



Back into Life: Transdisciplinary Trauma Research

Understanding, treating and avoiding physical and psychological traumas

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Back into life: trauma research in Ulm

In Ulm, we deal with all aspects of the theme “trauma” at an advanced scientific level. The facilities in the University and the surrounding region examine all facets of trauma. This ranges from physical trauma caused by external force, which may result from traffic or sports accidents, or accidents at work, to psychological trauma triggered by mental injuries. There is a close relationship between physical and mental injuries. Our objective in Ulm is to improve our understanding of the complex mechanisms of damage and cure, to develop new therapies and to reduce long-term damage. Our physicians and scientists enjoy an international reputation. As their areas of expertise are complementary, they can interweave basic, translational and clinical research on trauma in a unique manner.



Trauma research – an Ulm trademark with tradition

Foreword by Prof. Dr. Karl Joachim Ebeling, President of Ulm University

Ulm University enjoys a nationally leading position in the investigation, prevention and treatment of both the damage and physical and psychological consequences caused by trauma. The university has strong trauma therapy research programmes, an excellent trauma clinic, and outstanding research and treatment centres for the investigation and treatment of psychological trauma. Specific cooperation with German Army Hospital (BWK) in Ulm, one of only four German Army locations, as well as with the Rehabilitation Clinic Ulm and the locally based German Red Cross (DRK) Blood Donation Centre, with its innovative transfusion medicine, completes the picture of the comprehensive treatment of problems with an outstanding and unique position in research and patient treatment.

Ulm University can look back upon a long tradition and exceptional success in both physical and psychological trauma research. In 1973, one of the two oldest chairs for trauma surgery in Germany had already been established in Ulm. Later, in 1989, the first chair for trauma surgery research was set up. Since then, musculoskeletal research has developed into a key focus within the Faculty of Medicine. Ground-breaking innovations were achieved in the treatment of trauma damage. Implants for the fixation of

bone fractures were developed, for example, including biodegradable pins for the fixation of bone fragments. For the treatment of psychological trauma resulting from serious physical injury, the Ulm University has the Department of Child and Adolescent Psychiatry at its disposal, as well as the Department for Psychosomatic Medicine and Psychotherapy, both of which have excelled through structures developed over years and their recognised scientific competence.

Important, internationally visible areas of research are represented by the Centre for Musculoskeletal Research Ulm (zmfu) and the nation-wide Centre of Excellence for Child Protection in Medicine, both of which are supported by the Ministry of Science of the state of Baden-Württemberg.

In addition, there are numerous successful collaborative research projects for the scientific excellence of trauma research in Ulm. The German Research Foundation (DFG) and the Federal Ministry of Education and Research (BMBF) both support these collaborative projects. As an outstanding success Ulm University has recently been granted a multiple million euro grant by the DFG to establish a collaborative trauma research centre (CCR1149).

Starting from the social and socio-economic significance of traumas, in particular for health care and individual lifestyle, as well as the ability to continue work following a severe injury or illness, it is a central concern of Ulm University to contribute to an holistic understanding of traumas through coordinated research. A focal point of this is the study of complex cellular and molecular processes and reactions with trauma cases. ■



Prof. Dr. Karl Joachim Ebeling

“It is our stated goal to expand and structurally further develop cooperation between the research fields of physical and psychological trauma in Ulm for the well-being of the patient. This is based upon Ulm’s locational advantage of a transdisciplinary connection between research and patient treatment, as well as the near-unique spectrum of methods which this proven cooperation model makes possible.”

Prof. Dr. Karl Joachim Ebeling, President of Ulm University

Trauma treatment – Ulm’s excellence in patient care

Prof. Dr. Hartmut Döhner, Vice President for Medicine, Gender and Diversity



About 8 million people in Germany suffer an injury each year. For people aged under 45, injury is the most frequent cause of death. Thus, the treatment of trauma damage and the consequences of

trauma are of the greatest medical and socio-economic importance.

Ulm can look back on a very long tradition of trauma research and treatment. The Department of Trauma Surgery was founded in 1973 and is thus one of the two oldest in this subject. This was followed in 1989 by the first Department for Research in Trauma Surgery. The Hospital now has one of the most famous departments of trauma surgery. Moreover, when the Department of Surgery moved from Safranberg to Oberer Eselsberg, this gave rise to one of the best equipped clinics in Europe. Thus, the Department has two highly modern shock rooms, in which patients with life-threatening injuries are given first aid. For diagnostic testing, there is a modern ultrasound instrument, a digital X-ray system for conventional X-rays—which allows direct data transmission in the PACS system into the operating theatre—, as well as an ultrafast

computed tomograph, which can be used to provide cross-sectional images of the whole body within a few minutes. In collaboration with the Emergency Medicine Section in the German Army Hospital Ulm, the Department coordinates the certificated national trauma centre (Ulm Trauma Network), which is one of the first such centres in the country. Prof. Dr. Florian Gebhard is the speaker of the Centre, that now integrates more than 20 clinics within a radius of 60-80 km. Ulm not only has an excellent reputation in the care of the results of physical trauma. In addition, the Department of Child and Adolescent Psychiatry (Prof. Dr. Jörg M. Fegert) and the Department of Psychosomatic Medicine and Psychotherapy (Prof. Dr. Harald Gündel) ensure that it has an outstanding reputation in the care of patients with psychological damage from traumas. In the course of their lives, many people develop post-traumatic disorders. In children and juveniles, this may come from traumatic events such as sexual abuse, physical violence, the sudden death of significant others or severe accidents. Within an interdisciplinary network, the objective of trauma research in the University Hospital is to understand and improve the treatment of physical and psychological disorders. Because of this collective expertise in trauma medicine at a single site, Ulm is unique in university medicine in Germany. ■

Transdisciplinary approach and outstanding training

Prof. Dr. Thomas Wirth, Dean of the Faculty of Medicine



The Greek philosopher Plato was the first to recognise it: “The most important error in the treatment of illnesses is that there are physicians for the body and physicians for the soul, even though it is quite

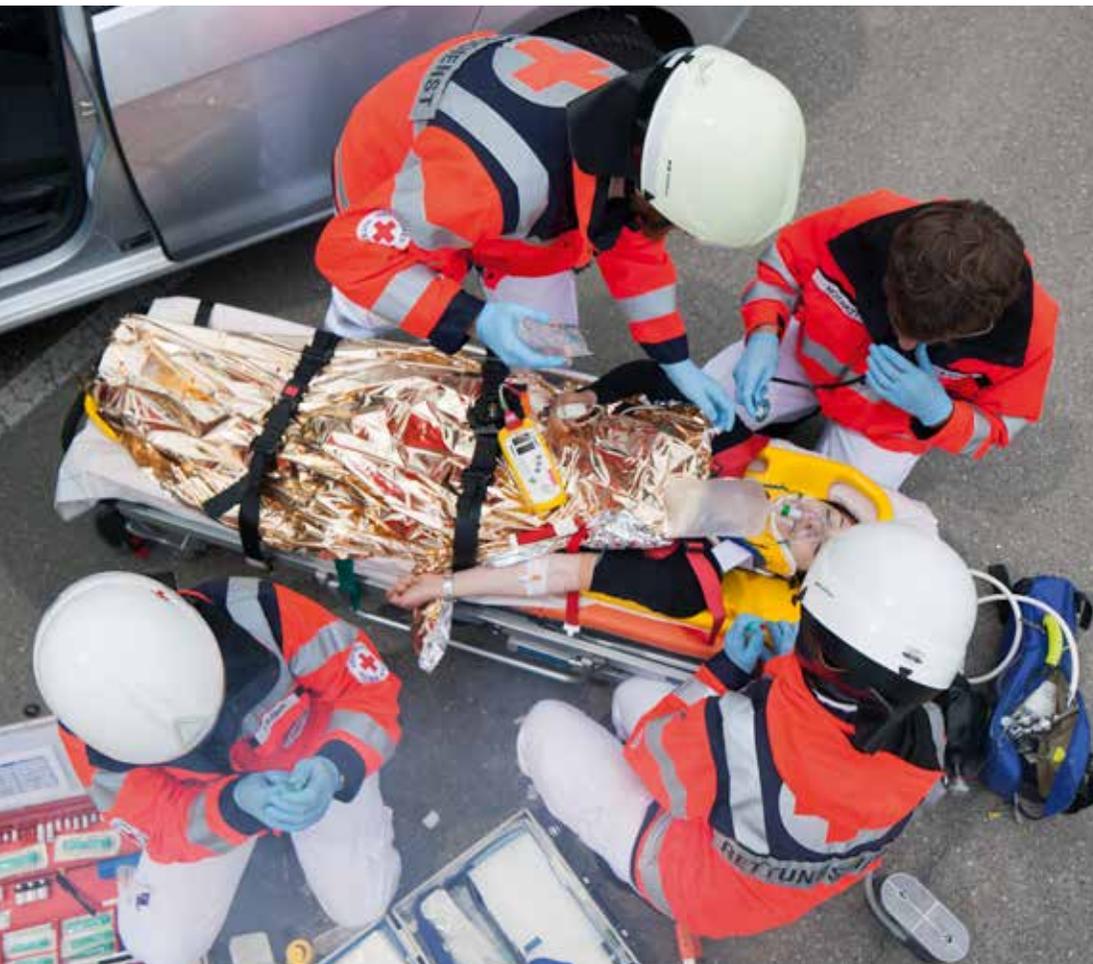
impossible to separate the two.” This is how modern traumatology is seen in Ulm: research into the close interrelationships between physical and psychological trauma for the good of the patient.

