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מסחור טכנולוגיות של מכון ויצמן למדע
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YEDA 유망 기술이전 리스트 (BIO분과)

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한국·이스라엘 산업연구개발재단
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2016년 2월 12일 기준 ※ YEDA UPDATE현황에 따라기술리스트는 계속 수정됨을 알려드립니다.

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NO.	Field	Technology Number
1	Biotechnology, Pharma and Diagnostics	1270
Principal Investigator:	**Department**	**Patent Status**
Prof. Zelig Eshhar	Immunology	N/A
Title	**Mouse IgE and Anti-Mouse IgE Monoclonal Antibodies**	
Link	http://www.yedarnd.com/technologies/mouse-ige-and-anti-mouse-ige-monoclonal-antibodies	

Summary

Rat monoclonal anti-IgE antibodies that was generated by fusion of plasmacytoma (84.1C) or myeloma (EM953) cells with splenocytes of rat immunized with purified murine IgE mAb. The antibodies react with various IgE mAb of different specificities and not with immunoglobulins of other classes, and recognize an epitope on the murine Fc epsilon region.

Were shown to block IgE-FcR interactions and inhibit passive cutaneous anaphylaxis.

Clone 84.1c recognizes a site on IgE, which is identical or very close to the FcR binding site. May be used for detection and manipulation of the IgE response in mice.

Applications

N/A

Advantages

N/A

Technology's Essence

N/A

NO.	Field	Technology Number
2	Biotechnology, Pharma and Diagnostics Chemistry and Nanotechnology	1267

Principal Investigator:	Department	Patent Status
Prof. Lia Addadi	Structural Biology	N/A

Title	**Cholesterol Antibodies**
Link	http://www.yedarnd.com/technologies/cholesterol-antibodies

Summary

Monoclonal antibodies specific for cholesterol/ceramide-rich domains (clones 405F, 14F, 499F) and cholesterol micro-domains (clones 36A1, 5881) in cell membranes.
Originally raised against an artificial monolayer of lipid mixtures in, and were shown to specifically label the above domains in different cell membranes.

Applications

N/A

Advantages

N/A

Technology's Essence

N/A

NO.	Field	Technology Number
3	Biotechnology, Pharma and Diagnostics	1750
Principal Investigator:	**Department**	**Patent Status**
Prof. Dan S.Tawfik	Biological Chemistry	Pending
Title	**rPTE with Potent Organophosphate (OPH) activities**	
Link	http://www.yedarnd.com/technologies/rpte-potent-organophosphate-oph-activities	

Summary

Organophosphates are toxic compounds found in chemical warfare agents, such as nerve gases, and insect pesticides.

Use of volatile nerve gas agents by terrorist organizations is a key concern of governments around the world. V-type nerve agents (e.g. VX, RVX, and CVX) are particularly toxic nerve gases, with an exceptionally high potency. Although not as lethal as nerve agents, organophosphate insecticides can be harmful in large or prolonged doses. The standard therapy has limited efficacy, carry risks of serious adverse effects and have relatively short shelf life in field conditions.

Applications

Prophylactic or post exposure treatment for nerve gases attack, in particular V-type agents

Treatment for pesticides poisoning

Advantages

High catalytic activity allow high efficacy at low doses

Reduced effective doses allows to reduce adverse effects

High stability increasing shelf life

Compatible with both prophylaxis and post exposure

Compatible for both surface decontamination and administration to patients

Technology's Essence

Researchers at Prof. Tawfik lab use directed evolution to drive protein mutagenesis towards desired traits. Appling this approach, using the actual threat agents, the present inventors generated recombinant phosphotriesterase (PTE) variants with improved catalytic efficiencies towards V-type nerve agent hydrolysis. Serving as catalytic bioscavengers, these recombinant PTE variants hydrolyze organophosphates without being consumed and thus can be applied at low doses (catalytic efficiency (kcat/KM) greater than 3.106 M-1min-1).

Importantly, PTE is efficient both as a prophylactic agent that may be given several hours prior to exposure as a preventive measure, and as post exposure antidote, even days after in a single or multiple-doses.

NO.	Field	Technology Number
4	Biotechnology, Pharma and Diagnostics	1664
Principal Investigator:	**Department**	**Patent Status**
Prof.Michal Schwartz-Eisenbach	Neurobiology	Pending
Title	**Immunomodulation therapy for neurodegenerative disorders**	
Link	http://yedarnd.com/technologies/immunomodulation-therapy-neurodegenerative-disorders	

Summary

Neuroinflammation is well established as a key secondary injury mechanism following CNS trauma, such as traumatic brain/spinal injury or ischemic stroke, and it has been long considered to contribute to the damage sustained and fatal outcomes following brain injury. Early inflammatory events enhance brain damage, yet they provide the framework for later inflammatory events that enhance tissue remodeling and are crucial for tissue recovery. A major unmet need in the field is a targeted treatment that would down regulate the damaging events of inflammation, while maintaining reparative functions.

Applications

Anti-inflammatory treatment following CNS injury

Advantages

Targeted therapy avoids general immuno-suppressive side effects
Based on a well understood molecular mechanism
May allow relatively large therapeutic window according to proof-of-concept preliminary experiments

Technology's Essence

Resident microglia are the major specialized innate immune cells of the central nervous system (CNS). During the process of wound healing or pathogen removal, there is an induction of the microglia active pro-inflammatiry phenotype (M1), leading to a transient inflammatory response, which is resolved via local conversion to the M2 anti-inflammatory phenotype. Following acute injury, microglia fail to acquire an inflammation-resolving phenotype (M2-like phenotype) in a timely manner, often resulting in self-perpetuating local inflammation and tissue destruction beyond the primary insult. Prof. Schwartz and her team uncovered the mechanisms that lead to injury-based inhibition of the M1 to M2 phenotype switch. They showed that the capacity to undergo pro- to anti-inflammatory (M1-to-M2) phenotype switch is controlled by the transcription factor Interferon regulatory factor-7 (IRF7).
Importantly, the anti-inflammatory activity of IFN was demonstrated in-vivo, when administrated 24h following the primary insult, proposing a relatively large therapeutic window.

NO.	Field	Technology Number
5	Biotechnology, Pharma and Diagnostics	1704
Principal Investigator:	**Department**	**Patent Status**
Prof. Anthony H. Futerman	Biological Chemistry	N/A
Title	**Biomarker for therapeutic evaluation in type 2 and 3 Gaucher disease**	
Link	http://yedarnd.com/technologies/biomarker-therapeutic-evaluation-type-2-and-3-gaucher-disease	

Summary

Neuropathic Gauchers (nGD), is a rare but very severe manifestation of the disease, with a varying degree of involvement of the central nervous system, in addition to systemic symptoms. As of today, there is no cure for these severe conditions. The search for such cure is tremendously hindered by the unmet need for a reliable biochemical biomarker for nGD. The present invention identifies the glycoprotein non-metastatic B (GPNMB) as a potential powerful nGD biomarker for use in early diagnosis, determination of disease severity, as well as a straight forward readout in clinical and preclinical experiments.

