MEDICINE & MEDICAL TECHNOLOGY

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Since 1996, TransMIT GmbH, with its around 160 employees, has been tapping and marketing the innovation potential of numerous scientists from several research institutions in and outside the German federal state of Hesse at the intersection of science and business. More than 160 TransMIT centres offer innovative products, technologies and services as well as continuing education events from almost all disciplines under professional scientific leadership, drawn directly from the three shareholder universities of TransMIT GmbH (Justus Liebig University Giessen, University of Applied Sciences Mittelhessen (THM) and Philipps University Marburg).

EXPERT KNOWLEDGE AND DEVELOPMENT COMPETENCE

The patent commercialisation business unit identifies and evaluates product ideas and research results on behalf of customers and offers them for licensing or purchase worldwide. The portfolio of services covers all fields of technology. This offer is complemented by services for holistic innovation management from idea to market-ready product in the business segment Managed Innovation Services (MIS), in particular funding consultancy and project management for small and medium-sized enterprises. In addition, the business segment Cooperation Networks & New Markets initiates and supports networks between SMEs that wish to proactively develop further.

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GO-BIO-INITIAL – FOR A SUCCESSFUL START

With the Go-Bio initial funding initiative, the BMBF supports the identification and further development of new project ideas and research approaches from the natural and life sciences with recognisable innovation potential. The focus is particularly on ideas and inventions from the fields of therapeutics, diagnostics, research tools and platform technologies.

The programme is aimed at scientists from the three universities in Central Hesse, who are in a phase of professional (re)orientation: graduate students, PhD students and postdocs, who want to develop their applicable ideas or inventions further, ideally to the point of commercialisation and could imagine starting their own company, as well as experienced professionals who are looking for a new perspective.

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IP protected technologies

MEDICINE

THERAPY

- Treatment of pulmonary arterial hypertension (PAH)
- Diaplatin – a new and powerful active pharmaceutical ingredient (API) against cancer
- Darobactin effective as an antibiotic against gram-negative bacteria
- PHMB-slow-release granula for wound disinfection
- Active compounds for the treatment of SARS coronavirus 2 infections (Covid-19)
- Antisense Circular RNA as Therapeutic Compound for Treatment of Covid-19
- Treatment of ZIP9-associated diseases with tetrapeptides
- New therapeutic approach for genetic diseases
- Active ingredients for the treatment of lung in Idiopathic Pulmonary Fibrosis (IPF)
- Biodegradable nano- and meso-polymer particles for protecting the pulmonary surfactant of the lung
- Active agent for regeneration of the lung
- Steroid-based compounds against Malaria
- Asian plant against the Ebola virus
- Yeast Surface Catalysis (YSC) Platform
IP protected technologies

MEDICINE

DIAGNOSTICS

- Method and kit for diagnosis of parasitic/fungal infections and de novo allergen identification via recognition of conformational epitopes (DNA-ICE)
- Enhanced detection of hemolytic activity of gram-positive pathogenic microorganisms
- Simple and reliable detection of colistin-resistant bacteria
- Supply of a specific, direct and fast detection method for Cholesterol dependent Cytolysin (CDC)
- Cyanine dyes for in-vivo staining of microorganisms
- Verfahren zur Bestimmung der lastunabhängigen Kontraktilität einer Herzkammer
- Elektronisches Diagnosesystem für die Karies am menschlichen Zahn

MEDICAL TECHNOLOGIES

- Cement applicator for embedding endoprostheses
- Short Shaft Prosthesis
- Integrated fibre optic microelectrode
Treatment of pulmonary arterial hypertension (PAH)
orphan disease, small-molecule compounds, pulmonary arterial hypertension (PAH), benzimidazole derivates, epigenetic modulation-based therapy

DESCRIPTION OF TECHNOLOGY
Pulmonary arterial hypertension (high blood pressure in the lung arteries) is a rare, multifactorial, progressive form of pulmonary hypertension (PH). Untreated, it can lead to right heart failure and premature death.

The key structural alteration of PAH is pulmonary vascular remodeling, which causes increasing thickness and stiffness of pulmonary arteries and as a result, leads to increased pressure.

Our novel treatment approach utilises epigenetic modulation by histone-acetyltransferase inhibition with benzimidazole derivates and aims at the restoration of damaged lung vessel structure and function, and the reversal of remodeling.

Researchers from the German excellence cluster Cardio-Pulmonary Institute (CPI) and Justus-Liebig University Giessen (JLU) evaluated two different potential drug candidates for treatment of PAH, with focus on the reversal of pulmonary remodeling.

The preclinical studies with three different animal models in vivo, showed promising therapeutic results, as did the efficacy evaluation in human PAH precision cut living lung slices (PCLS).

AT A GLANCE …

Application Fields
- Treatment of PAH
- Rare lung diseases

Business
- Pharmaceutical companies
- Biotechnology companies

USP
- Reversal of pulmonary vascular remodeling
- Restoration of damaged lung vessel function and structure
- Effective for PAH treatment

Development Status
- Pre-clinical studies in vivo (in three different PAH rat models)
- Evaluation of therapeutic efficacy in human PAH-PCLS ex vivo

Patent Status
Priority applications filed on 08.04.2022 with the European Patent Office. PCT applications are planned. Orphan status is possible.
ADVANTAGES OVER THE PRIOR AR
The compounds showed strong promise for efficacy within 14 days of treatment in animal models and PCLS, with improved hemodynamic, anti-hypertrophic, anti-proliferative and anti-fibrotic properties.

Focus is on restoration of damaged lung vessel structure and function as well as the reversal of the pulmonary vascular remodeling.

Our fundamentally new treatment approach with epigenetic modification offers, for the first time, a reversal of remodeling.

STATE OF THE PRODUCT DEVELOPMENT
Results from pre-clinical studies in vivo (three different PAH rat models) and evaluation of therapeutic efficacy in human PAH PCLS ex vivo are available.

Compounds are freely available. One compound is currently part of a phase II clinical cancer treatment trial with a basic oral formulation. Other application forms of the compounds are possible, which enables for more effective and targeted treatment.

We offer medical and scientific expertise in the area of pulmonary research, with multiple renowned institutions (German excellence cluster Cardio-Pulmonary Institute (CPI), Bad Nauheim; Universities of Giessen and Marburg Lung Center (UGMLC) and specialist medical centre Kerckhoff Clinic, Bad Nauheim. We can recruit a considerable number of potential clinical trial participants and perform clinical trials up to phase III on site.

MARKET POTENTIAL
The global market for PAH treatment is expected to grow considerably in the future, with risk factors (HIV, drugs, excessive lifestyle, aging population) on the rise. Furthermore, better disease understanding and diagnosis also increases the market potential.

The range of PAH prevalence in Europe is 15-60, in the United States 5-50 cases per million and European PAH incidence 5-10 cases per million per year. Without effective treatment, the average survival is 2.8 years after diagnosis.

COORDINATION OPPORTUNITIES
On behalf of its shareholder Justus-Liebig-Universität Giessen, TransMIT GmbH is looking for cooperation partners or licensees for clinical trials and further development worldwide.
Diaplatin – a new and powerful active pharmaceutical ingredient (API) against cancer

Cancer therapy, Cisplatin/Oxaliplatin, Diamantane complexes

DESCRIPTION OF TECHNOLOGY

Cisplatin, resp. oxaliplatin, are well known API's for the treatment of cancer. Nevertheless, due to the development of increasing resistance against even these well established high performance compounds there is great need for new API's in cancer therapy.

Recently, a whole new class of API's has been created and successfully tested as being effective against some cancer lines. Some exemplary compounds of this new class of API's are already available in high enantiomeric purity for individual additional testing.

The tests carried out so far were run with the human ovarian cancer cell line A2780 and its cisplatin-resistant variant A2780cis. The results demonstrate that one enantiomer of the sample compound performed better than cisplatin.

Additional nucleotide binding experiments were also carried out, which showed good binding affinity, characteristic for high potential regarding effectiveness against cancer growth.

AT A GLANCE …

Application Field
- Cancer therapy

Business
- Pharmacy
- Medical research

USP
- New type of ligand
- Higher activity than cisplatin

Development Status
- First successful tests of efficacy on laboratory scale by use of A2780 and A2780cis cell-lines.
- Nucleotide binding experiments on laboratory scale also showed a high binding affinity.
- Material is commercially available, e.g. via abcr GmbH

Patent Status

REFERENCE NO.: TM 1060
APPLICATION FIELDS

The new diaplatin complexes (complexes of platinum(II) with 1,2-diaminodiamantane ligands) show activity against human cancer cell lines, thus proving their applicability in cancer therapy.

ADVANTAGES OVER PRIOR ART

The \((R,R)\)-enantiomer of \(\text{cis-}[1,2\text{-diaminodiamantane}]\) platinum(II) dichloride complex, so far exemplarily tested, showed even better performance against A2780- and A2780cis cell lines.