The national and international reputation of Ulm trauma research is based on a long tradition and is documented by many research collaborations financed by external funds. These include DFG-supported research groups focussing on physical trauma and BMBF-supported collaborative projects concentrating on psychological trauma, as well as interactions between physical and psychological traumas. The objective is to carry out intensive research on their mutual dependencies, bearing in mind that psychological trauma in children may influence the chances of curing physical trauma in adults. This is a fascinating challenge that can only be successfully tackled with an interdisciplinary approach.

Excellent science is always founded on excellent training for young scientists. In order to achieve this objective in trauma research, innovative teaching concepts have been implemented at all levels of training. This includes the Trauma Track—trauma care and trauma research in the Ulm medicine curriculum MED@ULM—, a specific doctoral program for medical students, as well as rotating positions, that offer young physicians the chance to devote themselves to their own research projects, free from clinical duties. In addition, the International Graduate School in Molecular Medicine in Ulm, as supported by the Federal Centre of Excellence and the Federal States, incorporates trauma research in a special Research Training Group. And last but not least, tools have been created in the Ulm centre of excellence “e-Learning in Medicine Baden-Württemberg” to help physicians to continue with their training in trauma research and care. Thus, the Ulm site is exceptionally well equipped for trauma research and trauma care. The Faculty of Medicine is determined to push this successful model and to develop it into an international beacon. ■

Torn from everyday life — but integrated again

Develop new therapies with an interdisciplinary approach: improve understanding of trauma damage and link translational and clinical practice for the good of the patient



A gravel lorry, an old ladies' bicycle and a children's bicycle. At the edge of district road 7384, two emergency physicians are looking after Lukas and his grandmother. The 5-year old is not moving. His stomach looks inflated. Broken pieces of glass have made deep cuts in his right leg. The emergency physician comments: "suspected severe internal bleeding". The grandmother is pushed into the ambulance with suspected fracture of the thigh and pelvis. The lorry driver is desperate and gives himself the blame: "I wanted to turn off and overlooked the two of them in the blind spot in my mirror." One moment of inattention has torn two people abruptly out of their everyday lives. The day was planned as a pleasant outing to the Lautertal, but ended in the intensive care ward.

Lukas and his grandmother have suffered severe traumas. Even though the driver has no apparent injuries, he needs medical treatment too. Trauma includes both physical and psychological injuries. In 2010, more than 20,400 people in Germany died from the consequences of an accident. In the first half of life (up to age 45), trauma is the most common cause of death. About 8.7 million people—every tenth—suffered a trauma from an accident.

Psychological injuries may also be caused by accidents or catastrophes. Frightful events, such as the train accidents in Eschede or the amok run in Winnenden, are rare and this is just why they are publicised in the media. However, a great deal remains hidden, due to the shame or fear of those affected. Particularly children and women are the victims of domestic violence. Humiliation, abuse and social isolation wound the soul. More than a fifth of the population suffer from traumatic stress in childhood. The expenditure for psychological and physical traumas is correspondingly high. The direct and indirect health costs are probably much greater than those for the major widespread diseases, such as cardiovascular diseases.

No progress without research

Health disorders from physical and mental traumas often lead to considerable long-term stress for the patient. It is therefore important to continue to develop therapies and to establish new approaches. This is only possible with comprehensive interdisciplinary research work at all levels. The principle objective of basic research is to understand the complex mechanisms of damage from a trauma. It is then necessary to learn more by moving from pure academic

research, to translating the results of laboratory insights, to the actual treatment of a patient.

The network is the basis of success

Ulm trauma research is superbly equipped in all areas. It has excellent local, national and international contacts. In Ulm itself, the research rests on four pillars: the University Faculty of Medicine, the University Hospital, the Ulm Rehabilitation Hospital (RKU) and the German Army Hospital Ulm. In collaboration with other partners in the region (see Figure), staff members work hard to improve the understanding of traumas, to treat them and to minimise the long-term consequences. Moreover, they attempt to avoid traumas (so-called “trauma prophylaxis”) and to prevent mistreatment, sexual abuse and neglect.

The research structure: started first and has grown continuously

The Clinical Department of Trauma Surgery in Ulm was founded in 1973, when it was one of the first two of its type. In 1989, this was followed by the first Department of Orthopaedic Research

and Biomechanics. In 1998, the institute of the same name was founded. A research team has developed in Ulm, based on a concept that is outstanding—not only in research on trauma surgery in Germany. Physicists, IT experts, physicians, veterinarians, biologists, molecular biologists and engineers devote themselves to the complex issues of musculoskeletal research. This interdisciplinary approach has been clearly successful. In 2007, under the direction of Prof. Dr. Anita Ignatius, the Centre for Musculoskeletal Research Ulm (zmfu) was founded as a centre of excellence supported by the Federal State of Baden-Württemberg.

Interdisciplinary and cooperative

This led to a centre of excellence network within the University, currently consisting of twelve departments. The method platform ranges from cell and molecular biology to clinical research. The modern laboratories in the Centre for Biomedical Research (ZFB) can be used by all departments and are the symbol for this cooperative approach. Numerous research projects

“By combining cell biological knowledge with histological and biomechanical results and clinical data, as well as computer simulation models, we can analyse the factors that influence the healing of bone fractures.”

Prof. Dr. Anita Ignatius, Director of the Institute of Orthopaedic Research and Biomechanics

are included within the zmfu. These concentrate on immunological trauma research, regenerative medicine, biomaterial and implant research, biomechanics and rehabilitation research.

Ulm Trauma Centre

Lukas and his grandmother are on the way to Ulm Trauma Surgery. During the journey, Lukas is given a crystalline solution as volume substitute to replace his substantial blood loss. The physicians want to prevent the young patient from suffering shock from blood loss. For a patient with multiple trauma, it is important to ensure ventilation and circulation. The lungs are normally responsible with supplying the organs with enough oxygen. Lung function can be restricted by blood loss and also by blunt injury to the chest, which is easy to overlook with all the other obvious injuries. Then the lung too does not receive enough oxygen. Inflammation is even possible if no pathogen enters the body, as the immune system recognises destroyed tissue as “foreign”. The scientific expression for this is “post-traumatic inflammatory response”. The interaction between the lungs and the other internal organs after a trauma is one of

the important foci of Ulm trauma research. New treatment methods are being developed from these insights and these are being incorporated into precisely defined treatment guidelines in the shock room and operating theatre, so-called algorithms.