Applications

Diagnosis and drug development for neuropathic GD

Advantages

Straight forward diagnostic tool based on standard biochemical assays
Relatively simple clinical procedure samples are collected from CSF and not brain
High sensitivity for the diagnosis of disease severity
Compatible with preclinical experiments

Technology's Essence

Prof. Futerman and his team preformed a quantitative global proteomic analysis (using LC-MS/MS) of cerebrospinal fluid (CSF) samples from four patients with Type 3 GD, to identify mis-regulated proteins, compared with healthy subject. Glycoprotein non-metastatic B (GPNMB), a protein that was previously associated with several lysosomal storage disorders, exhibited very high levels (a 42-fold increase) in the CSF of type 3 GD patients. Two peptides were identified from GPNMB, both located in the non-cytosolic domain, suggesting that GPNMB is cleaved and secreted into the CSF from the brain. LC-MS/MS results were validated by ELISA and by western blot analysis in CSF and in human brain samples. Several proof of principle experiments were conducted in order to prove the validity of using GPNMB as a biomarker for monitoring disease state and treatments efficacy in neuropathic GD in patients and mouse models: GPNMB levels were shown to be correlated with the severity of type 3 Gaucher□s disease patients, as measured by lower IQ score and lower score in Purdue Pegboard test, assessing eye-hand coordination. In addition, using conduritol b epoxide (CBE)-injection based mouse model that simulate different severities and recovery periods, it was shown that GPNMB levels rapidly rise or decline to reliably reflect progress/remission states of the diseases.

NO.	Field	Technology Number
6	Biotechnology, Pharma and Diagnostics	1712
Principal Investigator:	**Department**	**Patent Status**
Prof. Yechiel Shai	Biological Chemistry	Pending
Title	**Peptides as potential treatment for inflammatory or viral infections**	
Link	http://yedarnd.com/technologies/peptides-potential-treatment-inflammatory-or-viral-infections	
Summary		
N/A		
Applications		
N/A		
Advantages		
N/A		
Technology's Essence		
N/A		

NO.	Field		Technology Number
7	Biotechnology, Pharma and Diagnostics		1686
Principal Investigator:		**Department**	**Patent Status**
Prof.Menachem Rubinstein		Molecular Genetics	Pending
Title	**Attenuation of chemotheraphy side effects in hematopoietic cancer**		
Link	http://yedarnd.com/technologies/attenuation-chemotheraphy-side-effects-hematopoietic-cancer		

Summary

N/A

Applications

Co-treatment with chemotherapy

Co-treatment with statin treatment

Advantages

Lower collateral toxicities allow for greater flexibility in treatment dosage.

Enhanced patient survival rate.

More favorably considered as a line of therapy due to decreased side effects.

Utilization of well-characterized compounds alleviates safety and toxicity considerations.

Technology's Essence

ER stress, elicited by chemotherapeutic agents such as doxorubicin, 5FU, vincristine and bortezomib, or statins such simvastatin, triggers cell death at least in part through generation of leukotriene C4 (LTC4), which induces ROS accumulation, DNA damage and subsequent cell death. LTC4 can be produced by two parallel pathways. Cells of hematopoietic origin express C4 synthase (LTC4S) and secrete their LTC4 load, thereby affecting nearby tissues. In contrast, as discloses by the present invention, non-hematopoietic cells generate LTC4 by the enzyme MGST2 (an isoenzyme of LTC4S), and retain it to act internally leading to their demise. This difference is the basis for the present invention. Thus, LTC4 receptor antagonists (montelukast, pranlukast, etc.) will alleviate the toxicity of chemotherapy towards non-hematopoietic tissues and cells, but retaining the therapeutic effectiveness of chemotherapy on lymphocytic leukemia, lymphoma and myeloma patients. In conjuction, it was found that pranlukast attenuated cell death triggered by a broad range (0.5-4 μg/ml) of simvastatin (a statin) concentrations.

NO.	Field	Technology Number
8	Biotechnology, Pharma and Diagnostics	1710
Principal Investigator:	**Department**	**Patent Status**
Prof. Yechiel Shai	Biological Chemistry	Pending
Title	**Peptides as anti inflammatory and anti alergy treatment**	
Link	http://yedarnd.com/technologies/peptides-anti-inflammatory-and-anti-alergy-treatment	

Summary

Dysregulation of the immune system is the underlying cause of potentially fatal conditions such as sepsis and severe allergic reactions. Adequate therapies are currently absent or lacking. There is therefore an unmet medical need for therapies that would target the underlying causative immune pathways. Anti-microbial peptides (AMPs) possess promising anti-inflammatory activities, however, are commonly toxic.

In a series of newly synthesized peptides, the outlined invention provides a method to modify naturally occurring AMPs to possess both potent therapeutic anti-inflammatory activity and minimal toxicity in-vitro and in-vivo. The resulting series of peptides were shown to remarkably inhibit severe allergic reaction as well.

Applications

Novel Therapy for sepsis and severe allergic reactions

Advantages

Very potent anti-inflammatory and anti-allergenic agents Non-toxic Targeted against the underlying cause of both indications, which is an improper and uncontrolled immune response Diversity elucidating the parameters that control efficiency and toxicity allows to modify the basic formula to optimally fit different systems

Technology's Essence

With natural AMPs properties in mind, Prof. Shai and his team characterized the key modifications that underline anti-inflammatory activity and toxicity. A series of peptides with variable degrees of hydrophobicity, length, charge, position of charge and amino acid chirality were tested for their LPS neutralizing activity.

It was found that ~20mer peptides under the formula Kn(AL)mKn (wherein n et each occurrence is independently 0-2, and m is 6-9) demonstrate anti-inflammatory activities at nanomolar concentrations as evident by inhibition of TNF? secretion from macrophages, following LPS induction. Furthermore, a single dose of an exemplary peptide was able to inhibit septic shock in mice induced by purified LPS or by whole heat-killed E.coli.

In contrast to previous attempts, which focused on increasing hydrophobicity, the core of the present invention is the designation of an optimal hydrophobicity that is necessary for high activity and low toxicity. Additional important features for LPS neutralizing were found to be ?-helical structure and strong oligomerization ability.

NO.	Field	Technology Number
9	Biotechnology, Pharma and Diagnostics	1640
Principal Investigator:	**Department**	**Patent Status**
Prof. Irit Sagi	Biological Regulation	Granted
Title	**Biological treatment for pancreatic cancer**	
Link	http://yedarnd.com/technologies/biological-treatment-pancreatic-cancer	

Summary

Although early programs targeting MMPs (matrix metalloproteins) were largely unsuccessful due to adverse side effects, they remain a viable and highly desirable therapeutic target. The main obstacle in the attempts to target MMPs is the ability to selectively target individual family members. The present invention provides highly selective targeted therapy against MMP-7, which is strongly associated with aspects of cancer development such as angiogenesis and metastasis. The innovative concept leading to this high selectivity is immunization with both a synthetic metal-protein mimicry molecule, previously developed by the present inventors, followed by the metalloenzyme itself (e.g. MMP-7). The resulting antibody exhibits exceptional degree of specificity towards MMP-7 over other MMPs. The present technology offers an opportunity to re-introduce improved MMP-targeting agents to the cancer therapeutics market, in particular aggressive cancers that face a major unmet medical need.