STATE OF PRODUCT DEVELOPMENT

Two examples of the diaplatin complexes are already commercially available (for example via abcr GmbH) for performing own tests, both in racemic form and as pure enantiomers:

- \(\text{cis-}[(R,R)-1,2\text{-diaminodiamantane}]\) platinum(II) dichloride
- \(\text{cis-}[(S,S)-1,2\text{-diaminodiamantane}]\) platinum(II) dioxalate

COOPERATION OPPORTUNITIES

On behalf of its shareholder Justus-Liebig-University Giessen TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, US, and Asia.
Darobactin effective as an antibiotic against gram-negative bacteria

New drug candidate for antibiotic therapy of patients

DESCRIPTION OF TECHNOLOGY

Many bacteria that cause serious infectious diseases have developed resistance to common antibiotics, so that antibiotics are no longer effective. These include in particular the Gram-negative bacteria with their stable outer membrane, such as Pseudomonas aeruginosa, Escherichia coli, Acinetobacter baumannii, Neisseria gonorrhoeae, Chlamydia trachomatis, Shigella sonnei, Salmonella enterica Typhimurium LT2, Enterobacter cloacae, Bifidobacterium longum, Bacteroides fragilis, Lactobacillus reuteri, Enterococcus faecalis, Yersinia pestis and Klebsiella pneumoniae.

Darobactin is now a promising candidate for a new class of drugs with a new mechanism of action. It binds to the protein BamA, which is localised in the outer membrane of Gram-negative bacteria. This disrupts the formation of a functional outer membrane and the bacteria die. This means that darobactin does not first have to penetrate the bacterial cell to exert its antibiotic effect, but is effective and reliable from the outside. Chemically, darobactin is a peptide isolated from the extract of bacterial symbionts of threadworms, but it can also be produced recombinantly or chemically. It consists of seven amino acids and has two fused macrocyclic ring systems that form post-translationally. Darobactin is effective against typical Gram-negative bacteria both in vitro and in animal models.

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AT A GLANCE …

Application Fields
- Medicine
- Hygiene

Business
- Pharma
- Medicine
- Biotechnology

USP
- New drug candidate
- Attacks bacterial cell wall from the outside
- there is no resistance to it
- shows no cell toxicity in animal

Development Status
- in vitro and in vivo results with E.coli strains in mice
- Cloning of the Dar operon for recombinant production

Patent Status
Priority application filed on November 2019
International PCT Patentapplication filed on Nov. 22, 2020

REFERENCE NO. TM 1077
ADVANTAGES OVER THE PRIOR ART

New active substance candidate against antibiotic-resistant Gram-negative bacteria such as Pseudomonas aeruginosa, Escherichia coli, Acinetobacter baumannii, Neisseria gonorrhoeae, Chlamydia trachomatis, Shigella sonnei, Salmonella enterica Typhimurium LT2, Enterobacter cloacae, Bifidobacterium longum, Bacteroides fragilis, Lactobacillus reuteri, Enterococcus faecalis, Yersinia pestis and Klebsiella pneumoniae.

Darobactin can be easily administered and shows reliable efficacy against infections with wild-type or antibiotic-resistant Gram-negative bacteria.

The good efficacy is shown in vivo in mice, where no cell toxicity and no development of resistance was found.

STATE OF THE PRODUCT DEVELOPMENT

First preclinical experiments are available.

MARKET POTENTIAL

In Germany, most antibiotics are prescribed in the outpatient sector (85%), the share of clinic consumption is only 15%. In medical practices, about 39 million antibiotic prescriptions were issued in 2014, which corresponds to 374 million mean daily doses (DDD) and a turnover of 699 million euros. Consumption has been relatively constant over the last few years, but reserve antibiotics are being prescribed more and more frequently. In Europe, the situation is similar: most antibiotics (90%) are consumed outside hospitals. In the outpatient sector, the average is 21.5 DDD per 1,000 inhabitants per day, compared to 2.0 DDD in hospitals. Broad-spectrum antibiotics, which are effective against many different types of bacteria, are used most frequently. The top countries for antibiotic consumption are Greece (31.9 DDD per 1,000 inhabitants and day), as well as Belgium, France and Hungary. In terms of consumption in hospitals, Finland is the frontrunner. Global antibiotic consumption increased by 36% between 2000 and 2010, with South Africa and the BRIC countries accounting for three quarters of the increase: Brazil, Russia, India and China, as they experience huge population growth. This trend has roughly continued until today.

COOPERATION OPPORTUNITIES

On behalf of its shareholder Justus-Liebig-University of Gießen TransMIT GmbH is looking for cooperation partners or licensees for distribution / further development in Germany, Europe, USA and Asia.
PHMB-slow-release granula for wound disinfection

Disinfection, periodontitis, polyhexamethylene biguanide, PHMB, chronic inflammation

DESCRIPTION OF TECHNOLOGY

Disinfection of chronically inflamed wounds is an important prerequisite for successful healing.

In periodontitis pockets around teeth are filled with a bacterial biofilm, which causes a local inflammation but may also provoke systemic reactions. Apart from antibiotics in many cases chlorhexidine (CHX) is used for disinfection, which exerts release of CHX as active ingredient for a maximum time-span of 2 weeks. CHX may provoke side-effects and the available devices usually contain gelatin, which is of mammalian origin and may be the reason to refuse application by patients.

We present a gelatin-free alternative, using polyhexamethylene biguanide ("Polyhexanide", PHMB) as active ingredient instead of CHX and exerting a much longer (at least twice as long) time-span during which the active ingredient (PHMB) is released in therapeutic concentrations.

The PHMB-granula presented herein may either be single-phased or core-shell structured in order to optimize the release-kinetics of PHMB and may also contain additional agents, which support the healing process, e.g. sodium ascorbate, selenium, zinc, vitamin D, vitamin E, vitamin K, vitamin K2 or coenzyme Q10.

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AT A GLANCE …

Application Field

- Wound treatment
- Preventing of wound-infection
- Therapy of acute or chronic inflammations

Business

- Wound management
- Dental surgery,
  - Periodontology

USP

- Short-term and
- Long-term efficacy (≥ 8 weeks)
- Less side-effects than chlorhexidine
- Free of gelatin

Development Status

- Efficacy successfully proven on laboratory scale
- Proof of principle clinically evaluated

Patent Status

Priority application, filed 05.01.2021 at the European Patent Office.

REFERENCE NO.: TM 1092
APPLICATION FIELDS
The field of application of the PHMB-granula is primarily the area of wound-disinfection and the therapy of acute or chronic inflammations, especially the disinfection of niches and (periodontal) pockets in the area of (dental) medical treatments. For these areas the application was developed and quite numerous application data is already available. But the application is not confined to dental medical treatment. Any other area of medical treatment where niche-disinfection/pocket-disinfection is required, e.g. regarding complications with diabetic necrosis and other illnesses, the PHMB-granula may be applied successfully.

ADVANTAGES OVER PRIOR ART
In contrast to the disinfection particles already known, which provide release of CHX for only about 2 weeks, the granula presented herein allow release of PHMB for at least about twice as long (available experimental data: > 56 days) and do not contain animal material (gelatin) and supply PHMB instead of CHX.

STATE OF PRODUCT DEVELOPMENT
The effectiveness of the granula has been proven by seeding granula-containing agar-plates with *Streptococcus gordonii* and then observing the growth of *S. gordonii* over time. According to the size of the inhibition zones around the granula it is shown that the release of PHB is active and effective for at least about 60 days. In a first clinical study to demonstrate the proof-of-principle the antibacterial power of the devices showed an impressive reduction of the local bacterial load and the immediate healing of the lesions.

SOURCE OF SUPPLY
The application of the granula has been developed by Prof. Joerg Meyle and Dr. Sabine Groeger at the Dental School, University of Giessen. Development is further proceeded and more detailed information as well as sample material may be obtained from the TransMIT-Projektbereich für orale Biologie, Implantologie und Parodontologie, led by Prof. Meyle.

COOPERATION OPPORTUNITIES
On behalf of its shareholder Justus-Liebig-University Giessen TransMIT GmbH is looking for cooperation partners or licensees for distribution or further development in Germany, Europe, US, and Asia.

A TECHNOLOGY OF

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Active compounds for the treatment of SARS coronavirus 2 infections (Covid-19)

Covid-19, SARS coronavirus 2 infection, therapy, furin inhibitors, inhibitors of TMPRSS2

DESCRIPTION OF TECHNOLOGY

The binding of SARS coronavirus 2 (SARS-CoV-2) to host cells is mediated by its spike (S) surface glycoprotein. As a prerequisite for virus replication the S-protein has to be activated at two different cleavage sites by the host serine proteases furin and TMPRSS2. By using of specific inhibitors, the inventors discovered that the singly inhibition of furin or TMPRSS2 is sufficient for the virus replication, whereas the combined inhibition of both proteases provides an even stronger antiviral effect. The new technology is therefore based on the use of efficient inhibitors of the proteases TMPRSS2 and furin, so that the cleavage of the S-protein does not occur and thus SARS-CoV-2 cannot enter the host cells. This mechanism of action can effectively prevent infections with SARS-CoV-2.

The combination of the TMPRSS2 inhibitor aprotinin with the furin inhibitor MI-1851 is particularly effective.