Positive pressure developed in Lukas’s lung, which threatened to make his breathing more difficult. The physicians reduced this pressure by drainage. As luck would have it, the Ulm Trauma Network with all its possible treatments was only 15 minutes away from Lautertal. Otherwise, the ambulance would first have taken the patient to a regional trauma centre. If computed tomography (CT) had shown that the injuries could not be treated there, they would have telephoned the national centre. For example, the patient would then have been transferred to Ulm University Hospital. In the Trauma Network DGU® (German Association for Trauma Surgery), it is clearly regulated which clinic is responsible for which case, depending on the quality of the care provided by the individual clinics. This saves time—which a patient like Lukas with his internal injuries does not have.

COLLABORATIVE RESEARCH CENTER FOCUSES ON TRAUMA

Strictly pursuing trauma research in a collaborative effort, the University of Ulm has recently been granted a multiple million euro grant by the German Research Foundation to establish a collaborative trauma research center (CRC1149). The close interaction of basic and clinical researchers within this nationwide unique center will substantially contribute to a better understanding of the body’s response after acute trauma on a molecular, cellular and organ level. This shall result in an improved clinical management for trauma patients.

Optimal care of mentally traumatised children and juveniles

The Department of Child and Adolescent Psychiatry was founded in 2001. Several nationally supported projects on child protection and prevention of sexual abuse were then transferred to Ulm. The Department made an essential contribution to the national campaign entitled “Early support to prevent child neglect” and carried out the first model project in collaboration with several federal states and the Federation. The “National Centre for Early Support” and essential elements of the Federal Law on Child Protection are based on this experience. The main emphasis is on the optimal therapeutic care of traumatised children and juveniles. For this purpose, a special section was set up for psychotherapy research and behavioural medicine. This was associated with a centre for training in child and juvenile behaviour therapy. A psychotraumatological outpatient clinic and numerous projects are devoted to research into therapeutic methods for the consequences of psychological consequences of trauma in children.

The Centre of Excellence for “Child Protection in Medicine” in Baden-Württemberg concentrates Ulm research activities. The e-learning programmes developed there deal with neglect, early support and sexual abuse and are available to physicians throughout Germany for advanced training or study. ■





Understanding trauma

A physical trauma causes local destruction of body tissue, which can lead to severe structural and functional defects. In addition, multiple injuries like those Lukas suffered trigger an acute whole body reaction. Depending on the severity of the injury, this may damage important organs and influence the patient's recovery.

It is therefore important to understand the extremely complex pathological processes triggered by a severe injury, even at the cellular and molecular levels. This may mean that different treatment methods may be applied to similar injuries in the young and old or in healthy and sick people.

Lukas is rolled into the shock room. The emergency physician informs the team of doctors briefly and precisely about the course of the accident, as well as the known and suspected injuries. The interdisciplinary shock room team consists of trauma surgeons, anaesthetists, radiologists and non-medical assistants; they will now examine Lukas with the help of the most modern imaging technology. Within 30 min, the team must perform all the necessary diagnostic testing and therapy and reach a decision—an immediate operation, primary or secondary operative care. Severe rupture of the liver is confirmed, which requires an operation. There is also minor bleeding of the lungs. This was

caused by the blunt trauma and is a typical concomitant injury. If the young patient cannot be moved to another bed due to his condition, the OP can also be performed in the shock room. A theatre in the operating centre is now prepared for the operation.

The correct treatment is only possible with a profound knowledge of the body's response to the trauma

Traumas with major tissue destruction are life-threatening. However, it is often not the injuries themselves that are fatal, but the body's response to the trauma. In almost 50% of cases, severe multiple injury triggers a whole body reaction. As Prof. Dr. Gebhard explains: "In spite of all the progress made in the surgical and anaesthesiological care of the injured, the physician is still scared of an excessive inflammatory response after a trauma. This is so complex and brings so many complications that it is a great challenge—for both the clinician and the research worker."

KFO 200

With the support of the DFG, Clinical Research Group KFO 200 is studying the inflammatory response to musculoskeletal trauma. The objective is to be able to predict—on the basis of blood and tissue measurements—how the body will react to specific injury patterns. The doctors

will then be able to take specific therapeutic measures more rapidly. One danger is presented by the molecules that the immune system produces during its excessive response. Various protein cascades are then activated and cells of the immune system are stimulated that then release signal and messenger substances. If two of the following four parameters change, there is whole body inflammation: body temperature, respiratory rate, heart rate or the count of white blood cells. In 15% of cases, these leads to multiple organ failure and the patient dies.

The focus is on the lungs

This research group primarily concentrates on the lungs. Firstly, more than 50% of all traumas include a thorax injury. Secondly, the prognosis is worse if the injury pattern includes a thorax trauma.

The lung is particularly susceptible to the biochemical processes involved in an excessive immune response and is therefore sometimes described as the motor of multiple organ failure. Even a relatively minor injury is enough, without a broken rib. This could be bruising after being thrown against a steering wheel.

The lung is not only the culprit, but also the target organ. Interactions between the kidneys and lungs are also being studied. If the kidney does not receive enough blood due to a haemorrhagic shock, it develops an oxygen debt and its function is impaired. It eliminates less urine. Oedema may develop, as the body stores more fluid. Transfer of oxygen from the alveoli in the lungs into the vascular system is restricted. Major blood loss, as in Lukas's case, can trigger blood loss shock in the liver. Protein production

is disturbed and this can impair blood coagulation. This can lead to tiny haemorrhages, even in the lungs.

The Ulm scientists have been concentrating for some years on the interactions between different systems. Their earlier studies have shown that the clotting and immune systems are cross-reactive. The clotting system can have immunological effects and the immune system can act through clotting factors.

Immune monitoring

For patients with severe traumas, it is important to be informed of the function of the organs at all times. The heart, lungs and kidneys can be effectively monitored online, using vital data monitors for the ECG, blood gas analyses and the volume of eliminated urine.

However, there is not yet a comparable monitoring system for immune function. A disorder may be in two diametrically opposite directions. The immune system may be completely hyperactive and be active against its own organs. On the other hand, as in AIDS patients, it may collapse completely and be incapable of resisting microorganisms. Thus, in one case the immune response must be suppressed and in the other stimulated. The objective of the research is therefore to develop immune monitoring, to support rapid and specific interventions. For example, the Ulm scientists have developed a procedure in which blood from patients is exposed

to infections or destroyed tissue in the test tube. Rather than taking a snapshot, the reaction of the immune system can then be observed over many hours—whether it is excessive or absent.

Significance of the complement system

One example of how scientific research can rapidly become a part of patient care is the work on the complement system. The complement system is a component of the innate immune system. “We could show that bone fractures heal more slowly in severely injured patients and that the complement system plays an important role here. The complement system can be blocked by drug treatment and this completely eliminates impaired fracture healing after severe injury, according to Prof. Dr. Huber-Lang, Research Professor and Project Manager of Clinical Research Group KFO 200 in the Department of Trauma Surgery. Thus, immune modulation at the level of the complement system could be a new therapeutic strategy to prevent disorders in healing fractures. ■

PSYCHOLOGICAL TRAUMA: THE SOUL LIES IN THE BODY

Sweating, going pale or blushing, the proverbial gooseflesh—these are all physical reactions which we can all link to a state of mind. With severe psychological stress, the physical reactions can become severe symptoms. The risks of infections, autoimmune diseases and high blood pressure increase. The Departments of Child and Adolescent Psychiatry and of Psychosomatic Medicine and Psychotherapy in Ulm University Hospital are carrying out research on the interactions between body and soul. As Prof. Dr. Fegert, Medical Director of the Department of Child and Adolescent Psychiatry explained: “Ulm is a Centre of Excellence for Child Protection in Medicine. Our objective is that the results of our research should be immediately translated into practice. To achieve this, we collaborate with teaching institutes, outpatient clinics and hospital departments.”