Applications

Therapy for MMP-7 associated diseases
Diagnostic tool for MMP-7 associated diseases

Advantages

Highly selective
Safe avoids adverse effects that are associated with broad spectrum MMP inhibitors.
Efficient targeting a physiological active conformation of the enzyme

Technology's Essence

The present technology is based on a previous invention that was developed in Prof. Sagi's lab, of synthetic metal-protein mimicry molecules that mimic the conserved structure of the metalloenzyme catalytic zinc-histidine complex within the active site of each MMP enzyme.
These molecules were shown to be powerful immunogens in the generation of highly selective MMP antibodies since they recognize both electrical and structural determinants residing within the enzyme active site. The potential of this method to successfully generate MMP-targeting therapeutics was shown for MMP-9/2 inhibitory antibodies in mouse models of inflammatory bowel disease. Prof Sagi and her team now take this invention a step further to achieve even higher specificity. They show that immunizing with the mimicking molecules described above, followed by immunization with the metalloenzyme itself increases selectivity further. Implemented for MMP-7-targeting, this approach yielded an antibody with a 5 fold lower Ki towards MMP-7 than towards other MMPs (e.g. MMp-2 and MMP-9).

NO.	Field	Technology Number
10	Biotechnology, Pharma and Diagnostics	1593
Principal Investigator:	**Department**	**Patent Status**
Prof. Alon Chen	Neurobiology	N/A
Title	**A system monitoring social interactions in rodents**	
Link	http://yedarnd.com/technologies/system-monitoring-social-interactions-rodents	

Summary

The study of social behavior in groups of mice may have crucial implications for understanding the social aspects of different disorders. To be executed correctly, group studies require the ability to track individual□s behavior within the group structure. The main challenge of current research tools is to allow individuals identification while maintaining sufficient resolution for accurate tracking. The present technology provides a system that utilizes fluorescent fur dyes to differentially mark and track individuals within a group. Using a sensitive color camera and a newly designed tracking algorithm, behavior of groups may be recorded and analyzed with high temporal and spatial resolution. The technology further offers a method for characterizing the group's interactions using the maximum entropy model.

Applications

N/A

Advantages

High spatial and temporal resolution enabled by sensitive color video tracking.
Enables high detailed analysis of individual behavior within the group.
Suitable for community study of groups - limited only by available fur dyes.
Compatible with long-term analysis.
Simple, cost effective.
Minimal suffering and improved animal welfare.

Technology's Essence

The present technology takes advantage of the fact that mice are nocturnal (active at night) animals, to mark their fur with different fluorescent dyes. Under ultraviolet light, the mice can be accurately and automatically tracked, over a number of days. As the mice are allowed to move freely in an interesting arena for exploration containing ramps, nest boxes and barriers (Figure 1), their trajectory and behavior are recorded using a sensitive color camera. The system further includes an image processing module which analyses the recorded images, calculates a spatiotemporal model and the nature of social interactions between individuals. Combining detailed behavioral and genetic analysis ate the level of individuals, in association with group analysis, may enable the identification of genetic and neuronal correlates of complex social interactions.

NO.	Field	Technology Number
11	Biotechnology, Pharma and Diagnostics	1733
Principal Investigator:	**Department**	**Patent Status**
Prof. Rony Seger	Biological Regulation	Pending
Title	**P38 inhibitor as treatment for inflammation**	
Link	http://yedarnd.com/technologies/p38-inhibitor-treatment-inflammation	

Summary

The spatial distribution of proteins inside the cell is under tight regulation. This regulation is necessary to ensure proper functioning of the cell, and is of particular importance when extracellular stimulation is applied. Upon stimulation, many signaling proteins rapidly and dynamically change their location. Today, there is a widely recognized need to identify novel sequences which regulates nuclear translocation.

Recently, Prof. Zeger and his team discovered a new level of regulation to stimulated transcription. They showed that ?-like importunes are central mediators of nuclear translocation of signaling proteins. Furthermore they identified the site of interaction and designed accordingly a peptide which was found to prevent nuclear translocation.

This technology presents peptides with the potential of treating inflammatory and immune disease by regulating (prevent or promote) the translocation of proteins into the nucleus.

Applications

Inflammation

Immune diseases

Advantages

Effective

Safe

Technology's Essence

The researchers found that -like importins play a key role in JNK and p38 translocation. They also found that the translocation of these MAPKs is mediated by the formation of either Imp3/Imp7/MAPK or Imp3/Imp9MAPK heterodimers. Most importantly, the researchers identified the site in p38 that mediate the interaction with Imp7 and Imp9 and showed that the important sequence lies within residues 20-30 of p38. Subsequently they synthesized a 14 amino acid myristoylated peptide based on the sequence of residues 21-34 of p38. When it was applied to HeLa cells prior to stimulation, it prevented the nuclear translocation and Imp7/9 interaction of the MAPKs. Since the peptides of this technology are able to specifically inhibit the nuclear activities of p38 (such as inflammatory activities) without modulating their cytoplasmic activities, these peptides may serve as a therapeutic agent for inflammatory and apoptosis related diseases without having side effect.

NO.	Field	Technology Number
12	Biotechnology, Pharma and Diagnostics	1745

Principal Investigator:	Department	Patent Status
Prof. Varda Rotter	Molecular Cell Biology	Pending

Title	Methods for stabilization of mP53 in embryonic stem cells for cancer treatment
Link	http://yedarnd.com/technologies/methods-stabilization-mp53-embryonic-stem-cells-cancer-treatment

Summary

Cancer is a leading cause of death in the developed countries. It is a highly heterogeneous disease even among patients with the same type and grade of cancer. Thus, drug development for cancer is extremely challenging. However there are some consistencies; most tumor cells exhibit genomic instability with an increased expression of oncogenes and inactivation of tumor suppressor genes. P53 is a key tumor suppressor that is mutated in more than half of the human cancers. Over the years several mouse models were developed in order to study p53 mutations. Interestingly it has been shown that mice homozygous for mutant p53 are viable, and develop malignant tumors only in adulthood. Prof. Rotter and her team revealed the mechanism by which embryos are protected from mutant p53-induced transformation. They found, using embryos stem cells (ESCs), that the conformation of mutant p53 in ESCs is stabilized to a WT conformation. They further identified the network of proteins that may shift p53 transformation to its WT form. This technology presents methods (compositions and kits) of stabilizing mutant p53 in ESCs by interacting proteins, thus propose a novel cancer therapy

Applications

Cancer

Advantages

Targeted for p53, Safe

Technology's Essence

The researchers hypothesized that cellular factors in the pluripotent cells contribute the stabilization of the WT conformation of p53. They used a mass spectrometry (MS)-based interactome analysis to examind the interaction network of the different conformations of p53 in WT and Mut ESCs compared with somatic cells from the spleen. They immunoprecipitated WT and Mut conformation of p53 and used p53 KO cells as controls for background binding. Importantly, they identifies chromatic-specific proteomic network that is suggested to bind p53 and act as a stabilizer of Mut p53 into a WT conformation. This network (59 proteins) includes the CCT complex, USP7, Aurora kinase, Nedd4, and trim24. Interactions with this network enables the activation of WT activity of p53 and eliminates the gain-of function Mut activities, despite the p53 mutation.

Overall this is a proposed mechanism of rescuing ESCs cells from transformation which sets the basis for future p53-targeted cancer therapeutics.

NO.	Field	Technology Number
13	Biotechnology, Pharma and Diagnostics	1033
Principal Investigator:	**Department**	**Patent Status**
Prof. Zvi Livneh	Biological Chemistry	Granted US 8043807
Title	**Cancer Biomarkers for Risk Assessment and Early Detection**	
Link	http://yedarnd.com/technologies/cancer-biomarkers-risk-assessment-and-early-detection	

Summary

A non-invasive diagnostic test to identify individuals with increased risk of lung cancer.
Lung cancer is one of the most common cancers and considered to be the leading cause of cancer deaths in the western world, accounting for nearly 30% of all cancer deaths. The high mortality rate is related to the low cure rate, which in turn is related to the lack of adequate screening and early detection measures. Despite the numerous studies and primary prevention efforts pointing at smoking as the major cause of lung cancer, still over one third of the adult population smokes cigarettes and will not quit this habit. One way to increase success of smoking cessation programs would be to identify individuals at high risk for developing lung cancer. The outlined technology is a simple blood test termed the OGG Activity Assay or OGGA that monitors the activity of OGG1, a DNA-repair enzyme. Poor DNA-repair capacity by OGG1 is highly correlated with increased susceptibility of developing lung cancer.

