efforts, among academic institutions such as universities, and increasingly among very many firms.

The exchange is extremely inten-



Having studied medicine and molecular biology at the University of Hamburg, Professor André Gessner received his medical doctorate in infection immunology and a PhD in molecular virology. Following five years' basic research at the Heinrich-Pette Institute, Hamburg, he established his research group at the University of Erlangen, where he qualified as a specialist in medical microbiology and infectious disease epidemiology. His scientific work focuses on molecular infection immunology, infectious diseases and the role of the microbiome for diseases. He is an expert and reviewer for several international journals and scientific societies and, between 2008 and 2010 he received four calls regarding chairs for medical microbiology. Since 2010 he has been a professor and director of the Institute for Medical Microbiology and Hygiene at Regensburg University, where 150 employees focus on all aspects of infectious diseases. In 2015, Gessner became the Dean of research at the Regensburg medical faculty.

sive, not only through scientific publications but also via Internet fora and more than a dozen international congresses annually on microbiome topics.

Infection control in orthopaedics and trauma surgery

Local antibiotics improve results

Hip and knee joint surgeries are among the most common procedures in orthopaedics and trauma surgery and complications can occur. Rare, but serious, among these is periprosthetic infection (PJI), which causes high costs in healthcare and stress for patients. PJI is caused by microorganisms that form a biofilm on the surface of the implant and, in this sessile state, they are difficult to diagnose and treat. Successful management of a PJI is therefore based on prevention and prophylaxis so that infections cannot develop in the first place.

Antibiotic prophylaxis using antibiotic-loaded bone cement

Polymethylmethacrylate (PMMA) bone cement, which is primarily used to fix prosthetic implants, can support effective infection management in primary arthroplasty, revision and the treatment of periprosthetic infections. The local release of the antibiotic from the bone cement supplements standard systemic antibiotic prophylaxis. The advantage lies in the considerably higher local concentration of the antibiotics with a low systemic load.

Choosing the right treatment algorithm is a critical factor for successful prevention and reduction of PJI. Combinations of antibiotics – systemic and local – are advantageous for effective infection management for revisions, in trauma cases after femoral neck fracture and occasionally in primary arthroplasty. When choosing the antibiotic, the current resistance situation and prevalence of microorganisms responsi-

ble for PJI should be considered. The COPAL bone cements Copal G+C and Copal G+V, for instance, contain combinations of antibiotics (gentamicin and clindamycin and gentamicin and vancomycin respectively) that tackle most of the microorganisms responsible for PJI. Synergistic effects of the combinations of antibiotics enable a high

local antibiotic concentration in situ.

In revision, the range of treatments includes one-stage replacement with good soft tissue conditions and known susceptible pathogens, as

69% reduction in the rate of deep infections following femoral neck fracture when using high-dose antibiotic-loaded bone cement. Source: Sprowson et al.

well as two-stage replacement with precarious soft tissue conditions and unknown resistant pathogens. In both cases the effectiveness of the treatment can be increased by using bone cement with combinations of antibiotics. The combination of antibiotics used should be determined after completing diagnostics and an antibiogram.

For revisions due to verified resistant microorganisms (MRSA/MRSE), the use of Copal® G+V is recommended. This contains the antibiotic gentamicin combined with vancomycin which, as a reserve antibiotic, is an option for use with known bacterial resistance to MRSA/MRSE, for example.

For septic loosening or chronic infections, a spacer made of antibiotic-loaded bone cement is often inserted as a temporary joint replacement to eliminate infection. Articulating spacers with an implant-like design, e.g. from Copal knee moulds, should be given preference here to preserve the joint function and to prevent the formation of contractures and scar tissue.

Risk of deep infections can be considerably reduced

In primary arthroplasty patients, who are particularly at a high risk of infection, are recommended for combinations of antibiotics for antibiotic prophylaxis, and thus the use of Copal G+C bone cement. The risk factors that can increase the likelihood of infections include diabetes, osteoporosis, limited mobility, excess weight and dementia.

When treating femoral neck fractures with a cemented hemiarthroplasty using Copal G+C, it can be verifiably demonstrated that the risk of deep infections (surgical site infections, SSI) can be considerably reduced by using dual antibiotic-loaded bone cement.