1. Trauma

Every day in Germany, tens of thousands of people of all ages suffer a trauma—a physical or mental injury. If the victim is to survive and be secured, it is essential to have a professional ambulance service that can ensure that the victim is delivered to the hospital that can provide the best and most rapid care. The Ulm Trauma Network is a certified national trauma centre for severe injuries.

2. Patient

Injuries in traffic, work or other violent events are the principle cause of events in young people under 45. Within minutes of a severe injury, the human organism develops a very complex inflammatory reaction. The precise mechanisms are still poorly understood. The Ulm scientists are working intensively to clarify the risk response.

3. Emergency Room (ER)

Within the first hour after a trauma, modern imaging procedures are used to clarify injury patterns and life-saving measures are performed. The functions of the organs and of the immune system are then monitored; this is another focus of the research in Ulm.

4. OP (Operating Theatre)

In the operating theatre, the injuries are treated with the most modern techniques and surgery, using biocompatible materials. Ulm has one of the most modern operating theatres for this purpose. Clinicians and research workers in Ulm are always trying to improve the operative techniques and materials.

1. TRAUMA



2. PATIENT



Back into life after the stations of

8. BACK INTO LIFE



7. REHABILITATION





3. EMERGENCY ROOM (ER)



4. OP (OPERATING THEATRE)



5. INTENSIVE CARE WARD (ICU)



6. SURGICAL WARD



5. Intensive care ward (ICU)

On the intensive care ward, the patient is cared for 24h a day by the team of doctors and nurses. The aim is sustained stabilisation and improved organ function, as well as providing the patient with psychological support. Ulm scientists are concentrating on the early detection and avoidance of severe complications.

6. Surgical Ward

Once the patient is out of acute danger, the focus is on his physical and mental regeneration in the hospital ward. Cure and regeneration are strongly influenced by the patient's state of health and his age. These are aspects that have hardly been considered in previous research. Ulm scientists are tackling these issues with an innovative research concept.

7. Rehabilitation

In order to avoid or alleviate the long-term physical and mental consequences of a trauma, the patient is given scientifically based rehabilitation treatment. In cooperation with the surrounding rehabilitation clinics, Ulm scientists are studying Individual rehabilitation needs and how to optimise the sustainability of the rehabilitation measures.

8. Back into life

The Ulm doctors and scientists accompany the traumatised patients in all phases of treatment. The objective is to achieve sustained results, which pass from the laboratory to the hospital bed and then work their way all through society.

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Treating trauma



Accidents can happen any time during sport or domestic work, at the workplace and in traffic. Luckily these are mostly only minor injuries that heal rapidly. However, it is much too often the case that injuries cause severe damage, that is life threatening, no longer heals properly and has permanent effects. Research workers in Ulm are working continuously on new methods to provide optimal care throughout the course of treatment – from first aid to rehabilitation.

The old lady is prepared for surgery by Prof. Dr. Dr. Georgieff's team of anaesthetists. The trauma surgeon fixes Lukas's grandmother's bi-

lateral pelvic fracture with screws. This requires extremely high precision. The hybrid OP has already been prepared and the operating theatre has the modern navigation systems. With CT images and X-rays, the doctors plan the path of the instruments to the site in the body where the screws are to be positioned. Using three dimensional intra-operative images, the surgeon directs his instrument along the planned route to the target site. Then he can attach the screws at the planned angle and to the nearest millimetre. According to Prof. Dr. Gebhard: "We used only to have a two dimensional image, directly in front of the OP instrument and taken by its

camera. But now the navigation instruments show us the whole landscape. I can use my instruments more precisely. As a result, the scars are smaller and there is less additional stress during the OP." Prof. Dr. Gebhard has developed the hybrid OP in such a way that the surgeon himself can steer the instruments, without having to give instructions to the staff outside the sterile area. The hybrid OP can also be used as a normal OP with an intra-operative radiographic system. In this way, the team can also stabilise the end of the thigh properly. After two hours, the old lady's trauma surgery is complete. The team finally controls the position of the screws,

using the swivelling X-ray machine again. This passes round the patient and provides three dimensional images of the operated pelvis. In close cooperation with the instrument manufacturers, Gebhard has developed a unique symbiosis between the systems for the hybrid OP. Operating these systems is demanding. For a perfect result, the whole team have to undergo several months of training before they start.

Fit for everyday life as soon as possible

With the help of a supporting trolley and optimal analgesic dosage, the patient can make her first attempts to walk on the day after the operation. After a joint visit, Prof. Dr. Gebhard and Prof. Dr. Gert Krischak from the Bad Buchau Rehabilitation Clinic decided on the plan for rehabilitation. Krischak is the Director of both the Ulm University Institute for Research in Rehabilitation Medicine and the Federsee Clinic in Bad Buchau. Six days later, Lukas's grandmother is transferred.

The rehabilitation concept for the patient is based on the most modern scientific knowledge. The objective is not only that the patient should be able to walk, but that she should recover abilities that are important for everyday activities. This is why she is cared for by an interdisciplinary team of doctors, psychologists, social workers, occupational therapists, sports therapists and physiotherapists. Her initial progress is very good. After only a week, she is fully

mobile and can stand and look after herself very well. It is important to train the weak musculature in the trunk, the pelvis and the legs.

Stem cells support bone healing

The routine X-ray follow-up was performed in Trauma Surgery eight weeks after the accident. The doctors found that the bone fracture was healing very slowly. The next follow-up, after three months, found that the healing process had totally stopped. Prof. Dr. Gebhard from Trauma Surgery and Prof. Dr. Hubert Schrezenmeier of the Institute for Transfusion Medicine offer the old lady the opportunity of taking part in a European study. Stem cells are isolated from the patient's bone marrow. In the course of several weeks, these give rise to about 100 million cells. Lukas's grandmother agrees to this. Six weeks later, cells were inserted into the fracture space, with the help of a carrier material tested

in Ulm. The healing process got going again. The patient's age was certainly one reason that the healing was poor. The Ulm scientists have long since recognised the need to concentrate on age-specific features of trauma treatment.

As Lukas is young, the doctors gave him a good prognosis. As his liver rupture had led to severe bleeding, he suffered general blood loss shock. The intensity of the inflammatory reaction was tested with blood parameters that have been validated in many studies in Ulm. After eight days, his immune system had stabilised to such an extent that the inflammatory response became weaker and the boy recovered.

Lukas will stay in the intensive care ward for only a few days and then probably another ten days in the hospital ward. Two weeks after the accident, he will try to go for a walk with his grandmother.

Treating psychological traumas

In Germany, there is not yet any psychotherapeutic adequate care for children and juveniles with post-traumatic stress disorder. According to Prof. Dr. Lutz Goldbeck, Director of the Section on Psychotherapy Research and Behavioural Medicine in the Department of Child and Adolescent Psychiatry: "Disorders from traumas are often overlooked or misdiagnosed. Scientifically tested therapies have been rarely used."

Psychological traumas in Ulm are treated in both the inpatient and outpatient settings, in the Department of Child and Adolescent Psychiatry, the Departments of Psychiatry and Psychotherapy and in the Department of Medicine and Psychotherapy. Research work is of central importance in all these departments.

One focus of the work is on traumatised children and juveniles. In Germany, there are no adequate data on how well therapies work. For this reason, the scientists offer children suffering from a trauma, as well as their parents, a trauma-focussed therapy; this therapy has been very successful in the United States. The efficacy of the therapy is examined in the context of the BMBF study "Treat Child Trauma". This is linked to a BMBF collaborative project on how to accelerate the initiation of treatment of traumatised children and juveniles. After abused children



have been taken from their families for their own protection, there have often been unacceptable delays in their treatment.