Applications

The OGGA test represents a rapid, reliable and high-throughput cancer diagnostics platform for early detection of individuals at high risk of developing lung cancer. The OGGA test may potentially be used to predict the outcome of cancer therapies such as chemotherapy and radiotherapy. The OGGA test may also be applied to other forms of cancers such as squamous cell carcinoma of the head and neck.

Advantages

A simple, cost-effective diagnostic tool to predict lung cancer risk. The test enables the integration of multiple factors that are known to affect DNA-repair enzymes expression and activity, in contrast to polymorphism-based assays. Smokers who are diagnosed with low OGG1 activity can be advised to enter smoking cessation programs, as a way to reduce cancer risk. Such an approach based on personal susceptibility is expected to be more effective than a general warning on the hazards of smoking, as has been seen in the case of personal risk factors for cardiovascular diseases (e.g., personal cholesterol levels).

Technology's Essence

Reduced DNA-repair capacity plays an important role in sporadic cancer. The OGG test measures the activity of a specific DNA repair enzyme, called OGG1 (8-oxoguanine DNA glycosylase 1) which plays a pivotal role in alleviating DNA damage caused by toxic molecules such as oxygen radicals, or radiation. The test provides a number, OGG Activity Index (OGGA Index), which varies among individuals. Among lung cancer sufferers, 40% showed low OGG1 activity compared to only 4% of the general population. Smokers with low OGG1 function were up to 10 times more likely to have lung cancer than those whose enzyme worked normally and 120 times more likely than nonsmokers with normal enzyme activity.

NO.	Field	Technology Number
14	Biotechnology, Pharma and Diagnostics	1641

Principal Investigator:	Department	Patent Status
Prof. Zelig Eshhar	Immunology	Pending

Title	**Trans Seq - a novel high throughput method to generate multiplex DNA libararies**
Link	http://yedarnd.com/technologies/trans-seq-novel-high-throughput-method-generate-multiplex-dna-libararies

Summary

A novel RNA-seq method enables unbiased identification and characterization of cell populations from low-quantity samples (~1000 cells). Utilizing tag-free FACS sorting, researchers at the Weizmann Institute are able to create single cell cDNA libraries in under two hours and at a low cost.

As personalized medicine requires analysis of minute RNA quantities from patients, there is a great need for unbiased and comprehensive analysis of cells□ transcriptome from low-quantity samples. Attaining simultaneous observation on millions of cells in their native context is currently a laborious and expensive process. Therefore an unbiased functional characterization of In vivo cell populations is of great demand.

The Researchers have successfully addressed this challenge in a top down fashion by focusing on cell types. Using broad sampling of single cell transcriptional states from multi-cellular tissues they could reconstruct biological functions. They suggest a straightforward path to construct an unbiased map of functional cell states that are sampled directly from their native context. Thus they reveal a new methodology for microscopic analysis of the transcriptome in heterogeneous tissues.

Applications

The innovative technology has potential applications in basic research, personalized medicine and clinical diagnostics. Kits for single cell transcriptome analysis of FACS output.

Advantages

Dramatic reduction is costs and labor. High resolution, robust.
Top down, unbiased. No need to use markers.

Technology's Essence

This technology combines an automated 384-well cell capture and library preparation assay, two-tier molecular and cellular labeling and efficient poly-A tailed RNA conversion. Amplification and sequencing of multiplexed libraries is achieved with 1000 cells in a single experiment. Notably, each read in this method is directly interpretable as representation of a single RNA molecule from a specific single cell. The result is highly practical profiling of large cells samples. This further enables robust characterization of subpopulations□ functional state (at a resolution of 10 cells or 1% of 1000 cells sample).

NO.	Field	Technology Number
15	Biotechnology, Pharma and Diagnostics	1616
Principal Investigator:	**Department**	**Patent Status**
Prof. Zelig Eshhar	Immunology	Pending
Title	**Universal immunotherapy for cancer**	
Link	http://www.yedarnd.com/technologies/universal-immunotherapy-cancer	

Summary

Existing treatments against cancer are non-sufficiently selective. Immunotherapy based treatment offers highly selective and efficient solution to this problem. A promising approach in Immunotherapy is adoptive cell therapy (ACT). In ACT, therapeutic lymphocytes are administrated to patients in order to treat a disease. In this process antibody-type cells are generated ex vivo, and then infused to the patient. By this technology the cells can be redirected against specific tumors via genetic engineering, using chimeric receptors. Currently ACT is logistically and economically challenging since it is limited by the used of the patients□ own cells. Another key concern is safety, due to the danger that the allogeneic cells will be rejected by the patient, or will attack the patient. In cancer, use of tumor specific, chimeric receptor redirected allogeneic T cells can transform ACT into a standardized, off-the shelf therapy. Overall this method proposes a safe and effective adoptive therapy using allogeneic cells while avoiding the use of bone marrow transplantation (BMT).

Applications

Cancer immunotherapy

Advantages

Off the shelf, standard treatment / Safe / Effective
No bone marrow transplantation (BMT) is required

Technology's Essence

A novel approach for adoptive immunotherapy using fully MHC-mismatch allogeneic T cells. These cells are redirected with tumor specific non-MHC-restricted antibody-based chimeric antigen receptor (T-bodies) in the absence of Graft-versus-host disease (GVHD). In order to create a standardize treatment, the redirection of T cells can be done through an antibody-based chimeric antigen receptor (CAR), thus creating □universal effector T cells□. This is based on a combination of of MHC-mismatched allogeneic T-cells with an MHC unrestricted chimeric antigen receptor. These cells would recognize their target independently of MHC restriction, therefore applied as an □off-the shelf□ immunotherapy. Regarding the second challenge of avoiding GVHD, by using a controlled lymphodepletion the researchers were able to create therapeutic window during which the allo-T-body cells could destroy the tumor before being themselves rejected.

NO.	Field	Technology Number
16	Biotechnology, Pharma and Diagnostics	1611
Principal Investigator:	**Department**	**Patent Status**
Prof. Yechiel Shai	Biological Chemistry	Pending
Title	**Novel immunosuppressive peptides**	
Link	http://yedarnd.com/technologies/novel-immunosuppressive-peptides	

Summary

Novel HIV-derived peptides for the treatment of T-cell related disorders. Autoimmune diseases affect millions of individuals worldwide and the cost of these diseases, in terms of actual treatment expenditures and lost productivity, is measured in billions of dollars annually. Uncontrolled activation of T cells is a hallmark of many autoimmune diseases; prominent among these are rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis and Type I diabetes. T cells also play a cardinal role in the rejection for organ transplantation or graft versus host disease. Currently available therapies such as immunosuppressive drugs suppress the patient's entire immune response, thereby increasing the risk of infection, and can cause toxic side effects to non-lymphoid tissues. The development of new immunosuppressive agents capable of selectively inhibiting the activation of T lymphocytes with minimal side effects is therefore desirable. The present invention provides novel peptides endowed with immunosuppressive activity, for the treatment of T-cell related conditions such as autoimmune, inflammatory and graft rejection disorders.