APPLICATION FIELDS

- Early prevention of infections by SARS-CoV-2
- Post-exposure prophylaxis after contact with Covid-19 patients

AT A GLANCE …

Application fields

- Therapy of Covid-19
- Infectiology
- Post-exposure prophylaxis (PEP)

Business

- Pharmaceutical industry
- Medical compound company
- Specialty Chemicals Company

USP

- New mechanism of action
- Known active compounds

Development status

- Proof of mechanism performed on human Calu-3 epithelial cells by antisense knockdown of TMPRSS2 expression
- Further steps: Proof of principle, animal experiments, clinical studies

Patent status


REFERENCE No.: TM 1094
ADVANTAGES OVER THE PRIOR ART

The new SARS-CoV-2 has made the disease Covid-19 a pandemic with effects on all aspects of human life by spreading rapidly across the world. Despite the immense progress in the treatment of Covid-19 patients in recent months, there is an urgent need for effective, well-tolerated, low side effects and cost-effective treatment options. Inhibitors of the proteases TMPRSS2 and furin meet these requirements and also allow post-exposure therapy. By combining a TMPRSS2 inhibitor with a furin inhibitor, a much stronger effect is achieved with a lower dose and thus lower rate of potential side effects.

STATE OF THE PRODUCT DEVELOPMENT

The synthetic inhibitors of the proteases TMPRSS2 (MI-432, MI-1900) and furin (MI-1851) have been synthesized and are available together with additional analogues of these inhibitor types. Aprotinin, an additional TMPRSS2 inhibitor, is commercially available. A proof of mechanism (PoM) was performed on human Calu-3 epithelial cells with excellent success.

MARKET POTENTIAL

Conservative predictions suggest that despite the launch of vaccines against SARS-CoV-2, Covid-19 will continue to have a huge impact on healthcare, the economy and society worldwide in the coming years. In addition, the TMPRSS2 and furin inhibitors can also be used against other infectious agents. Therefore, the market potential is considered to be very large.

COOPERATION OPPORTUNITIES

On behalf of its shareholder, Philipps-University of Marburg, TransMIT GmbH is looking for cooperation partners or licensees for the production / distribution / further development in Germany, Europe, the US and Asia.
Antisense Circular RNA as Therapeutic Compound for Treatment of Covid-19

Circular RNA, Covid-19, Therapy, Coronavirus, Compound, Post-exposure Prophylaxis, SARS-CoV-2

DESCRIPTION OF TECHNOLOGY

**Feature:** A new artificial circular RNA prevents SARS coronavirus 2 (SARS-CoV-2) from replicating in infected cells.

**Advantage:** The new circular RNA is very stable, it can easily be transfected into cells. It efficiently recognizes its target sequence in the SARS coronavirus 2 genome, thereby inhibiting viral protein biosynthesis and virus proliferation.

**Benefit:** The new circular RNA enables specific binding and inhibition of SARS coronavirus 2 and thus opens up new therapeutic approaches for the treatment of Covid-19. This mechanism of action can effectively prevent and treat infections with SARS-CoV-2.

APPLICATION FIELDS

- Therapy of Covid-19
- Early prevention of infections by SARS-CoV-2
- Post-exposure prophylaxis (PEP) after contact with Covid-19 patients

© Prof. Dr. Albrecht Bindereif, Justus-Liebig-Universität Gießen

AT A GLANCE …

**Application Fields**

- Therapy of Covid-19
- Infectiology
- Post-exposure prophylaxis (PEP)

**Business**

- Pharmaceutical industry
- Medical compound company
- Speciality chemicals company

**USP**

- New mechanism of action
- Designer circRNA for treatment of Covid-19

**Development Status**

- Circular RNAs with specific binding functions to SARS-CoV-2 were produced
- Circular RNAs were functionally validated in cell culture
- Further steps: Scale-up and optimization (RNA modifications, nanoparticle packaging), animal experiments, clinical studies

**Patent Status**

The priority application was filed with the European Patent Office on December 03th, 2020. An international patent application (PCT) is possible.

REFERENCE NO. TM 1110
ADVANTAGES OVER THE PRIOR ART
The new circular RNA is much more stable than the corresponding linear RNA.

Circular RNA is designed to bind specifically to sequence-conserved regions of SARS-CoV-2 genome and subgenomic RNAs.

Circular RNA can easily be synthesized in preparative amounts and introduced into cells.

STATE OF THE PRODUCT DEVELOPMENT
The new circular RNA can be produced by *in vitro* transcription and circularization. Alternative, it can also be expressed in cell lines.

MARKET POTENTIAL
The new SARS-CoV-2 has made the disease Covid-19 a pandemic with effects on all aspects of human life by spreading rapidly across the whole world. Despite the immense progress in the treatment of Covid-19 patients in recent months, there is an urgent need for effective and well-tolerated therapeutic options, alternatively to the current mRNA-based and other vaccination strategies.

Despite the launch of vaccines against SARS-CoV-2, Covid-19 will continue to have a huge impact on healthcare, economy and society worldwide in the coming years. Therefore, the market potential is considered to be very large.

COOPERATION OPPORTUNITIES
On behalf of its shareholder Justus-Liebig-Universität Giessen TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, US, and Asia.
Treatment of ZIP9-associated diseases with tetrapeptides

Osteoporosis, osteopathy, muscle atrophy, myopathy, amyotrophy, infertility

DESCRIPTION OF TECHNOLOGY

Osteoporosis, myodegenerative diseases and male infertility are generally treated - depending on the cause of the illness - e.g. by administering testosterone or testosterone derivatives. This type of treatment also involves the classic nuclear androgen receptor (AR), resulting in a variety of unwanted side effects caused by the hormonal activity (e.g. hirsutism, virilisation, high blood pressure, reduction in sperm count and much more).

These as well as other diseases are based on malfunctions of somatic cells which (also) possess the ZIP9 receptor (osteoblasts, myoblasts, Sertoli cells, etc.), a membrane-bound testosterone receptor of physiological and pathophysiological significance. Agents binding to this receptor can therefore be expected, unlike testosterone or testosterone derivatives, not to cause any of the AR-mediated side effects mentioned above.

In search for active substances corresponding to ZIP-9 at the Justus-Liebig-Universität, tetrapeptides were identified by means of molecular theory-calculations that bind to the ZIP9 receptor, and their effects upon cells bearing this receptor were investigated experimentally. During these investigations, therapeutic effects were found.

AT A GLANCE …

Application Field
- Osteoporosis
- Myodegenerative diseases
- Male infertility

Business
- Pharmacy
- Medical science

USP
- Avoiding the side effects associated with testosterone
- Easy production and high storage stability compared to peptide hormone therapeutics

Development Status
- Efficacy successfully proven on laboratory scale

Patent Status

REFERENCE NO.: TM 1095
APPLICATION FIELDS

Fields of application of the tetrapeptides, e.g. tetrapeptide "isoleucine-alanine-proline-glycine", are the treatment of various diseases in which ZIP9-expressing cells are involved, e.g. osteoporosis and muscle atrophy as well as other diseases.

ADVANTAGES OVER PRIOR ART

Since the designed tetrapeptides only bind to the ZIP9-receptor, and not to the androgen-receptor (AR), they do not exhibit the unwanted androgenic side effects associated with the application of testosterone.

Moreover, they are also easier to produce and more stable in storage than, for example, peptide hormones such as parathormone, another active ingredient used in the treatment of osteoporosis.

STATE OF PRODUCT DEVELOPMENT

Laboratory experiments show cell culture-based evidence of efficacy in various cell lines, e.g. in SAOS-2 osteoblasts (effect against osteoporosis), in L6 myoblasts (effect against muscle degeneration) and in Sertoli cells (effect against infertility).

MARKET POTENTIAL

Already the market volume of therapeutics against osteoporosis and against myopathies is quite considerable. Since further therapeutic effects can be expected, including effects that have not yet been investigated (as a result of the widespread occurrence of the ZIP9-receptor in a broad variety of cell types), generally a high market potential for such active substances can be assumed.

COOPERATION OPPORTUNITIES

On behalf of its shareholder Justus-Liebig-University Giessen TransMIT GmbH is looking for cooperation partners or licensees for distribution or further development in Germany, Europe, US, and Asia.
New therapeutic approach for genetic diseases

Therapy of aspartylglucosaminuria (AGU) and late-infantile neuronal ceroid lipofuscinosis (cLINCL)

DESCRIPTION OF TECHNOLOGY
Herbal substances from the methylxanthine range have been identified that correct the negative effects of the genetic defect and are suitable for therapy of the genetic diseases aspartylglucosaminuria (AGU) and late-infantile neuronal ceroid lipofuscinosis (cLINCL).
AGU and cLINCL are rare inherited diseases that lead to severe developmental disorders and shorter life expectancy. They are caused by mutations in the genes for the enzyme aspartylglucosaminidase (AGA) and tripeptidyl peptidase 1 (TPP1), respectively, and belong to the group of lysosomal storage diseases.
Currently there is no therapy for AGU. The only therapy for cLINCL is based on regular intracerebro-ventricular infusion which is a very cost-intensive therapy.

APPLICATION FIELDS
Application field is the therapy of rare genetic diseases AGU and cLINCL

AT A GLANCE …

Application Fields
- Medicine
- Pharma
- Therapy

Business
- Therapy for AGU and cLINCL

USP
- Herbal substances
- Therapy for orphan disease

Development Status
- Testing in animal model
- Further steps: validation for therapy, clinical trial and approval procedure

Patent Status
Priority application filed on May, 12th, 2021 in EP. PCT-Application and further nationalization procedures are possibly.
ADVANTAGES OVER THE PRIOR ART

Plant substances from the classes of methylxanthines or flavonoids have very few side effects and are therefore well suited for therapy.