"Resilient" children are also an interesting object of research. In spite of their traumatic experiences, they exhibit no psychiatric symptoms. According to Prof. Dr. Fegert, Medical Director of the Department of Child and Adolescent Psychiatry: "We want to identify the protective factors and their duration of activity. Can we be certain that the affected children will not develop trauma damage later in life? Or perhaps the problems will develop during the next step in development, perhaps at puberty? These results are also important for youth welfare departments in planning their support activities." ■

"Our aim is to make the patient rapidly fit for everyday life once again. This is only possible with an optimal chain of care, extending from first aid to rehabilitation. In Ulm, we have a variety of interlocking measures carried out by enthusiastic staff. These include the most modern operative and therapeutic techniques based on current scientific results."

Prof. Dr. Florian Gebhard, Medical Director of the Department of Orthopaedic Trauma

Avoiding trauma

Avoiding traumas is one important goal of research in Ulm. This aspect of the research covers a broad spectrum, ranging from avoiding physical injuries to preventing mental traumas. Road traffic can be made safer with the help of high technology. Trainings programmes enhance the expertise of specialists in paediatric psychology and the cognitive performance of older people.



Prototypic display

Why did the lorry driver overlook Lukas and his grandmother? Was it the infamous blind spot in the outside mirror? Was he distracted by having to change gears? Or was he dazzled by the low sun? Almost all accidents are caused by people—their wrong decisions, loss of concentration or the excessive demands placed on them. Technical failures are not the cause. In 2012, under the direction of Prof. Dr.-Ing. Klaus Dietmayer and in collaboration with the Daimler Research Centre, Ulm University founded the

innovation centre DriveU. This is where new technologies are founded, through which the vehicle is increasingly becoming the seeing and thinking partner of the driver. According to Prof. Dr.-Ing. Dietmayer; “The key to avoiding accidents is recognising danger in good time and avoiding it. We are researching on systems with foresight, that can reliably and comprehensively analyse even the most difficult traffic situations. If there is a risk, the driver is warned in good time or the system intervenes.” The scientists

have developed a sensor system that is capable of recognising and assessing the accident risk and can react independently if the driver is inattentive. DriveU participates in the national research project UR:BAN (Urban Environment: User-Friendly Assistance Systems and Net Management). This also develops driver assistance and traffic management systems, intended to improve the protection of the weaker participants in traffic, such as cyclists and pedestrians.

The long-term objective is a highly mechanised vehicle that can find its goal reliably and independently, even in complex traffic situations.

Capability in age

Older people are often overtaxed by complex traffic situations. To help them to retain their autonomy and mobility to advanced age, special training programmes have been developed by the Department of Clinical and Biological

Psychology at the Institute of Psychology and Education, in collaboration with the group for Experimental Alzheimer Research. They are currently working on the visual abilities needed for driving a car. This programme is based on the ability of the brain to undergo physiological changes with the help of mental training.

However, the risks are not only in traffic. Most accidents happen at home. About 2.7 million people are injured each year, including many older people. Research at the Agaplesion Bethesda Clinic in Ulm is investigating the possibility of avoiding traumas in age. For example, measures are being developed to avoid falls. as these can lead to injuries in old people, may be difficult to heal and threaten the patient’s ability to lead an independent life. The results from the research projects are being implemented in old people’s homes, clinics and other facilities.

“We study predictive systems that are reliable in even the most difficult traffic situations and can carry out comprehensive analyses. If there is a risk, the driver is warned in good time or the system intervenes.”

Prof. Dr.-Ing. Klaus Dietmayer, Director of the Institute of Measurement, Control and Microtechnology

The soul suffers too: prevention of sexual abuse

For a long time, there was hardly any research in Germany on the sexual abuse of children. The abuse scandals in recent years have changed opinions and national research programs have been announced. Scientists in the Ulm Department of Child and Adolescent Psychiatry, under Prof. Dr. Fegert, had already studied these issues on their own initiative. Together with the Department of Psychosomatic Medicine and Psychotherapy under Prof. Dr. Gündel, they are now closely involved in these research projects and are carrying out basic research to avoid psychological traumas.

When a culprit is in court for abusing his own children, we often hear: “He had an unpleasant childhood himself.” In Paediatric and Juvenile Psychiatry, transgenerational transmission of abuse and maltreatment by traumatised mothers is being studied in a collaborative BMBF project, under the title: “My Childhood—Your Childhood”.

Mothers are accompanied for two years from the birth of their child. The Ulm scientists want to find out whether the stress felt by the mothers is greater if they are themselves at a disadvantage. Special programmes are intended to break the vicious circle when the victim becomes a mother herself and thus to make an important contribution to stopping the transmission of the effects of traumas. In this context, it is also being examined whether the effects of trauma are epigenetic and which genes are activated.

Expertise from E-Learning

The BMBF has commissioned the Department of Child and Adolescent Psychiatry, to develop an online course on health and teaching professions. The course provides basic knowledge for the specific professional group and provides trained personnel with fundamental knowledge on the theme of the sexual abuse of children. The first question is whether people from ancil-

lary professions learn material in the context of computer e-learning. The current situation is that more than 250 participants daily from medical, therapeutic or teaching professions are visiting material in the test phase of the online course, which shows that there is outstanding interest in this theme.

In the future, it will be important to develop more advanced modules for the different professions and activities. Thus, the Department of Child and Adolescent Psychiatry has prepared a similar project for the Centre for Child Protection, in cooperation with the Pontifical University Gregoriana and the Archdiocese of Munich-Freising. The international e-learning curriculum “Prevention of Sexual Abuse of Minors” is intended for members of pastoral professions and can be accessed in several languages throughout the world.

Continued development of protection concepts

In addition, the Department of Child and Adolescent Psychiatry, is also taking part in a collaborative BMBF project to record how children, juveniles and persons responsible for their care perceive sexual violence, as well as concepts for protection in resident facilities for helping young people, boarding schools, clinics and convalescence clinics. It is expected that the results will help in the discussion and development of specific concepts for protection in teaching organisations.



Since 2013, the Baden-Württemberg Ministry of Science, Research and the Arts, has been supporting the Centre of Excellence for Child Protection in Medicine. In the context of this multicentre project, the Department of Child and Adolescent Psychiatry, has been developing a postgraduate training module for medical students on the theme of child protection. This is intended to optimise the knowledge of the practical procedure in cases of child protection in medical practice. Moreover, a model is being developed for a child protection network and efforts are being made to improve the contacts between jurisprudence and medicine. ■

“We work in an interdisciplinary team with colleagues doing fundamental biological research, lawyers, teachers and other therapeutic professions. Part of our expertise is that our discussions can involve people who would normally not be able to talk to each other, as their areas of knowledge are so different.”

Prof. Dr. Jörg M. Fegert, Medical Director of the Department of Child and Adolescent Psychiatry

Ulm collaborates with leading international scientists

Prof. Dr. Michael De Bellis, Duke University School of Medicine, Durham, USA



Prof. Dr. Michael De Bellis,
Duke University School of
Medicine, Durham, USA

Abuse, violence and neglect also affect the structure of the human brain. Scientists in the Ulm Network are working on improving our understanding of psychiatric disorders. “Sometimes the changes are maintained over generations”, comments Prof. Dr. Michael De Bellis, Director of the Research Program for Healthy Childhood Brain Development and Developmental Traumatology in Duke University, Durham in North Carolina, USA. Prof. De Bellis is a research worker in paediatric and juvenile psychiatry and collaborates closely with trauma research in Ulm.

Professor De Bellis: How does a psychological trauma modify brain structures?