Applications

Treatment of various T-cell mediated pathologies including:
Autoimmune diseases. Inflammatory disorders. Graft rejection and graft-versus-host disease (GVHD).

Advantages

The peptides exhibit minimal toxicity. The peptides are about 20 times more potent than the strongest peptide reported from the HIV envelope proteins. The peptides are less hydrophobic than other gp41-derived peptides and as such are more readily soluble in aqueous solution.

Technology's Essence

A team of scientists from the Weizmann Institute has developed peptides, derived from the ectodomain of the HIV gp41 envelope protein, that are able to effectively inhibit T cell activation. These peptides are 20-fold more potent as immunosuppressive peptides compared to other HIV-derived immunosuppressive peptides. The novel gp41-derived peptides robustly attenuated autoimmune disease in vivo, as shown in an experimental autoimmune encephalomyelitis (EAE) animal model, while demonstrating minimal toxic effect in both in vivo and in vitro studies.

NO.	Field	Technology Number
17	Biotechnology, Pharma and Diagnostics	1657
Principal Investigator:	**Department**	**Patent Status**
Prof. Ron Milo	Plant Sciences	Pending
Title	**Electro-biosynthesis of fuels**	
Link	http://yedarnd.com/technologies/electro-biosynthesis-fuels-0	

Summary

Bioengineered formatotrophic E.Coli can be utilized to efficiently generate biomass from electricity. A popular direction for cleantech in recent years is that of biorefineries, that use living organisms to supply the human demand for chemical commodities. Electricity is considered to be a potential feedstock for biorefineries, with the end products serving as solid or liquid storage of energy. Such microbial electrosynthesis is highly dependent on mediators to enable electron transfer from an electrode to a living cell.

Formic acid (formate) is an electron mediator with a number of desired features for microbial electrosynthesis. However, wild-type organisms that can grow on formate are not suitable for industrial use due to slow growth rates and metabolism.

Researchers at the Weizmann Institute have successfully engineered a formatotrophic E.coli. By combining systematical analysis with computational tools they screened numerous metabolic pathways and identified the optimized metabolic pathway that supports efficient formate-based growth. This innovative method enables the design of industrial strains of bacteria capable of efficient microbial electrosynthesis.

Applications

Biofuel and chemical commodities production.

Advantages

Efficient and robust storage of electrical energy.

Cost effective conversion of C1 compounds into sugars.

Technology's Essence

By engineering E. coli, the workhorse bacteria used in biotechnology and enabling its growth on formate, researches at Dr. Ron Milos lab paved the way for efficient microbial electrosynthesis. The Researches started by investigating many metabolic pathways in order to discover how a model organism such as E.coli can be engineered for formatotrophic growth. estimate which pathway is most suitable to support growth on formate each pathway was examined based on various criteria such as biomass yield, thermodynamic favorability, chemical motive force, kinetics and additional practical challenges. One short favorable pathway was consistently identified, that is the reductive glycine pathway. Furthermore. Researches generated an isolated organism that is able to convert formate to pyruvate or glycerate.

NO.	Field	Technology Number
18	Biotechnology, Pharma and Diagnostics	1695

Principal Investigator:	Department	Patent Status
Prof. Varda Rotter	Molecular Cell Biology	Pending

Title	**IFN beta as treatment for mutant P53 tumors**
Link	http://yedarnd.com/technologies/ifn-beta-treatment-mutant-p53-tumors-0

Summary

A Novel Therapeutic Strategy for Mutant p53-Bearing Cancers. A prominent example for such abnormal cancer protein is p53, which normally plays a cardinal cancer-protective role by regulating key biological processes. When mutated, the aberrant form of p53 instigates a cascade of events that may eventually lead to the emergence of cancer. Indeed, loss of p53 activity is considered one of the hallmark features of practically all human cancers. However, no treatment has been proposed to date that can specifically and effectively target the mutant forms of p53. The current technology provides a simple and efficient first-in-class therapy to combat cancers that exhibit p53 mutations, by administering low doses of type I Interferon (IFN). The technology further provides means to stratify patients that are amenable for such treatment according to their tumors p53 mutation status. Finally, a prophylactic method to chronically treat susceptible patient populations, such as subjects carrying p53 germline mutations, is presented.

Applications

Treatment of cancer patients with IFNb as a sole active component, or as a sensitizing agent in combination with other anti-cancer agents such as chemotherapeutics.
Treatment with IFNb as a prophylactic agent for preventing emergence of cancer in subjects afflicted with a disorder associated with a p53 mutation, such as Li-Fraumeni syndrome.
Treatment with IFNb for the prevention of cancer spreading or metastasis.
Detection of patients amenable for IFNb treatment by screening for p53 mutations.
Stratifying patients according to their mutant p53 type might also prove beneficial in improving IFNa performance.

Advantages

Low dose administration of IFNb to target mutant p53-bearing cancers should be well-tolerated and minimize the severe side effects usually associated with IFN treatment.
The technology enables the stratification of cancer patients according to p53 mutation state. This should lead to improved IFN therapy, providing both enhanced efficacy and improved safety.

Technology's Essence

Cancer Associated Fibroblasts (CAFs) are sub-population of stromal cells residing adjacent to the tumor, that mediate the cancer promoting effect of the stroma.

NO.	Field	Technology Number
19	Biotechnology, Pharma and Diagnostics	1628
Principal Investigator:	**Department**	**Patent Status**
Prof. Irit Sagi	Biological Regulation	Pending
Title	**A novel TNF alpha inhibitor**	
Link	http://yedarnd.com/technologies/novel-tnf-alpha-inhibitor	

Summary

New generation of superior nature-inspired therapeutics for treating inflammation.Inflammation is characterized by elevated levels of TNF-?. Neutralizing TNF- activity was shown to be beneficial for patients with chronic autoimmune inflammatory diseases such as rheumatoid arthritis (RA) and inflammatory bowel disease (IBD). However, current treatments of such conditions include general anti-inflammatory and immunosuppressive drugs that are of limited effectiveness and may cause serious side effects. Another class of drugs includes targeted therapies directed against TNF-, that are associated with serious infections including tuberculosis (TB) and sepsis as well as increased risk of cancer in some cases. Thus, there is an urgent need for highly selective, safer and more effective drugs for inflammatory conditions that involve TNF- as a key mediator.

Applications

Treatment of autoimmune inflammatory conditions such as IBD and RA.

Treatment of neuroinflammatory conditions such as multiple sclerosis (MS).

Treatment of other inflammatory mediated diseases such as psoriasis, systemic sclerosis and ankylosing spondylitis.

All MMPs and ADAMs proteases possess an autoinhibitory pro-domain and therefore this technology can be broadened to other MMP and ADAM targets.

Advantages

TACE pro-domain is highly potent and efficient.

TACE pro-domain is metabolically stable, unlike small molecule inhibitors of TACE.

Targeting TACE through nature-inspired protein design may constitute a safer approach to combat TNF- induced inflammation.

Unlike non-specific small molecule inhibitors, which target the conserved catalytic zinc site of TACE, TACE pro-domain shares little homology to other MMPs, making it a good candidate for specific inhibitor of TACE.