They can correct the processing of the mRNA precursors in the case of gene defects, so that a complete mRNA and active enzymes are produced despite the mutation. In this way, the accumulation of the undegraded proteins can be reversed and the diseases AGU and cLINCL can be treated.

STATE OF THE PRODUCT DEVELOPMENT

The application is still at an early stage of development. Clinical trials can be conducted at the Gießen Hospital.

MARKET POTENTIAL

The market potential for research and therapy of rare diseases is rather small. Nevertheless, in 2020, 41% of all newly launched drugs were orphan drugs. Their share of sales in 2020 was 6.4%, measured against the total market. Each of the rare diseases AGU and cLINCL occurs in a maximum of five out of 10,000 people according to the definition of the European Union (EU).

COOPERATION OPPORTUNITIES

TransMIT GmbH is looking for cooperation partners or licensees for clinical studies, for approval, validation for other genetic diseases and further development in Germany, Europe, the USA and Asia on behalf of its shareholder Justus Liebig University Giessen.
Active ingredients for the treatment of lung in Idiopathic Pulmonary Fibrosis (IPF)

Correction of maladaptive ER-response, blockade of epithelial apoptosis primary target molecules

DESCRIPTION OF TECHNOLOGY

Patients with fibrosing pulmonary disease idiopathic pulmonary fibrosis (IPF) show a pronounced maladaptive, i.e. to the programmed cell death leading ER response in the type II cells of the alveolar epithelium. An essential cause of this chronic maladaptive ER-stress response is the perturbed processing of the protein SP-B by minor expression or absence of the two proteases napsin A and cathepsin H in conjunction with an accumulation of unprocessed SP-B precursor protein (proSP-B).

The new therapeutic approach corrects this maladaptive ER-stress response and blocks the epithelial apoptosis. Primary target molecules are napsin A and cathepsin H. The therapeutically active agents bind Napsin A polypeptide or napsin A polynucleotide and / or cathepsin H polypeptide or cathepsin H polynucleotide either directly or influence them indirectly as transcription factors, which bind to the promoter sequence of napsin A and cathepsin H. Examples for this are Thyroid transcription factor 1 TTF1, Runt-related Transcription factor 1 and Homebox protein CD-X-1.

APPLICATION FIELDS

Fibrosing pulmonary diseases associated with the apoptosis of alveolar epithelial cells, such as the sporadic idiopathic pulmonary fibrosis (IPF), family forms of IIP and certain memory diseases such as the Hermansky Pudlak syndrome or the Niemann-Pick diseases are treated

AT A GLANCE …

Application Fields

- The new substances for the treatment of patients with sporadic idiopathic pulmonary fibrosis (IPF) are intended to effect the correct lysosomal processing of the surfactant protein B and / or the blockade of an epithelial maladaptive ER-stress response.

Business

- Pharmacy
- Medicine

USP

- Demand in pharma industry
- First promising results

Development Status

- Partially already available as effective substances and confirmed
- Clinical studies are performed

Patent Status

Priority applications filed on 20.12.2007 in Germany. Status pending.
ADVANTAGES OVER THE PRIOR ART

Idiopathic pulmonary fibrosis (IPF) accounts for about 20-30% of all interstitial pulmonary diseases (ILD) and is associated with a rapidly advancing course and a survival time of on average 3-5 years after diagnosis. It has one of the worst forecasts. The IPF does not respond to therapy with glucocorticoids, even in combination with immunosuppressive drugs, so the only effective therapeutic measure at present is lung transplantation. A progressive change of the alveolar architecture and the exchange of the lung epithelium by fibrotic tissue lead to death after only a few years.

STATE OF PRODUCT DEVELOPMENT

The specific substances are partly already present as active substances and confirmed. Clinical studies are currently performed.

MARKET POTENTIAL

Globally, the lung diseases with regard to mortality, incidence, prevalence and costs are second (behind the cardiovascular diseases); in some countries (e.g. Great Britain), they are already the leading “killer”.

COOPERATION OPPORTUNITIES

On behalf of Justus-Liebig-University Giessen, TransMIT GmbH is looking for cooperation partners or licensees worldwide.

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Biodegradable nano- and meso-polymer particles for protecting the pulmonary surfactant of the lung

Binding of pathogenic proteins, electrostatic interactions, entropy/enthalpy effect

DESCRIPTION OF TECHNOLOGY / PRODUCT
Pathogenic proteins reduce the surfactant protein in the lung and thus cause an increase of the surface tension. As a consequence, tight junctions between lung cells are destroyed. The resulting elevated pressure in the lung leads to severe respiratory problems.

This innovation concerns biocompatible polymeric nano-, meso- and micro-polymer particles which are able to bind pathogenic proteins that penetrate into the lining layer of the lung. Here, biologically degradable polymeric nanoparticles with positive charge intercept pathogenic proteins. These particles are furthermore smaller than or equal to 250 nm, which means that they can be degraded by lung macrophages. The surfactant of the lungs can subsequently regenerate, i.e. the surface tension is reduced and tight junctions are restored.

SCOPE OF APPLICATION
The particles of this innovation can be used for the prevention and treatment of lung diseases which are associated with an increased lung surface tension and a damage of the pulmonary surfactant.

AT A GLANCE ...

TECHNOLOGY FIELD / SCOPE OF APPLICATION
Pathogenic proteins are bound and can therefore be regenerated.

MARKET / BRANCH
- Medicine
- Pulmonology

USP
- Effective protection
- Regeneration of the surfactant

DEVELOPMENT STATUS
✓ Proof of principle could be provided as part of a validation project
➢ Next steps: Development of the medical product until approval with an industry partner

PATENT PORTFOLIO
Priority application filed on 23.01.2013 in EP, pending;

REFERENCE NO.: TM 465
ADVANTAGES COMPARED TO STATE OF THE ART
The interception of pathogenic proteins is based on a size effect (in comparison to the lung surfactant), electrostatic interactions and an entropy/enthalpy effect, which allows for the first time an efficient protection or even regeneration of the lung surfactant.

DEVELOPMENT STATUS
A proof of principle with nano-, meso- or micro-polymer particles of this invention in a surfactant-damage model could be provided as part of a validation project within the scope of a grant provided by the fund for refinement and exploitation of patents of the state universities of Hesse. The next step would be the development of the medical product until approval with an industry partner.

MARKET POTENTIAL
The market potential for this innovation can be deduced from the total number of patients affected by acute lung injuries or severe acute respiratory syndrome. The achievable patient number amounts to 0.5 million cases per year in the EU, North America and Japan. Due to the severity of the disease, the high death rate, and a lack of alternative treatment concepts can be assumed that the new technology will be well established in the market. This results in a potential market volume of up to 1 billion Euros per year.

OFFER
On behalf of its shareholder Justus-Liebig-Universität Giessen, TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, US, and Asia.

REFERENCE NO.: TM 465

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Active agent for regeneration of the lung

Medical agent for prophylaxis and/or treatment of chronic lung diseases

DESCRIPTION OF TECHNOLOGY
Medicamentous regeneration of forms of lung damage as a result of chronic lung diseases such as COPD, pulmonary fibrosis, asthma etc. is possible for the first time thanks to the new active agent.

The novel active agent may remove the necessity of having to undergo a risky lung transplantation and could cure the disease, making it of interest to a broad patient population.

By applying a known substance in a new manner it is possible to treat severe lung damage resulting from chronic lung diseases medicamentously for the first time, thereby potentially preventing the need for a lung transplantation or even the death of the patient. The lung structure can be rebuilt and its function can therefore be restored.

L-NIL is a relatively selective inhibitor of iNOS. It exhibits IC50 values of 0.4-3.3 µM for iNOS as opposed to 8-38 and 17-92 µM for eNOS and nNOS, respectively. L-NIL effectively inhibits iNOS both in vitro and in vivo.

APPLICATION FIELDS
The novel active agent is of interest to pharmaceutical companies which develop and synthesize drugs and perform clinical studies for patients with lung diseases such as chronic obstructive pulmonary disease (COPD), tuberculosis, pulmonary emphysema, lung and bronchial carcinoma, and pulmonary fibrosis.

AT A GLANCE …

Application fields
- Lung diseases
  - COPD, pulmonary fibrosis, asthma

Business
- Pharmaceuticals
- Medicine

USP
- Regeneration of lung structure and restoration of the lung function
- Curative therapy for the first time

Development status
- Invention was tested in vivo with mice
- Mice showed regeneration of the lung, including reconstruction of structure and restoration of function
  - Clinical study in human is in preparation

Patent status

REFERENCE No.: TM 479
ADVANTAGES OVER THE PRIOR ART

To date, severe lung damage as a result of diseases such as COPD can neither be cured, nor can the progression of the disease be completely delayed. The current treatment only tends to slow down the deterioration of the disease and/or decrease discomfort. As such, medicaments such as bronchodilator drugs, inhaled corticosteroids, supply of oxygen, and other medicamentous drugs including antibiotics for bacterial infections of the respiratory tract, mucolytics, and antioxidants are applied.

The new application of the known substance is beneficial for the regeneration of lung structure and restoration of the lung function, thereby ensuring that a curative therapy for lung diseases that cause lung damage is available for the first time.