De Bellis: A trauma triggered by violence and abuse causes intense stress. During the child’s

development, intense stress is thought to cause faulty regulation of the body’s biological stress system and impairs the development of the brain. The effects of trauma on the child’s brain are detectable years later. A brain that has been stressed by traumatic experiences releases more stress hormones (messengers), such as cortisol and noradrenaline. The increased levels of these substances can enhance the “fight or flight” reflex or lead to reactions such as the “freeze response”; these are behaviour patterns with which the individual attempts to master life-threatening dangers. However, the traumatised brain no longer deals with its experiences in an appropriate manner. In everyday situations, current experiences are adulterated with past experiences of traumas. A traumatised person may overreact to a frightening event, as the stress hormones are dysregulated and may be triggered even if there is really no immediate risk of a life-threatening trauma. This condition of faulty regulation can lead to psychiatric diseases (post-traumatic stress disorder, depression, aggressive disorder) or to health problems (immune disorders, cancer).

In such cases, what is the role played by people who are close to the child or juvenile?

The trauma is particularly intense if the violence

or abuse come from persons closest to the child or juvenile — those persons who are actually responsible for its care and good treatment.

What is the overall potential of Ulm neurobiological research?

Research in Germany as a whole and in Ulm in particular is concentrated firstly on the biological and psychological processes in the brain and body after violence. Secondly, the Ulm scientists are studying the biological and psychological changes that take place during trauma treatment. They wish to identify which consequences of childhood trauma can be successfully treated. In this respect, Germany is ahead of the USA.

Could you describe that in more detail?

In North America, the causes of traumas and the therapeutic options are not studied holistically. The Ulm holistic approach will lead to a better understanding of the neurological and hormonal mechanisms in acts of sexual violence—how they act and how they can modify brain structure. The Ulm scientists also want to know how evidence-based treatments can cure the victim’s brain and body. For we know that the consequences can be really severe: impaired memory and sleep, difficulties in concentrating, depression and even suicide.

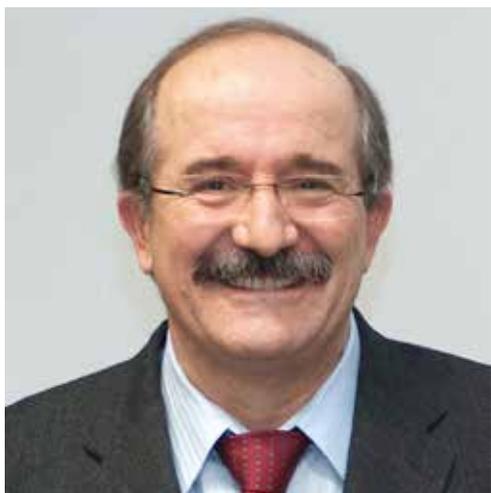
What are the opportunities provided by international collaboration in research?

We need this international collaboration. We also need large scale and widely supported population studies, if we are to understand the effects of abuse on the brain and improve the treatment of the various consequences.

What do you think of the approach of combining basic research, clinical research and care research - as done in the Ulm Network?

From an international point of view, you cannot praise this too highly. Ulm research is outstanding. It is particularly important to combine the results from research and treatment. This incorporates the patient’s everyday life and makes it possible to develop therapeutic options that aim to improve the patient’s overall or holistic function. The Ulm work is inspiring and influences research in the USA too. ■

Prof. Dr. John D. Lambris, University of Pennsylvania School of Medicine, Philadelphia, USA



Prof. Dr. John D. Lambris, University of Pennsylvania School of Medicine, Philadelphia, USA

For several years, Prof. Dr. John D. Lambris has repeatedly worked with the Ulm trauma scientists within Clinical Research Group KFO 200. He is particularly interested in the structure and function of the complement system—an important component of the innate immune response in inflammation and trauma. His work uses the methods of the natural sciences, engineering and information science. One of his outstanding discoveries was the discovery of compstatin, an inhibitor that regulates the complement system. Most recently, in 2013 he

was Hans Kupzyk Guest Professor at Ulm University, which gave him the opportunity to gain a deeper insight into trauma research at Ulm.

Professor Lambris: On which research projects are you working here in Ulm?

Lambris: For more than ten years, I have been collaborating intensively with the members of three different research groups in Ulm. Together we are studying the dangerous inflammatory response after different injuries. These activate the “complement” defence system in the body and disturb its function. Nature has developed incredibly effective mechanisms to exploit or to circumvent this system, which was developed at a very early period of evolution.

What was the specific contribution made by your laboratory in Philadelphia, USA?

My laboratory performs submolecular studies of complement factors for the Ulm scientists. We are developing highly active modulators of the complement system for application after tissue injury or inflammation. We think that these modulators will be able to improve the healing of damaged tissues and of bone fractures.

What impresses you most about trauma research in Ulm?

“We scientists and clinicians have spent enough tax money in the laboratories of the world. Our scientific knowledge should now be used to benefit patients. In other words, we need to transfer effective experimental therapies to the bedside.”

Prof. Dr. John D. Lambris, University of Pennsylvania School of Medicine, Philadelphia, USA

My compatriot Plato once said: “χαλεπὰ τὰ καλὰ.” (translation: What is difficult is beautiful). Ulm scientists employ elegant methods to study very difficult and complex interrelationships, for example in the pathophysiology of multiple injury to patients who were previously either healthy or already ill. The research groups in trauma research on the campus are obviously effectively interlinked—which I consider to be of decisive importance for successful research into complex interrelationships.

If you had unlimited time, in which areas would you perform research?

Hmm. Life is short, but art is eternal! If I were 20, I would investigate the fascinating question

of the complete regeneration of extremities after amputation in nature, for example in the axolotl, and exploit the findings for man. I might win a Nobel Prize! Till then, we are going to continue working on our own research topics.

What is your vision for Ulm University?

We scientists and clinicians have spent enough tax money in the laboratories of the world. Our scientific knowledge should now be used to benefit patients. In other words, we need to transfer effective experimental therapies to the patient’s bedside. In my opinion, trauma research in Ulm is ideally prepared for these important steps and I am enthusiastically awaiting the first results. ■

Trademark: networked medicine

Insurers value the structure in Ulm, in which all necessary disciplines are interlocked



Prof. Dr. Volker Bühren,
Murnau Trade Association Accident Clinic

Professor Bühren: How do you see trauma surgery in Ulm?

Bühren: I have been observing the activities of the Ulm trauma surgeons for 30 years. The outstanding qualities of this work is certainly due to the individuals—at least in part. This started with Caius Burri and his pioneering work, with his laboratory for experimental traumatology and the newly developed treatment methods for bone replacement. It continued with Lothar Kinzl, who was an expert spinal column surgeon and who worked according to specific algorithms when a patient had multiple injuries.

Florian Gebhard and his team have won great respect for their work in multiple injuries and geriatric traumatology.

Is trauma surgery concentrating on the right areas?

The holistic approach has been used since the start of the millennium. The objectives are to restore function, reintegration of the patient and restoration of quality of life. This approach concentrates fully on the patient's future life and thus automatically complies with the interests of the statutory accident insurance (DGUV), as, in extreme cases, they may have to pay a pension.

Do the Ulm surgeons take this into account?

Ulm surgeons have always worked hard on reconstruction and have always emphasised subsequent reconstruction and anaplastic operations. After a perfect operation, the patient's quality of life should really have improved. This is supported by psychotraumatology, which has the aim of processing the direct psychological effects of an accident, so that the patient's confidence is enhanced and he can adjust his level of activity to the residual damage. In addition, there is functional therapy, that can activate the reserve functions that the body still has.

For the severely injured, time and the site of treatment are very important.

This is why the Trauma Network, as established in Ulm, is so important. Expertise is classified and this helps the ambulance men to decide where to bring the patient. At the highest level are the facilities that can take the most difficult case at any time, as they possess enough expertise and enough staff. Ulm also knows how the most important people can be contacted directly and how they can help each other, as some facilities do not have all the necessary equipment

And who decides about the quality?