Technology's Essence

The A disintegrin and metalloproteinase 17 (ADAM17), also known as tumor necrosis factor converting enzyme (TACE), has been defined as the major shedding protease for a broad range of substrates predominantly the key immuno-regulatory cytokines TNF-?. Cleavage by TACE renders TNF pro-inflammatory, highlighting ADAM17 as a rationale target for treatment of autoimmune diseases such as IBD and arthritis.

NO.	Field	Technology Number
20	Biotechnology, Pharma and Diagnostics	1665
Principal Investigator:	**Department**	**Patent Status**
Prof. Michal Neeman	Biological Regulation	N/A
Title	**MRI of tissue fibrosis without contrast agent**	
Link	http://yedarnd.com/technologies/mri-tissue-fibrosis-without-contrast-agent-1	

Summary

Improved magnetic resonance imaging (MRI) for cardiac fibrosis and other fibrotic diseases. Myocardial fibrosis is associated with worsening ventricular systolic function, abnormal cardiac remodeling, and increased ventricular stiffness, significantly increasing the risk of adverse cardiac outcomes. Hypertension and diabetes elicit fibrotic processes in the heart, placing a high percentage of the western world population at risk, yet the early identification of fibrotic development in high-risk patients is hindered by lack of adequate fibrosis imaging modalities. This in turn leads to increased morbidity and additional financial burden to health care services. The current standard method to assess myocardial fibrosis employs the usage of MRI coupled with intravenous infusion of Gadolinium contrast agent. However, this method suffers from considerable drawbacks including reduced sensitivity (that permits diagnosis only at advanced stages of disease), lengthy scan times and toxicity of the contrast agent, which excludes a significant subset of patient populations from diagnosis. Thus, the capacity to diagnose myocardial fibrosis in its early stages would allow successful therapeutic intervention, and may also create a platform for the non-invasive study of fibrotic development, thereby facilitating the design of targeted therapies. The current invention is comprised of a novel cardiovascular magnetic resonance method with enhanced sensitivity, without the need for contrast agent administration.

Applications

Detection of cardiac fibrosis due to various pathologies, including hypertension, diabetes and heart failure. The method can be applied to detect fibrotic tissues in a broad range of disorders including cancer, renal fibrosis and pathologies related to skeletal muscles.

A platform for the clinical study of targeted therapies that may prevent or arrest fibrotic diseases. Monitoring the efficacy of treatment tailored to target fibrotic tissue development.

Advantages

The method relies on magnetization transfer to provide contrast, and therefore obviates the need for any extrinsic, toxic contrast agent such as Gadolinium.

Improved sensitivity over current contrast agent-based cardiac MRI methods.

The method can be readily applied to existing MRI clinical imaging systems.

Technology's Essence

A team of researchers at the Weizmann Institute has developed a novel approach for detection of myocardial fibrosis using magnetization transfer contrast (MCT) MRI cardiac imaging technology.

NO.	Field	Technology Number
21	Biotechnology, Pharma and Diagnostics	1697
Principal Investigator:	**Department**	**Patent Status**
Prof. Adi Kimchi	Molecular Genetics	Pending
Title	**DAP1 as a novel substrate of MOTR**	
Link	http://yedarnd.com/technologies/dap1-novel-substrate-motr-0	

Summary

Autophagy is primarily a protective process for the cell, but it can also play a role in cell death. For example, autophagy is vital for embryonic developments, and can prevent cancer cells from spreading while deregulated autophagy was suggested to play a role in autism. Although autophagy is highly regulated, controlled by both positive and negative regulators little is known about the mechanisms that govern balanced autophagy in health. Consequently, there is no targeted pharmacological solution for diseases that are attributed to dysregulation in autophagy.

In this technology, a way of modulating autophagy is introduced, via the newly identified death-associated protein 1 (DAP1) which serves as autophagy suppressor. DAP1 is a direct substrate of the mammalian target of rapamycin (mTOR). mTOR serves as the cells□ integrator by combining inputs from upstream pathways thus it plays a key role in the life of the cell and affects many fundamental cellular functions. This discovery opens a new window of treating autophagy related diseases.

Applications

A target for drug design to treat a diverse set of diseases such as neurodegenerative diseases, cancer, and cellular aging.

Advantages

Controlling the intensity of the autophagic flux to maintain healthy state.
Regaining healthy state in pathogenic state.

Technology's Essence

This technology presents DAP1, a novel substrate of mTOR that negatively regulates autophagy. Initially, a link of DAP1 to autophagy was apparent in that its knockdown enhanced autophagy flux. Also, it displayed a rapid decline in its phosphorylation in response to amino acid starvation. Next, by mapping the phosphorylation sites and analyzing phosphorylation mutants it has been demonstrated that DAP1 is functionally silenced in growing cells via mTOR-dependent phosphorylation on Ser3 and Ser51. Last, Inactivation of mTOR during starvation caused a rapid reduction in these phosphorylation sites and converted the protein into an active suppressor of autophagy.

NO.	Field	Technology Number
22	Biotechnology, Pharma and Diagnostics	1545
Principal Investigator:	**Department**	**Patent Status**
Prof. Yair Reisner	Immunology	Pending
Title	**Hematopoietic Procursors Mobilization**	
Link	http://yedarnd.com/technologies/hematopoietic-procursors-mobilization-1	

Summary

A method for increasing the mobilization of hematopoietic stem cells. The forced migration of hematopoietic stem/progenitor cells (HSPC) from the bone marrow (BM) into the peripheral blood (PB), termed mobilization, is important from a clinical point of view as a procedure that allows for the collection of HSPC for transplantation in leukemia patients. Granulocyte-colony stimulating factor (G-CSF), most frequently employed in the clinic, efficiently mobilizes HSPC after a few consecutive daily injections. Unfortunately, about 25% of patients do not respond efficiently to currently recommended mobilization protocols and are termed poor mobilizers. The present invention provides a method of increasing mobilization of hematopoietic precursors from the bone marrow to the peripheral blood, by using either G-CSF with thrombin antagonists, or the antagonists alone.

Applications

Improving the collection of stem cells from the peripheral blood of the donor
Treatment of cancer (since solid tumors depend on bone marrow-derived cells for tumor vascularization and survival)

Advantages

Lower doses of G-CSF, Shorten procedure

Technology's Essence

In the outlined technology it was found that enhancement of G-CSF levels is associated with enhancement of stem cell mobilization from the bone marrow to the spleen. Likewise, inhibitors of the interaction between thrombin and its receptors (known as PAR) could enhance the effect of G-CSF. Therefore, PAR antagonists are synergistic with G-CSF, leading to marked enhancement of stem cell mobilization.

NO.	Field	Technology Number
23	Biotechnology, Pharma and Diagnostics	1499
Principal Investigator:	**Department**	**Patent Status**
Prof. Irun R. Cohen	Immunology	Granted US 8748118
Title	**Biomarkers for Identification of Bladder Cancer**	
Link	http://yedarnd.com/technologies/biomarkers-identification-bladder-cancer	

Summary

Bladder cancer is a common malignancy; it is the 4th most common cancer in males and the 9th in females. The presenting symptom is usually blood in the urine, and diagnosis is currently based on cystoscopy, which is invasive, costly, painful and time consuming. To date, no biomarker has been identified in the urine that might be used for screening, staging, prognosis and monitoring treatment. We now report that the amount of the 60 kDa heat shock protein (HSP60) in a subjects urine is a biomarker for muscle invasion in patients with bladder cancer stage T2 and higher. Moreover, subjects with stage T1 disease can be stratified by their urine levels of HSP60 into a sub-group likely to progress into stage T2 or into a sub-group more likely to respond to conservative treatment with BCG, which does not require removal of the bladder. The distinction between these two sub-groups of T1 bladder cancer can identify earlier subjects in need of cystectomy, while sparing others unnecessary major surgery.