STATE OF THE PRODUCT DEVELOPMENT

The invention was tested in vivo in experiments with mice. After exposure to smoke, these mice showed regeneration of the lung, including reconstruction of structure and restoration of function, when the novel active agent was applied. The results suggest that the active substance is applicable as an agent for prophylaxis and/or treatment of chronic lung diseases or for regeneration of the lung.

MARKET POTENTIAL

In Germany, it is estimated that more than 15 million people suffer from chronic lung diseases such as bronchial asthma, chronic obstructive pulmonary disease (COPD). Chronic lung diseases are often accompanied by a significant reduction in the quality of life for those affected. They suffer from shortness of breath, coughing, and hospitalisation and accompany patients for decades.

COOPERATION OPPORTUNITIES

On behalf of its shareholder, the Justus Liebig University of Giessen, TransMIT GmbH is looking for cooperation partners or licensees for the production / distribution / further development in Germany, Europe, the USA and Asia.
Steroid-based compounds against Malaria

Highly effective / synergistic to artemisinin / no resistance / no side effects / upscaling possible

DESCRIPTION OF TECHNOLOGY / PRODUCT

A series of novel low molecular weight compounds with high activity against \textit{Plasmodium falciparum} have been developed, synthesized and tested. The compounds are based on a substituted steroidal pharmacophor and are as antiinfective agents in their structure completely new.

The compounds are highly active against red blood cell stages of \textit{P. falciparum}, also of chloroquine-resistant parasites. Present SAR data indicate that the hydrophobic steroid component and a hydroxyarylmethylamino group are essential for the antimalarial action of the compounds. The hydrophobic steroid part is likely to mediate membrane permeability.

SCOPE OF APPLICATION

The novel compounds are eligible for the development of new medicaments for the prophylaxis and treatment of Malaria or infections with the parasite \textit{Plasmodium falciparum}, respectively.

The compounds are also suitable for the development of other antiparasitic therapeutics (e.g. Trypanosomiasis, Chagas-diseases, Amoebiasis, Ancylostomiasis, Babesiosis, Balantidiasis, Blastocystis Infection, Schistosomiasis, Bilharziosis, Coccidiosis, Cryptosporidiosis, Dientamoebiasis, Microsporidiosis, Zoonosen, Giardiasis, Isosporiasis, Leishmaniosis, Naegleria Infection, Sarcocryptosporidiosis, Piroplasmosis, Trichinosis, Toxoplasmosis, Trichomoniasis, Ascariasis, Filariasis, Taeniais, Echinococcosis, Onchozerkose, Capillariasis, Elephantiasis, Enterobiasis, Strongyloidiasis, Trichuriasis and Zystizerkose.

MARKET / BRANCH

Pharma

USP

- Low nanomolar IC50 values in vitro (<2 ng/ml)
- More active than chloroquine or artesunate
- No known resistances
- No steroid-like side effects; very low cytotoxicity, no acute toxicity
- Upscaling possible
- Orally active
- Strongly synergistic to artemisinin

DEVELOPMENT STATUS

- Development of novel compounds based on steroidal pharmacophore
- Synthesis of ca. 60 derivatives plus series of non-steroidal analogs for SAR studies and lead optimization
- Compounds tested in vitro
- Compounds tested in mouse model in vivo
- Next steps: systematic SAR studies, optimization of lead compounds, more detailed toxicology and ADME studies

PATENT PORTFOLIO

Patent granted in US, EP and India
ADVANTAGES COMPARED TO STATE OF THE ART

Beside the high activity against *P. falciparum*, the inhibitors have a strong synergistic action with artemisinin and artesunate and exhibit a very low cytotoxicity and no acute toxicity in the mouse model.

Parasitemia in the mouse model could be reduced by 99.8% with the favorite compound in a dose-dependent manner i.p., all mice were cured.

The compounds are also orally active and reduced parasitemia by 99.78%. Two thirds of the animals were cured. Also a single dose reduced parasitemia by 98.46% and increased life span from 4 to 14 days.

The compounds are fast acting. The favorite compound was more active than chloroquine or artesunate.

DEVELOPMENT STATUS

The compounds were synthesized and their activity against *Plasmodium falciparum* blood stages was demonstrated according to internationally accepted protocols.

In various cell culture experiments no major cytotoxic effects have been observed. The compounds were furthermore tested in vivo in a Malaria mouse model. The novel active substances were well tolerated by the mice, substantially reduced the parasitic load and exhibited a life-prolonging effect.

MARKET POTENTIAL

To date, approximately three billion people in 108 countries are threatened by infections with the Malaria pathogen *Plasmodium falciparum*. Annually, about 240 million people are diagnosed with Malaria of which an estimated number of one million die from this disease, and 90% of the people affected by Malaria come from Africa.

The number of infections also increases in other countries on other continents. According to estimations by the WHO, about 15 millions of people are annually infected by Malaria in India alone, of which about 20.000 die from this infection. This number corresponds to approximately 77% of the Malaria cases in the entire Southeast Asian region.

In 2008, the market for pharmaceuticals for the treatment of Malaria reached 118 million US-dollars alone in the countries of Nigeria, Kenya and Tanzania (Frost & Sullivan, 2008).

OFFER

On behalf of its shareholder Justus-Liebig-Universität Giessen TransMIT GmbH is looking for cooperation partners or licensees for further preclinical and clinical development of the compounds in Germany, Europe, the USA, and Asia.
Asian plant against Ebola virus

Virustatic, silvestrol, RNA viruses, inhibitor

DESCRIPTION OF TECHNOLOGY

The Asian mahogany plant Aglaia contains the natural compound silvestrol. This compound reduces the number of pathogens in infected cells. The production of viral proteins is inhibited and almost stopped by the natural substance.

Experiments show that the Ebola virus depends on an enzyme (Helicase eIF4A) of the host cell to produce its own proteins. Silvestrol is an inhibitor of the helicase eIF4A, which is an integral part of the translation initiation complex.

That is why it is almost impossible for the Ebola virus to mutate its genome to escape from the antiviral effect of silvestrol.

The effective silvestrol concentration has proved to be non-toxic for human cells. Therefore, the use of silvestrol is a promising substance against Ebola infections. This increases the chance to trigger an immune response against the virus.

SCOPE OF APPLICATION

The aim is the usage of the natural compound silvestrol as an agent against Ebola and further RNA viruses. The inhibiting effect of silvestrol is also shown when the agent is used against other viruses which need the enzyme eIF4A for the production of virus proteins. There also exists a broad-spectrum effect against additional viruses, e.g. Corona viruses and Marburgvirus.
ADVANTAGES OVER THE PRIOR ART
Currently no approved antiviral drugs or vaccines are available against numerous viral infections e.g. Ebola. With the new knowledge it is possible to develop a highly specific and efficient therapy against this infectious disease.

STATE OF PRODUCT DEVELOPMENT
There are experimental data from cell cultures which provide evidence concerning the strong antiviral effect by using silvestrol. Viral proteins disappear almost completely. The effective silvestrol concentration has proven to be non-toxic for human cells.

COOPERATION OPPORTUNITIES
On behalf of Philipps-University Marburg and Justus-Liebig University Giessen, TransMIT GmbH is looking for cooperation partners or licensees worldwide.

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Yeast Surface Catalysis (YSC) Platform

Cephalosporin, Antibiotic production, 7-ACA, Single-pot conversion, Immobilisation, Surface Display

DESCRIPTION OF TECHNOLOGY

This technology provides D-Amino Acid Oxidase immobilized via surface display on yeast cells. It can be easily produced and used for the production of the Cephalosporin antibiotics precursor 7-ACA. No undesirable H₂O₂ is produced, and a single-pot conversion is possible saving valuable process time and production costs.

7-aminocephalosporanic acid (7-ACA) is a key precursor in the production of Cephalosporin antibiotics. In the traditional process D-Amino Acid Oxidase (DAAO) deaminates Cephalosporin C (Ceph C) under production of H₂O₂ and α-ketoadipyl-7-ACA (KA-7-ACA). H₂O₂ causes the degradation of KA-7-ACA into glutaryl 7-ACA (GL-7-ACA). GL-7-ACA Acylase (GA) transforms both compounds into 7-ACA. The main drawbacks of this process are that H₂O₂ causes undesirable byproducts and inactivates the enzymes, and a 2-3 step process is necessary.

The D-Amino Acid Oxidase is immobilized on the surface of a yeast cell via surface display (SD). The modified yeast cells can be easily produced in large amounts and with high oxidase activity. Cells can be used for the conversion of Ceph C to 7-ACA. The yeast surface thereby catches the formed H₂O₂ and hydrolyzes it with its natural catalase. No H₂O₂ production can be detected in the process. The enzymes are stably immobilized on the cells and can easily be separated from the reaction mixture.