Volume VII of the Social Security Code lays down that the accident insurer has the right to direct the treatment. As the accident insurers can say where the patient is to be treated, they were the first to introduce hospital certification. For injured patients, there are two steps: clinics that treat minor injuries and clinics that treat major injuries. This was the origin of the Trauma Network of the German Association of Trauma Surgery. The DGUV is now working on the introduction of a three-step system, which is almost identical to the trauma network. It is quite clear from the Trauma Register that Ulm has every right to be designated as a national trauma centre, as the process quality is so high. ■



Hubert Seiter, Director of German Pension Insurance (DRV) for Baden-Württemberg, Foundation Member of the Institute for Research on Medical Rehabilitation, Ulm University

From the point of view of the DRV, which issues should trauma research address?

Seiter: In medicine today there is the problem that isolated segments are handled at the highest possible level, but that interface management—the interaction with other institutes—does not work terribly well. If I operate on a patient and then discharge him with a handicap, I must also think about how he can manage his daily and professional life again—without extra support, if at all possible. What forms of support or rehabilitation does he need? If a surgical de-

“From the start, Ulm University thought and acted in networks, so that medicine developed into social medicine.”

Hubert Seiter, Director of German Pension Insurance (DRV) for Baden-Württemberg, Foundation Member of the Institute for Research on Medical Rehabilitation, Ulm University

partment fails to think of this, a lot of time may be lost that can hardly be made good later. We must study how we can guide the link from the acute event to the operation to reintegration.

How well is Ulm prepared for this?

From the start, Ulm scientists have thought and acted in networks, so that medicine developed into social medicine. Surgeons in Ulm not only operate outstandingly well, but always bear in mind how traumatised patients can be helped to reintegrate in their normal lives after an accident or injury.

How do you set this up?

The Faculty of Medicine in Ulm is a young university of limited size, which is surrounded by important facilities: Rehabilitation Research, the Centre for Musculoskeletal Research Ulm (zmfu), as well as the ethicists—who are more than ready to point out that operating well is not the be all and end all. This is easier to organise in a small, agile and rapid university like Ulm, rather than in a staid old university. Moreover, Ulm has the advantage that not only physicians work on the Eselsberg, but that sources of ideas and companies like Bosch and Siemens are in the immediate vicinity.

Can a network guarantee quality?

That’s exactly my point! Because we are talking about interlocking actions and thereby about communication. How can data be put into an account for social medicine, so that the next person in the chain of treatment not only knows that an excellent operation has been carried out, but can also see exactly what he has to look out for? Aside from this mutual communication, there must also be communication with those who expect something from Ulm—for example, the health insurance funds, who are interested in the patient’s reintegration into his normal life, if at all possible without drug treatment. ■



Prof. Dr. Paul Grützner, Ludwigshafen Trade Association Accident Clinic

Professor Grützner: There is a great deal in common between your research work and that of the Ulm trauma surgeons ...

Grützner: For more than 10 years, both groups have been working on the link between imaging and surgery. We collaborate in research, manage joint functions and are members of the same medical societies. This means that I have the right to say clearly that the Ulm workers are the leaders in this area.

What are the advantages of computer navigation?

The OP trauma must be minimised. Our slogan is: “Do no further harm”. This means that the trauma from the operation must be minimised, so that the patient can better cope with the stress. Thus it is extraordinary important to have intraoperative procedures to assist the surgeon. Intraoperative imaging plays a major role here and there have been decisive developments in Ulm.

What are the challenges that trauma surgeons must overcome?

The technology of intraoperative imaging was not primarily developed for trauma surgery. Ulm radiologists, cardiologists and cardiac surgeons have recognised the benefit of the instruments and integrated them in the OP, so that imaging in the operating theatre is now “hybrid OP”.

This is an important technical advance, but you have to know how to work with it.

Complex imaging requires new working routines and makes new demands on the trauma surgeon. Florian Gebhard was one of the first to use this in routine clinical work. This was a major visionary achievement in improving the quality of care in complex injuries.

You praise the force of innovation in Ulm.

Why has there been so much innovation in Ulm?

This is because of the structure in Ulm. All disciplines are linked in a network, that includes both clinical and scientific workers. This leads to a flow of information that furthers information. This is an excellent example of a structure for translational research.

But technologies change, so that approaches have to be revised ...

Trauma research is highly complex and interdisciplinary. Basic research aims at understanding the interrelationships at the molecular level, for example the processes of inflammation, as well as understanding how such processes can be triggered by therapeutic measures. This is why the Ulm scientists also work at the cellular level, in order to extend their knowledge. Combination of new knowledge and the specific use of technology enhance the quality of operative care and of overall trauma management. ■

Students and young scientists are involved in research as soon as possible

Prof. Dr. Tobias M. Böckers

Dean of Studies, Faculty of Medicine



The profile of the Ulm curriculum MED@ULM has been extended with the study section “Trauma care and trauma research” (Trauma Track). In this section, students are given six semesters of training in surgery,

anaesthesiology and intensive care, as well as emergency care and scientific studies and research. Internal and external experts in various specialities provide the instruction in the basic

seminar in the Trauma Track. In the practical sessions, the students practice emergency treatment in standardised patients and simulation dolls.

Using e-learning tools, the students can independently deepen their knowledge—anywhere and at any time. Typical cases and issue-specific e-learning programs have been developed for this purpose, in cooperation with the Baden-Württemberg Centre of Excellence in e-Learning in Medicine. The students are also taught about the current state of trauma research in the important areas. ■

“All departments and clinics participating in trauma research are also very actively involved in teaching and training. In the Trauma Track, excellent students can select an individual theme and soon start on research.”

Prof. Dr. Tobias M. Böckers, Dean of Studies, Faculty of Medicine

Janina Angermeyer

Doctoral Student in Medicine



Research helps me to look analytically at the clinical issues we learn about during our courses. My work deals with the analysis of blood cells in blood smears, particularly with the so-called “neutrophil extracellular traps” (NETs). Releasing NETs is an alternative mechanism used by neutrophilic granulocytes to attack bacteria and to catch them (in their DNA NETs). This is a strategy used as a component of innate immunity. The bacteria get stuck in the chromatin threads of DNA in the network released by the granulocytes. This process is known as NETosis.

The NETs could easily have been seen in the light microscope. Nevertheless, NETs were only discovered in 2003, by two Max Planck scientists. They have been linked to particularly

severe forms of injury (trauma) or infection (sepsis). I am studying NETs and am correlating their occurrence with respect to other biomarkers and clinical criteria. In Intensive Care Unit G1, I can observe the patients and the course of their disease. Using current study criteria, I can select those who have already developed sepsis, or who are at risk of this. My research work has already given me the chance to take part in two scientific symposia and to present my results. One reason that I have been able to start research so early in my studies is the “Trauma Track”, developed by Prof. Dr. Dr. h.c. Peter Radermacher and Prof. Dr. Markus Huber-Lang. Tracks focus on individual themes. Five special programs are now available, in which visiting scientists from Germany and abroad give special lectures on the current state of research. The program is complemented with practical exercises. The condition for participation is being a doctoral student in the corresponding area.

I am now working on my doctoral thesis. Among other things, I am looking at the correlation between the number of NETs and the occurrence of non-specific inflammation. ■

Dr. Tanja Besier

Department of Child and Adolescent Psychiatry



I am employed as research worker in the Department of Child and Adolescent Psychiatry. In many other departments, work is exclusively related to patient care, but in Ulm research enjoys equal rights. Thus, the newest research findings can be integrated into everyday clinical work. In Ulm, psychologists have the same status as medical doctors. Team work is very important in direct case work, supervision, visits and case discussions. This does not only apply to clinical work, but also to research, where experienced colleagues and novices work closely together.

My interest in trauma research lies in the interface between medicine and psychology. If a member of a family falls seriously ill, the other family members too are exposed to severe psychological stress. For example, cancer represents a sudden threat to body and soul and this is difficult for a child to understand. The child suffers a severe shock, leading to a severe stress reaction and can be perceived as a trauma. We aim to

identify the conditions under which the probability of traumatisation is increased. We then offer the children, parents and family members improved strategies to overcome the stress and thus to improve psychological well-being.