Applications

Screening subjects with overt hematuria, or at risk of developing bladder cancer (such as heavy smokers)
tratifying bladder cancer subjects
Prognosis
Determining treatment program
Monitoring response to therapy.

Advantages

Non-invasive
Easy to apply
Relatively inexpensive
Prognositic.

Technology's Essence

Quantitative measurement of HSP60 levels in a subjects urine by ELISA, radio-immunoassay or other simple assays.

NO.	Field	Technology Number
24	Biotechnology, Pharma and Diagnostics	1518
Principal Investigator:	**Department**	**Patent Status**
Prof. Yosef Yarden	Biological Regulation	Granted US 7498142; 7939072; 8883149; 9040047
Title	**Antibody Combinations in Treating Cancer**	
Link	http://yedarnd.com/technologies/antibody-combinations-treating-cancer-1	

Summary

Improved immunotherapy for breast cancer.

Monoclonal antibodies (mAbs) to ErbB-2/HER2 growth factor receptor, or to its sibling, the epidermal growth factor receptor (EGFR), prolong survival of cancer patients, especially when combined with cytotoxic therapies. However, low effectiveness of therapeutic mAbs and the evolution of patient resistance call for improvements. Furthermore, the response to the clinically approved monotherapy of Herceptin (a humanized mAb directed against ErbB-2), is relatively low (~15%) and short lived (median duration, 9 months). Therefore, there is a need to improve the therapeutic treatment against this receptor. The present technology enhances the therapeutic activity of anti-ErB-2 receptor antibodies, by combining two or more epitope-distinct antibodies.

Applications

Improved treatment of ErbB-2-overexpressing tumors (e.g. in breast and ovary cancers).

Advantages

May enhance patient response and delay acquisition of resistance.

Enhancement of therapeutic efficacy and synergy with chemotherapy.

Technology's Essence

Optimal selection of mAbs for cancer immunotherapy may improve its therapeutic potential. The outlined technology addresses an emerging strategy, which enhances the therapeutic activity of anti-receptor antibodies by combining two mAbs engaging distinct epitopes. It was demonstrated that pairs of anti-ErbB-2 mAbs better inhibit ErbB-2-overexpressing tumors than the respective individual mAbs, both in vitro and in vivo.

NO.	Field	Technology Number
25	Biotechnology, Pharma and Diagnostics	1527
Principal Investigator:	**Department**	**Patent Status**
Prof. Tsvee Lapidot	Immunology	Granted US 9155780
Title	**Novel peptides which serve as mobilization agents**	
Link	http://yedarnd.com/technologies/novel-peptides-which-serve-mobilization-agents-1	

Summary

New peptides for improving the recruitment of stem cells for transplantation.
Blood cancers (leukemia, lymphoma and myeloma) are very common: they accounted for nearly 9.5 percent of deaths in the US from cancer in 2009. Stem cell transplantation, which aims to restore the function of the marrow, is an important therapy for these malignancies. Successful blood and marrow transplant requires the infusion of a sufficient number of hematopoietic stem and progenitor cells (HSPC), which is done by recruitment of HSPC from the marrow into the blood (mobilization). Currently used clinical procedures to produce stem cell mobilization include administration of G-CSF or GM-CSF, either as single agents or in combination with chemotherapy. However, some autologous blood stem cell donors exhibit indifference to currently applied mobilization therapies. Hence, improved methods to mobilize peripheral blood HSPC are warranted. The present invention is directed to novel short peptides of beta-defensins for improving the mobilization of HSPC.

Applications

Rapid and efficient mobilization of HSPC for clinical transplantation
Inhibition of malignant cell proliferation and metastasis

Advantages

Non-toxic, derived from a physiological molecule of innate host immunity
Cheap and simple synthesis
Rapid, robust and preferential mobilization of immature HSPC
Enhancement of mobilizing efficiency of presently used substances (e.g. G-CSF)
Dual use of the derivatives

Technology's Essence

Beta-defensins belong to a family of antimicrobial peptides, a major component of the innate immune system. In a mouse model, two different linear beta-defensin-derived peptides provided a strong and rapid HSPC mobilization, alone and in combination with G-CSF, a cytokine that is the major agent inducing robust mobilization of HSPC. In addition, a cyclic peptide derivative effectively inhibited HSPC mobilization and proliferation, as well as human malignant cell motility in mice. These findings make beta-defensin-derived peptides as promising small molecule candidates for improving current clinical HSPC mobilization protocols, and their cyclic derivatives as promising candidates for reducing cancer cell development and metastasis in patients.

NO.	Field	Technology Number
26	Biotechnology, Pharma and Diagnostics	1546
Principal Investigator:	**Department**	**Patent Status**
Prof. Yitzhak Pilpel	Molecular Genetics	Pending
Title	**Efficient production of Recombinant Proteins**	
Link	http://yedarnd.com/technologies/efficient-production-recombinant-proteins-1	

Summary

Improvement of protein production by modulating the tRNA pool. For maximal heterologous expression of proteins per host cell, the optimal level of expression of genes needs to be addressed. The science and art of expressing a gene from one species in another often amounts to modifying the codons of the gene, and supplementing the host with specific tRNAs. Yet the full challenge of heterologous expression is not only to maximize expression per host cell, but also to minimize the burden on the host. The outlined invention describes a universally conserved profile of translation efficiency along mRNAs, based on the adaptation between coding sequences and the tRNA pool, to improve heterologous gene expression and thus protein production.

Applications

Improvement of the yield and success rate of recombinant protein production.

Advantages

Protein expression levels can be artificially increased
Minimization of the burden on the host

Technology's Essence

The translation efficiency profile of a gene is defined, for each codon position, as the estimated availability of the tRNAs that participate in translating that codon. The profile is high at codons that correspond to abundant tRNAs and low at codons that correspond to rare tRNAs. In this invention it is predicted that the first ~30-50 codons of genes appear to be translated with a low efficiency □ramp□, while the last ~50 codons show highest efficiency. The □ramp□ serves as a late stage of initiation and is an optimal and robust means to reduce ribosomal traffic jams, thus minimizing occupation of free ribosomes, ribosomal abortions and, ultimately, the cost of protein expression. Implementation of appropriate ramping in heterlogous proteins, given the host's tRNA pool, might improve the yield of expressed recombinant proteins.

NO.	Field	Technology Number
27	Biotechnology, Pharma and Diagnostics	1475
Principal Investigator:	**Department**	**Patent Status**
Prof. Dan S. Tawfik	Biological Chemistry	Granted US 7786071; 9023631; 8735124
Title	**PON1 as a detoxification agent**	
Link	http://yedarnd.com/technologies/pon1-detoxification-agent-1	

Summary

An enzyme with improved anti-atherosclerotic and detoxiftying activities.
The enzyme Paraoxonase 1 (PON1) resides on HDL in the blood. The levels of PON1 and its catalytic proficiency appear to have a major impact on susceptibility to atherosclerosis, cardiac and vascular diseases, cholesterol reducing drugs and various toxins and pollutants, such as organophosphates (pesticides and nerve gases). However, when trying to use the human PON1 one encounters several problems, including its insolublilty and the lack of recombinant PON variants that can be expressed and manipulated in bacteria. The current technology offers new, genetically-engineered PON1 variants that are expressed in a fully functional form, at multi-miligram quantities and unprecedented purity.