AT A GLANCE …

USP

▪ Single-pot conversion of cephalosporin C to 7-aminocephalosporanic acid
▪ Instant H₂O₂ degradation by native yeast catalase
▪ Direct expression of enzyme in, and immediate immobilization on the surface during yeast fermentation
▪ Simple purification of SD cells by filtration of fermentation broth
▪ Stabilization of SD enzyme through immobilization
▪ Co-immobilization of Glutaryl 7-ACA Acylase possible

Development Status

▪ Proof of Concept
▪ Developed in cooperation with DirectSens GmbH

Patent Status


REFERENZ NR. TM 1174
ADVANTAGES OVER THE PRIOR ART

▪ Single-pot conversion of cephalosporin C to 7-aminocephalosporanic acid
▪ Instant H₂O₂ degradation by native yeast catalase.
  ➢ No formation of GL-7-ACA
  ➢ No catalase or H₂O₂ addition necessary
  ➢ No enzyme activity loss due to oxidation by H₂O₂
▪ Direct expression of enzyme in, and immediate immobilization on the surface during yeast fermentation.
▪ Simple purification of SD cells by filtration of fermentation broth
▪ Stabilization of SD enzyme through immobilization
▪ Co-immobilization of Glutaryl 7-ACA Acylase possible

STATE OF PRODUCT DEVELOPMENT

▪ Proof of Concept
▪ Developed in cooperation with DirectSens GmbH

COOPERATION OPPORTUNITIES

On behalf of University of Natural Resources and Life Sciences, Vienna (BOKU); TransMIT GmbH is looking for collaboration partners and license Agreements (exclusive/non-exclusive) worldwide.
Method and kit for diagnosis of parasitic/fungal infections and de novo allergen identification via recognition of conformational epitopes (DNA-ICE)

**DESCRIPTION OF TECHNOLOGY**

DNA-ICE is a newly developed method for *in vitro* diagnosis of fungal or parasitic infections, as well as identification of novel allergens via bonding of specific immunoglobulin E (IgE) to conformational epitopes under nearly natural conditions. The nature-like bonding conditions of allergen and IgE recognition are achieved by attaching the IgE as molecular probe to a surface by use of a linker, which provides sufficient distance to the surface to prevent the deformation of the IgE. The surface may be a macroscopic solid phase (if implemented as quick-test kit) or the surface of magnetic beads in case of implementation as automated laboratory test.

Because of the near-natural bonding conditions, the test is especially sensitive for detecting allergens, either known ones or novel yet unknown allergens.

**APPLICATION FIELDS**

- *In vitro* diagnostics e.g. ELISA Kits
- Fungal or parasitic infection diagnosis
- Discovery of yet unknown allergens (via conformational epitopes, especially relevant for respiratory allergens)
- Detection of already known allergens e.g. in food

**AT A GLANCE …**

**Application Fields**

- Allergen Identification
- *In vitro* diagnostics of fungal or parasitic infections
- Tropical infectious diseases
- Human/animal/environmental and other biological samples

**Business**

- *In vitro* diagnostics manufacturers
- Research Institutions (e.g. tropical medicine, disease control & prevention)

**USP**

- Identification of novel allergens as well as diagnosis of infections with already known allergens
- Preservation of 3D folding of conformational epitopes during diagnostic recognition
- Simple process and screening results within a few hours

**Development Status**

- Technology concept formulated (TRL2)

**Patent Status**

Priority application filed on 15.07.2022 at the European Patent Office.
PCT application is possible.
ADVANTAGES OVER THE PRIOR ART
Current technologies are quite expensive, time consuming and work best with known (linear epitope) allergens.

The DNA-ICE method provides the following advantages:
- Universal applicability
- Preservation of conformational epitopes’ 3D folding structure
- Identification of novel allergens and allergies
- Simple and fast (results within a few hours)

STATE OF PRODUCT DEVELOPMENT
The application as a tool for identifying yet unknown allergens has already been shown to work in a model experiment.

The model experiment for proving the application as diagnostic method is currently under way.

Cooperation for developing a certain IVD-test, for example regarding infections with Schistosoma, Taenia, Echinococcus, parasitic nematodes or fungal pathogens etc. are welcome.

MARKET POTENTIAL
The most common chronic diseases in humans are allergic airway diseases like asthma or allergic rhinitis. Between 10-50% of the population, depending on geographic location, are affected by allergic rhinitis. (WHO 2022)

GAFFI estimates that worldwide over 300 million people are afflicted with various forms of fungal infections and around 1.5 billion people are infected with soil-transmitted helminths alone, according to WHO, 2022.

Due to changing climate and weather patterns and globalisation, fungi and plants need to adapt and parasites, together with their vectors, are also more likely to spread to new territories and increase the likelihood of parasitic infections.

COOPERATION OPPORTUNITIES
On behalf of Justus-Liebig-Universität Giessen, TransMIT GmbH is looking for cooperation partners for further development or licensees worldwide.

References:
Global Action For Fungal Infections (GAFFI), 2022
https://gaffi.org/why/fungal-disease-frequency/

World Allergy Organization (WAO), 2022

World Health Organization (WHO), 2022
https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections

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Enhanced detection of hemolytic activity of gram-positive pathogenic microorganisms

Microbial diagnostics in clinical-, veterinary-, food- and environmental-, safety laboratories

DESCRIPTION OF TECHNOLOGY / PRODUCT
Gram-positive bacteria such as Streptococcus pneumoniae, Streptococcus suis, Streptococcus pyogenes, Clostridium perfringens, Listeria monocytogenes, Bacillus cereus, Bacillus anthracis, and Clostridium tetani are significant pathogens of both animals and humans. Reliable detection of hemolytic activity is a cornerstone for diagnosis of the pathogenic properties of these bacteria in samples from human, animal, food, and environmental sources.

An improved diagnostic test that enables reliable detection of pathogenic Gram-positive bacteria by enhancing hemolytic zones on blood agar plates is presented. The enhancing substance is mixed with sterile blood and subsequently added into the agar base to make blood agar plates. Samples from various sources are simply plated on blood agar containing the hemolysin-enhancing additive. Clear and reproducible zones of hemolysis are obtained following incubation, additional testing is avoided, and life-saving and/or safety measures can be implemented appropriately.

Source: TransMIT GmbH

AT A GLANCE ...

TECHNOLOGY FIELD / SCOPE OF APPLICATION
Microbial diagnostics, food analytics, hygiene, quality assurance, surveillance

MARKET / BRANCH
• Clinical/Veterinary microbiology
• Food/Environmental Safety

USP
• Improved diagnosis on blood agar plates by the significant increase of hemolytic activity

DEVELOPMENT STATUS
✓ Testing in routine clinical microbiology laboratory
➢ Next steps: Standardization based on guideline requirements of quality assurance for use in clinical laboratory practice. The microbial performance test has to conform to standards laid down in DIN EN ISO 11133 and the Pharm. Eur. (pharmacopoeia)

PATENT PORTFOLIO
Priority application filed on 11.11.2016 in EP
SCOPE OF APPLICATION
The novel test is relevant for laboratories providing diagnostic services in clinical and veterinary microbiology as well as for laboratories involved in hygiene, food, and environmental safety surveillance.

ADVANTAGES COMPARED TO STATE OF THE ART
Addition of an active substance to the blood agar either before or even after the casting of the finalized plates, enhances detection of hemolytic zones around bacteria, thereby saving on further tests and otherwise extended incubation times using current diagnostic tests.

DEVELOPMENT STATUS
The application has been validated in the clinical routine diagnostic laboratory.

MARKET POTENTIAL
The market for reagents and prototypes of microbial diagnostics is indicated in the European IVD Market Statistics Report of 2014 with a value of 30 billion US$ and an annually growth of 5%.

OFFER
On behalf of its shareholder Justus-Liebig-University Giessen, TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, the US and Asia.

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REFERENCE NO.: TM 914
Simple and reliable detection of colistin-resistant bacteria

Medical diagnostics, resistant bacteria, food hygiene, saving antibiotics

DESCRIPTION OF TECHNOLOGY

Colistin is used in human medicine as an absolute reserve antibiotic. Before using, it should therefore be checked whether colistin resistance is already present. However, conventional methods for colistin resistance determination are complex and are not reliable, particularly in the case of bacteria which carry a plasmid-localized colistin resistance mediated by the gene mcr-1.

With the new nutrient medium colistin-resistant Gram-negative bacteria can be detected clearly and reliably in different biological samples. For the first time, all existing European Commission procedures for the testing of antimicrobial susceptibility (EUCAST) can be used, including agardiffusion-based methods. The technology can also be used in the high throughput process.

AT A GLANCE ...

APPLICATION FIELDS

Hygiene and food analysis as well as clinical diagnostics

BUSINESS

- Microbiological laboratories
- Central laboratories
- Food analysis

USP’s

- Detection of colistin-resistant Gram-negative bacteria with plasmid-localized colistin resistance and chromosomally localized resistance
- Easy-to-use, cost-effective and, above all, reliable process, suitable for routine use

DEVELOPMENT STATUS

- Use in the routine laboratory in the hospital of the University of Giessen
- Further steps: Approval of the European Commission for the Testing of Antimicrobial Susceptibility (EUCAST)

PATENT STATUS

Priority application filed on 01.06.2017 with the European Patent Office.

REFERENZ No.: TM 932
APPLICATION FIELDS
Application fields are in microbiological or clinical diagnostics, in food and hygiene testing. All solid or liquid biological samples can be used.

ADVANTAGES OF THE PRIOR ART
With the new technology, all colistin-resistant Gram-negative bacteria can be detected, including those which have less colistin resistance, e. g. such as in the frequently mcr-1-mediated colistin resistance.