My doctoral thesis in 2008 was on the development of a voluntary intervention program in inpatient facilities for youth welfare services. The objective was to avoid psychiatric treatment days. How can we stabilise the juveniles in the facility for youth welfare services, instead of moving them to psychiatry at every crisis and then perhaps moving them to another facility? The relationships of many children and juveniles are repeatedly broken off when they transferred to the facilities of youth welfare. They are thrown from one relationship to the next; they change facilities and spend periods in foster families or in their own families. This can lead to psychological traumatisation. In this context, improving quality of life means guaranteeing the best continuity and stability possible.

We are also developing research questions and studies on trauma teaching and therapy, in order to help the young people to process their experiences. It is helpful if the department is optimally linked to other facilities. We first have to know what the youth welfare services do, what the teachers in the facilities see and what the paediatricians and teachers perceive. We can then prepare a full diagnostic picture of the patient and provide specific help. ■

Dr. Anna Kovtun

Member of Clinical Research Group KFO 200
“The immune response after musculo-skeletal trauma”



My special area of research is the healing of bone fractures. Bone fractures heal poorly if a patient has several severe injuries, for example, after a car accident. This can lead to the patient suffering severe restrictions. I would like to understand why the ability of bone tissue to regenerate is impaired under these conditions. It is very important to clarify the cellular and molecular mechanisms if we are to treat healing disorders in severely injured patients. In this context, the role of the immune system is interesting. The immune system is activated after trauma, as the organism has to protect itself. However, after severe injuries, these regulation mechanisms no longer function; the immune system is hyperactivated and inflammation develops in the whole body. We have been able to demonstrate that this hyperactivation is responsible for the impaired bone regeneration. However, we are only now beginning to understand the molecular mechanism behind this phenomenon. But much research remains to be done. The main reason I find my work so exciting is that the results open the possibility of developing new therapies. My laboratory research is therefore of real use to severely injured people in hospital. This transactional aspect in my work is of very great importance to me personally. In Ulm, I work in an interdisciplinary research environment,

which centres on the interaction between basic and clinical research. As a biologist and basic research worker, I cooperate intensively with other disciplines in Clinical Research Group KFO 200, particularly with the trauma surgeons. In this way, we can compare our laboratory results with patient data and ensure that our results are relevant to our patients.

Clinical Research Group KFO 200 is embedded in the Centre for Musculoskeletal Research Ulm (zmfu). This gives me the possibility of networking with many different research groups and gives me access to their hoard of experience. In addition, young scientists have excellent opportunities for postgraduate studies and advanced training. ■

Trauma research in Ulm – people, institutes, departments, facilities and organisations

| Name | First Name | Title | Institute | Theme |
|----------------------|------------------|--------------------|---|---|
| Becker | Thomas | Prof. Dr. | Department of Psychiatry and Psychotherapy II (Ulm University Hospital) | Treating trauma |
| Böckers | Tobias M. | Prof. Dr. | Institute of Anatomy and Cell Biology | Understanding trauma |
| Brenner | Rolf | Prof. Dr. | Department of Orthopaedics (Ulm University Hospital / Ulm Rehabilitation Hospital (RKU)) | Understanding trauma |
| Debatin | Klaus-Michael | Prof. Dr. | Department of Paediatrics and Adolescent Medicine (Ulm University Hospital) | Understanding trauma |
| Dietmayer | Klaus | Prof. Dr.-Ing. | Institute of Instrumental, Control and Microtechnology / DriveU Innovation Centre (Ulm University) | Avoiding trauma |
| Fegert | Jörg M. | Prof. Dr. | Department of Child and Adolescent Psychiatry (Ulm University Hospital) | Understanding, avoiding and treating trauma |
| Gebhard | Florian | Prof. Dr. | Department of Orthopaedic Trauma (Ulm University Hospital) | Understanding and treating trauma |
| Geiger | Hartmut | Prof. Dr. | Department of Molecular Medicine (Ulm University / Central Institute for Biomedical Technology (ZIBMT)) | Understanding trauma |
| Georgieff | Michael | Prof. Dr. Dr. h.c. | Department of Anaesthesiology (Ulm University Hospital) | Understanding and treating trauma |
| Goldbeck | Lutz | Prof. Dr. | Department of Child and Adolescent Psychiatry (Ulm University Hospital) | Understanding and treating trauma |
| Gündel | Harald | Prof. Dr. | Department of Psychosomatic Medicine and Psychotherapy (Ulm University Hospital) | Understanding, avoiding and treating trauma |
| Henne-Bruns | Doris | Prof. Dr. | Department of General and Visceral Surgery (Ulm University Hospital) | Treating trauma |
| Huber-Lang | Markus | Prof. Dr. | Research Unit, Department of Orthopaedic Trauma (Ulm University Hospital) | Understanding trauma |
| Ignatius | Anita | Prof. Dr. | Centre for Musculoskeletal Research Ulm (zmfu) / Institute of Orthopaedic Research and Biomechanics (Ulm University) | Understanding trauma |
| Knippschild | Uwe | Prof. Dr. | Department of General and Visceral Surgery (Ulm University Hospital) | Treating trauma |
| Kolassa | Iris-Tatiana | Prof. Dr. | Department of Clinical and Biological Psychology / Institute of Psychology and Teaching (Ulm University) | Understanding and avoiding trauma |
| Krischak | Gert | Prof. Dr. | Institute of Research in Rehabilitation Medicine (Ulm University) | Treating trauma |
| Liebold | Andreas | Prof. Dr. | Department of Cardiac, Thoracic and Vascular Surgery (Ulm University Hospital) | Treating trauma |
| Radermacher | Peter | Prof. Dr. Dr. h.c. | Department of Anaesthesiology (Ulm University Hospital) | Understanding trauma |
| Reichel | Heike | Prof. Dr. | Department of Orthopaedics (Ulm University Hospital / Ulm Rehabilitation Hospital (RKU)) | Understanding and treating trauma |
| Riepe | Matthias W. | Prof. Dr. | Department of Psychiatry and Psychotherapy II (Ulm University Hospital) / Günzburg District Hospital | Avoiding trauma |
| Rothenbacher | Dietrich | Prof. Dr. | Institute of Epidemiology and Medical Biometrics (Ulm University) | Understanding trauma |
| Scharfetter-Kochanek | Karin | Prof. Dr. | Department of Dermatology and Allergology (Ulm University Hospital) | Understanding trauma |
| Schrezenmeier | Hubert | Prof. Dr. | Institute of Transfusion Medicine (Ulm University Hospital) | Understanding and treating trauma |
| Seufferlein | Thomas | Prof. Dr. | Department of Internal Medicine I (Ulm University Hospital) | Treating trauma |
| Spitzer | Manfred | Prof. Dr. Dr. | Department of Psychiatry and Psychotherapy III (Ulm University Hospital) | Treating trauma |
| Schneider | Elisabeth-Marion | Prof. Dr. | Department of Anaesthesiology (Ulm University Hospital) | Understanding trauma |
| Tuckermann | Jan | Prof. Dr. | Institute of General Zoology and Endocrinology (Ulm University) | Understanding trauma |
| Tumani | Visal | Ms | Department of Psychiatry and Psychotherapy III / Special Practice for Trauma Disorder Effects (Ulm University Hospital) | Treating trauma |
| Wirth | Thomas | Prof. Dr. | Institute of Physiological Chemistry Department of Anaesthesiology (Ulm University) | Understanding trauma |
| Wirtz | Rainer | Prof. Dr. | Department for Neurosurgery | Understanding and treating trauma |
| | | | German Army Hospital Ulm (BWK) | Treating trauma |
| | | | German Red Cross (DRK) | Understanding and treating trauma |

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