STATE OF THE PRODUCT DEVELOPMENT
Prototypes are available and can be passed on request.

MARKET POTENTIAL
The area of clinical microbiology recorded a turnover of about 750 million US $ in 2016 in Western Europe. At a moderate annual average growth rate of 2.8%, the market research institute Frost & Sullivan predicts a forecast to grow its market volume to US $ 863.8 million by 2021 in this subsegment.

The market segment of food diagnostics and analysis reached a level of US $ 2.6 billion in 2012. For the period from 2012 to 2017, Frost & Sullivan calculated an annual growth of 17.5%.

COORDINATION OPPORTUNITIES
On behalf of its shareholder Justus-Liebig-Universität Giessen, TransMIT GmbH is looking for co-operation partners or licensees for distribution / further development in Germany, Europe, USA and Asia.

A TECHNOLOGY OF

REFERENCE No.: TM 932

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Supply of a specific, direct and fast detection method for Cholesterol dependent Cytolysin (CDC)

Diagnostic of CDC producing pathogens, Food safety

DESCRIPTION OF TECHNOLOGY

Cholesterol dependent Cytolysin (CDC) is secreted by gram-positive bacteria. The CDCs are able to cause serious and life-threatening endogenous and exogenous human and animal infections. *Streptococcus pneumoniae, Streptococcus suis* and *Listeria monocytogenes* are important CDC producing pathogens. Due to the high lethality rate and the significance for humans and animals, it is important to specify and diagnose those pathogens in order to therapy the patients, to identify and eliminate the source of infection and ensure the food safety. The released CDCs are bound to a specific substance and can be detected with conventional methods like ELISA and Western Blot.

APPLICATION FIELDS

Application fields are in microbiological and clinical diagnostics, in food- and environmental analysis. Solid and liquid samples can be used.

© Dr. Helena Pillich, JLU Gießen

AT A GLANCE …

**Application Fields**
- Clinical diagnostics (Human and animal samples)
- Food samples
- Environmental samples
- Immunotherapy

**Business**
- Microbiological laboratories
- Clinical laboratories
- Food analytics

**USP**
- Reliable and rapid method for the detection of CDCs
- No necessity for elaborated and expensive technologies and laboratories
- Fast and cost-efficiently method

**Development Status**
- Detection of bounded CDC in human and animal body fluids and in food and environmental samples
- Development and test in the routine laboratory of the university hospital Giessen
- Further steps: Development of a lateral flow test

**Patent Status**
Priority application filed on Dec. 22, 2017 in EP.

REFERENCE NO. TM 958
ADVANTAGES OVER THE PRIOR ART

The test is carried out by using established methods (ELISA, Western Blot) and is highly specific for CDCs.

There is only a small amount of sample material needed. The toxins can be verified in a short period of time and directly out of the patient’s sample.

STATE OF THE PRODUCT DEVELOPMENT

A reliable, safe and fast detection method for Cholesterol dependent Cytolysin can be provided.

MARKET POTENTIAL

The product idea is in the market segment of medical analytics and food diagnostics. In case of a market ready lateral flow test and for ELISA tests the technology is also interesting for the smaller segment of consumables in immunochemical reagents. The largest market share in the area of IVD is in the US (47%), followed by the European market with 31% share. Until 2021 an increase of the market size up to 20,575 billion US-$ is predicted. This corresponds to an annual growth rate of 5,1%.

COOPERATION OPPORTUNITIES

On behalf of its shareholder Justus-Liebig-Universität Giessen TransMIT GmbH is looking for cooperation partners or licensees for distribution / further development in Germany, Europe, USA and Asia.

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Cyanine dyes for in-vivo staining of microorganisms

host-pathogen interactions, DNA-staining, monitoring of therapeutic success

DESCRIPTION OF TECHNOLOGY

Current approaches of host-pathogen interaction solely rely on genetic manipulation by use of GFP-expression. This is very strenuous and several important organisms have remained difficult to modify for GFP expression. This is particularly true for the growing number of multi-drug resistant bacteria, posing an emerging threat to patients worldwide.

The innovation presented herein provides cyanine dyes which can be used for in vivo-staining of microorganisms without reduction of the viability of the stained microbes. In doing so the dyes allow quite convenient investigation of the natural interaction of pathogens with their host cells.

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<th>AT A GLANCE …</th>
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<tbody>
<tr>
<td><strong>Application Fields</strong></td>
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<tr>
<td>- Medical studies of pathogen-host-interaction</td>
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<td>- Diagnostic kits</td>
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<tr>
<td><strong>Business</strong></td>
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<tr>
<td>- Medical diagnostics</td>
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<td>- Monitoring of therapeutic success</td>
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<tr>
<td><strong>USP</strong></td>
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<tr>
<td>- In vivo staining without loss of viability</td>
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<td>- No need for genetic manipulation</td>
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<tr>
<td><strong>Development Status</strong></td>
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<tr>
<td>- Already tested with:</td>
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<tr>
<td>- <em>Escherischia Coli</em></td>
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<tr>
<td>- <em>Klebsiella pneumoniae</em></td>
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<td><strong>Patent Status</strong></td>
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<td>Priority application filed on 24.05.2018 at the European Patent Office.</td>
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REFERENCE NO. TM 1011
APPLICATION FIELDS

The cyanine dyes can be applied for performing infection studies by use of stained living pathogens instead of genetically manipulated organisms, thus providing a much more realistic insight into host-pathogen interactions.

By using the dyes for staining pathogens within medical samples and observing their interaction with host cells the success of a certain therapy can be observed and – if need be – the therapy can be more precisely adjusted to the current situation.

ADVANTAGES OVER THE PRIOR ART

By use of the new cyanine dyes it is no longer necessary to genetically manipulate the pathogens which are to be investigated (microscopically observed).

The viability of the pathogens to be investigated is not negatively influenced, so that pathogen-host-interactions can be studied under real life conditions.

STATE OF THE PRODUCT DEVELOPMENT

The method has already been successfully applied on laboratory scale with *Escherichia coli* and antibiotic-resistant and -sensitive *Klebsiella pneumoniae* strains.

MARKET POTENTIAL


COOPERATION OPPORTUNITIES

On behalf of its shareholder Philipps-Universität Marburg TransMIT GmbH is looking for licensees or cooperation partners for further development in Europe.
Verfahren zur Bestimmung der lastunabhängigen Kontraktilität einer Herzkammer

Lastunabhängige Kontraktilität, kardiale Erkrankungen, medizinische Diagnostik, Herzultraschalluntersuchung, Echokardiografie

BESCHREIBUNG DER TECHNOLOGIE


ANWENDUNGSFELDER
Das Verfahren kann für die Untersuchung kardialer Erkrankungen insbesondere in Zusammenhang mit einer pulmonalen Hypertonie verwendet werden.

AUF EINEN BLICK …

Anwendungsfelder
- Medizinische Diagnostik
- Kardiale Erkrankungen
- Echokardiografie
- Herzultraschalluntersuchung

Branche
- Medizintechnik
- Messtechnik
- medizinische Software
- Herzultraschallgeräte

Alleinstellungsmerkmale
- noninvasiv
- Keine neuen technischen Messgeräte notwendig
- kostengünstig

Entwicklungsstand
- erste klinische Studie durchgeführt und publiziert
- Ergebnisse dabei positiv

Patentstatus
Prioritätsanmeldung, eingereicht am 13.08.2020 am europäischen Patentamt

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REFERENCE NR. TM 1093
VORTEILE GEGENÜBER DEM STAND DER TECHNIK


STAND DER PRODUKTENTWICKLUNG


KOOPERATIONSMÖGLICHKEITEN

Im Auftrag ihres Gesellschafters, der Justus-Liebig-Universität Gießen, sucht die TransMIT GmbH Kooperationspartner oder Lizenznehmer für den Vertrieb und die Weiterentwicklung in Deutschland, Europa, den USA und in Asien.
Elektronisches Diagnosesystem für die Karies am menschlichen Zahn

Diagnostik von Karies; Dentaltechnik, Zahnärztliche Messgeräte

BESCHREIBUNG DER TECHNOLOGIE
Es wurde ein verbessertes Verfahren der Kariesdiagnostik mittels elektrischer Widerstandsmessung entwickelt. Die Reproduzierbarkeit der neuen Methode übertrifft die herkömmlichen elektrischen Messmethoden signifikant und ist den konventionellen Kariesdiagnostikmethoden überlegen.

Bilder: Matthias Willamowski, Zahnklinik Marburg

Die Diagnostik der Karies am Zahn ist für den Zahnarzt schwierig, da bei kleinen Läsionen Verfärbungen des Zahnschmelzes visuell nicht von kariösen Löchern im Dentin unterschieden werden können. Es besteht die Gefahr der Überbehandlung, wenn eine nur verfärbte Stelle aufgebohrt und gefüllt wird, ebenso die Gefahr, dass eine Läsion, die bis in das Dentin reicht, nicht erkannt wird und unbehandelt bleibt. Diese genannten Problematiken werden mit dem Einsatz der Erfindung, die auf elektrischen Widerstandsmesstechnik beruht umgangen.

ANWENDUNGSFELDER
Die Technologie eignet sich für die Anwendung in zahnärztlichen Praxen oder Kliniken zur nicht invasiven Diagnostik von Karies, prinzipiell auch an den Approximalflächen. Des Weiteren kann die Diagnostik einer Karies in Fissuren und kleinen Gruben der Zahnoberfläche verbessert werden, um auch Frühstadien einer Karies sicher zu erkennen.

AUフ EINEN BLICK …

Anwendungsfelder
- Zahnarztpraxen
- Zahnärztliche Kliniken

Branche
- Dentaltechnik
- Gerätehersteller für Medizintechnik
- Zahnärztliche Messgeräte

Alleinstellungsmerkmale
- Falsch positive Kariesdiagnostik weitgehend ausgeschlossen
- Reproduzierbare Ergebnisse der Messungen
- Einfluss von Speichel bei Messungen eliminiert

Entwicklungsstand
- Prototyp für in-vivo-Messungen vorhanden und in der Zahnklinik Marburg im Einsatz
- Fortlaufende Zuverlässigkeitsprüfung des Systems mit exzellenten Ergebnissen
- Weitere Schritte: Entwicklung eines serientauglichen Produkts mit anschließender Medizinprodukte-Zertifizierung

Patentstatus
Prioritätsanmeldung, eingereicht am 10.11.2017 beim Deutschen Patent- und Markenamt

REFERENZ NR. TM 957
VORTEILE GEGENÜBER DEM STAND DER TECHNIK

- Verbesserte Sicherheit bei der Diagnose.
- Keine Gefahr von Fehldiagnosen wie bei visueller Diagnostik, da physiologische Verfärbungen der Zähne nicht als Karies fehlerkannt werden können.
- Keine Strahlenbelastung, da Röntgenuntersuchungen zur Kariesdiagnostik überflüssig werden.
- Es erfolgen kaum falsch positive Ergebnisse der Kariesdiagnostik in Vergleich zu bisherigen elektrischen Methoden.

STAND DER PRODUKTENTWICKLUNG

Ein Prototyp wird in der Zahnklinik in Marburg für in-vivo-Messungen eingesetzt und für fortlauenden Zuverlässigkeitsprüfungen verwendet, deren Ergebnisse sehr positiv zu bewerten sind.

MARKTPOTENTIAL


Der Dentalmarkt unterliegt einem kontinuierlichen Innovationsprozess. Damit kann davon ausgegangen werden, dass insgesamt ein großes Interesse der Marktteilnehmer an marktreifen Innovationen besteht.

KOOPERATIONSMÖGLICHKEITEN

Im Auftrag ihres Gesellschafters Philips-Universität Marburg sucht die TransMIT GmbH Kooperationspartner oder Lizenznehmer für den Vertrieb und die Weiterentwicklung in Deutschland, Europa, den USA und in Asien.
Cement applicator for embedding endoprostheses

Endoprosthetics, orthopaedic surgery

DESCRIPTION OF TECHNOLOGY AND PRODUCT

When implanting prostheses in bone, e.g. to replace joints destroyed by arthrosis, bone cement is often used to consolidate the implant on the bone. The newly developed cement applicator is used to apply this bone cement during implantation. For this purpose, the innovative cement applicator is designed in such a way that the applied bone cement can directly reach the joint space between bone and implant from the mixing system above the applicator and distribute itself particularly evenly there.

This provides a particularly even layer of bone cement on a bone, ensuring a reliable connection between the bone and the implanted prosthesis.

SCOPE OF APPLICATION

The new cement applicator is basically suitable for various types of implantations in which prostheses are fixed in bone using bone cement. Examples include operations to replace a hip joint, a knee joint or a shoulder joint.
ADVANTAGES COMPARED TO STATE OF THE ART

The innovative cement applicator makes it possible to distribute bone cement for embedding an endoprosthesis in a controlled, even and smooth manner on the bone. This optimises the fit of the endoprosthesis and increases its long-term stability. The cement applicator can be easily and reliably manufactured from a printable plastic that can be sterilised and sterilisedly packaged at the factory, e.g. polyetheretherketone (PEEK). The application is similar to the procedure for conventional cement applicators.

DEVELOPMENT STATUS

The development of a prototype for carrying out mechanical tests is performed. Currently, it is planned to carry out a feasibility study with artificial bone models using a 3D print model.

After positive completion of the preliminary study, a comparative study with the new system and established methods is planned.

MARKET POTENTIAL

In 2016, 122,961 initial implantations were performed in Germany (EPRD Annual Report 2016, p. 18 Tab. 5) on the hip alone. Due to demographic change, an increase in this and other types of endoprosthesis implantations is to be expected. Thus, there is a great need for cement applicators to fix the endoprostheses.

OFFER

On behalf of its shareholder Justus-Liebig-University Giessen, TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, the US and Asia.

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Short Shaft Prosthesis

Description of Technology

Hip short shafts are designed to introduce force into the femur as proximal as possible. Conventional shafts can ensure that the femur is stiffened due to their rigidity.

In order to improve the anchoring behaviour and the elastic deformation behaviour of short hip shafts, the newly developed prosthesis has a distally tapering shape and a double T-beam cross-section in the upper shaft course. The prosthesis no longer causes deformation of the femur, but follows the physiological curvature of the femur with a so-called counterswing. This leads to a more physiological load and to a reduction in bone loss in the area of the prosthesis.

Advantages of the New Prosthesis

The newly developed hip short shaft prosthesis represents an innovative shaft design. Due to its shape, the new prosthesis deforms elastically and therefore counteracts the bone remodeling processes that occur due to the altered stress mechanism of the prosthesis. In addition, the innovative shaft design ensures optimized preservation of the cancellous bone structure and thus immediate torsional stability.

At a Glance …

Application Fields
- orthopedic surgery
- endoprosthetics

Business
- medical technology

USP
- higher elasticity
- easier to adapt to individual anatomy of the patient

Development Status
- FEM analytical investigations according to ISO-7206-4 already carried out
- enhanced prototype in planning stage

Patent Status
Priority application, filed 25.03.2019 at the European Patent Office.

Reference No. TM 1036
ADVANTAGES OVER THE PRIOR ART

The new short shaft prosthesis is easier to adapt intraoperatively to the individual anatomy of the patient due to different flank inclinations of the medial and lateral flanks. The mobility of the hip does not differ from conventional prosthesis systems. The prosthesis is similar in length to conventional prostheses, but the shaft design described above allows better and faster osteointegration (ingrowth into the bone) of the prosthesis by approximating the deformation behavior of the prosthesis to the physiological femoral curvature.

STATE OF THE PRODUCT DEVELOPMENT

FEM-analytical investigations according to ISO-7206-4 were carried out. The development of an enhanced prototype for the execution of mechanical tests is in planning stage.

MARKET POTENTIAL

In 2016, 122,961 initial hip implantations were performed in Germany alone (EPRD Annual Report 2016, p. 18 Table 5). Demographic change is expected to lead to an increase in this figure. Thus, there is a great need for short shaft prostheses in Germany and other European countries.

COOPERATION OPPORTUNITIES

On behalf of its shareholder Justus-Liebig-University Giessen TransMIT GmbH is looking for cooperation partners or licensees for distribution or further development in Germany, Europe, US, and Asia.

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Integrated fibre optic microelectrode

neurosurgery, medical engineering

DESCRIPTION OF TECHNOLOGY AND PRODUCT

Fibre microelectrodes in general have been in use for several years and are used, for example, to measure neuronal interaction in the brain. They allow targeted and rapid control of precisely defined events in complex biological systems. Common fibre micro-electrodes consist of electrical conductors (wires) embedded in an insulator. Optical stimulation of neurons, which enables highly selective activation, opens up many new applications. However, common fibre microelectrodes are not suitable as light conduction.

This new optical integrated fibre-optic microelectrode combines the advantages of a fibre microelectrode with those of an optical fibre to enable parallel optical and electrical signal conduction. Optical and electrical signals are conducted simultaneously, reliably and with low cushioning.

SCOPE OF APPLICATION

This innovation enables the optical stimulation of neurons. This opens up possible applications especially in the field of biomedical engineering and neurotechnology, e.g. high-resolution implants to restore vision or hearing.

AT A GLANCE …

Application Field
- implants to restore vision or hearing

Branche
- medical engineering
- neurosurgery

USP
- optical and electrical signals are conducted simultaneously, reliably and with low cushioning

Development status
- prototype

Patent Portfolio
European Patent EP3216492C1 is granted.

Reference No.: TM906
ADVANTAGES COMPARED TO STATE OF THE ART

With this novel integrated fibre-optic microelectrode, light can be brought to a neuron and its (electrical) response simultaneously registered. The combination of both "worlds" by means of a novel integrated fibre-optic microelectrode (IFLM) is realised here for the first time and in an optimal way.

DEVELOPMENT STATUS

The development of a prototype for carrying out tests is performed. Currently, it is planned to carry out further feasibility studies.

MARKET

The hearing instrument manufacturers united in the European Hearing Instrument Manufacturers Association (EHIMA) sold about 14.12 million hearing instruments worldwide last year. The demand for modern technical hearing solutions is unbroken. Regular surveys show that there are still people living with untreated hearing loss, thus foregoing quality of life and accepting additional health risks.

OFFER

On behalf of University of Applied Sciences Giessen (THM), TransMIT GmbH is looking for cooperation partners or licensees for further development in Germany, Europe, the US and Asia.

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