Applications

PON1 variants with improved anti-atherosclerotic activities for the prevention of restenosis that follows the placement of stents (and other devices) in arteries
Diagnostics of risk factors and genetic polymorphisms for atherosclerosis
Detoxification and decontamination of a variety of reagents (e.g. organophosphates)

Advantages

Improved features of the recombinant PON1 enzyme compared to the wild type enzyme (e.g. increased activity, solubility and cholesterol efflux in macrophages)
Recombinant PON1 can be expressed and manipulated in large quantities in bacteria

Technology's Essence

PON1 resides within the cholesterol-carrying particles HDL and exhibits a multitude of activities related to the metabolism of drugs, lipids and other molecules associated with atherosclerotic vascular and cardiac diseases. The outlined technology utilized directed evolution in the laboratory, which yielded a series of variants that are 50-200 fold more proficient than native PON1 in different physiologically relevant tasks

NO.	Field	Technology Number
28	Biotechnology, Pharma and Diagnostics	1517

Principal Investigator:	Department	Patent Status
Prof.Michal Schwartz-Eisenbach	Neurobiology	Granted US 8716228; 8716228

Title	Immune therapy for treating Mental Disorders
Link	http://yedarnd.com/technologies/immune-therapy-treating-mental-disorders-1

Summary

A unique immune-based therapy to treat psychological disorders

Psychological disorders (e.g. schizophrenia, depression, etc.) are among the most prevalent diseases of humankind. These disorders affect approximately 16% of the U.S. population aged 18 and older in a given year, and when less severe conditions are considered as well (e.g. obsessive-compulsive behavior), the percentage is even higher (about 26%). Hitherto, no disease-modifying therapy has been available for any of these diseases the conventional treatments being psychotherapy and non-therapeutic medications whose use is complicated by side effects and limitations in the amount of time they can be administered. The market for an effective disease-modifying therapy is, therefore, potentially huge. The present technology offers the use of therapeutic vaccinations to boost the body's own repair mechanisms.

Applications

Treatment of acute and chronic psychological disorders such as schizophrenia, depression, post-traumatic stress disorder (PTSD), and attention deficit disorder

Preventative vaccination for some of the above disorders

Advantages

Effective treatment for diseases that do not respond well to present modes of treatment

Effective treatment for PTSD, even when given 24 hr after exposure to trauma

May be used both for treatment and prevention of certain psychological disorders

Technology's Essence

The basis of the therapeutic approach proposed in this technology is the groundbreaking discovery that peripheral immune cells play a key role in adult brain plasticity and that immune deficiency or malfunction can impair brain plasticity. Furthermore, it was found that the immunization of mice suffering from one of the above psychological disorders alleviated their symptoms. The recognition that the systemic immune system is a factor in containing mental stress offers new directions for the development of a therapy for stress-induced pathologies such as PTSD and depression. This T cell-based immunization increases the body's physiological ability to cope with stress.

NO.	Field	Technology Number
29	Biotechnology, Pharma and Diagnostics	1520

Principal Investigator:	Department	Patent Status
Dr. Ami Navon	Biological Regulation	Pending

Title	Novel Proteasome inhibitors for treating cancer
Link	http://yedarnd.com/technologies/novel-proteasome-inhibitors-treating-cancer-1

Summary

A unique class of proteasome inhibitors for cancer therapy.

Cancer is the second-leading cause of death in the United States after heart disease, and the amount of funding for cancer research public and private is higher than for any other disease. However, despite major advances in the management of cancer, most tumor types are resistant to conventional treatment modalities. Proteasome inhibitors induce selective cell death of malignant cells, and as such represent a promising class of targeted anticancer agents. The current technology involves a unique class of proteasome inhibitors that were discovered using a novel high throughput, image-based screening approach.

Applications

Therapeutic agents for the treatment of various malignancies.

Proteasome inhibitors are ideal candidates for combination therapy, since they were shown to enhance chemosensitivity and overcome drug resistance.

Proteasome inhibitors may serve as research tools to investigate protein degradation in eukaryotic cells.

Advantages

The outlined set of proteosome inhibitors target sites other than the 20S catalytic core, thereby offering an alternative mechanism of action, different from the one employed by commercially available inhibitors.

Proteasome inhibitors hold the promise of being more selective, thus harming fewer normal cells, reducing side effects, and improving the quality of life.

Technology's Essence

Proteasomal degradation plays an essential role in multiple cellular processes, including cell division and growth, DNA repair and cell cycle control. Despite its widespread distribution and involvement in multiple biological processes in normal cells, the proteasome activity is particularly critical for the survival of transformed cells. Thus, malignant cells are significantly more sensitive to proteasome inhibition than their normal counterparts, and blocking proteasomal degradation may sensitize them to both conventional chemotherapy and radiotherapy. The outlined technology involves a highly sensitive, microscope-aided high throughput screen. It makes use of a fluorescent reporter that translocates into the nucleus upon inhibition of proteasomal activity. Using this screen, several compounds with a pronounced and unique proteasome inhibitory activity were identified.

NO.	Field	Technology Number
30	Biotechnology, Pharma and Diagnostics	1369
Principal Investigator:	**Department**	**Patent Status**
Prof. Roy Bar-Ziv	Materials and Interfaces	Pending
Title	**On-Chip Synthesis of Biomolecules**	
Link	http://yedarnd.com/technologies/chip-synthesis-biomolecules-0	

Summary

A simple, single-step biochip platform for synthesis of biomolecules.
Biochip technology is used today in measuring passive probe-target interactions i.e. measurement of the abundance of specific biomolecules). This technology can now be extended to include complex and cascaded activities on the chip. The present immobilization approaches (based on UV photography) have been essentially limited to short single stranded DNA probes and have not been developed for entire genes or other biochemical functions. Furthermore, most biochips are assembled in a multi-step process that requires expertise in surface chemistry in order to obtain reproducibility and robustness. As a result, light-directed immobilization of molecules on biochips is not widespread and is not easily accessible for research and technology development. The present invention enables, in a simple manner, to immobilize different biomolecules anywhere on the chip to submicron resolution through selective exposure of the monolayer to UV light.

Applications

Light-directed immobilization of a variety of different biomolecules (e.g. DNA, antibodies, enzymes and peptides), On-chip protein biosynthesis from immobilized genes, Design and layout of on-chip traps for proteins from crude cell extract, Lab-on-a-chip that provides a general use biochip technology

Advantages

Enabling the use of long DNA molecules (whole genes), Robust and simple performance without the need for proficiency in materials science and surface chemistry, On-chip protein synthesis with high efficiency, minimal non-specific activity, and a wide dynamic range

Technology's Essence

This lab-on-a-chip technology (i.e. a technology that enables to perform laboratory operations on a small scale) is based on a newly synthesized molecule termed daisy that combines three parts all-in-one: a tail and head connected by a backbone. Selective exposure of daisy monolayer to UV light through a mask (photolithography) reveals the surface for chemical binding of a variety of biomolecules. Using this technology it is possible to immobilize different biomolecules anywhere on the chip to submicron resolution. By immobilizing whole genes, thus enabling cell-free biosynthesis of proteins, daisy technology takes the lab-on-a-chip concept to the next level. Daisy biochip technology holds a promise in proteomics, diagnostics and therapeutics.

NO.	Field	Technology Number
31	Biotechnology, Pharma and Diagnostics	1451
Principal Investigator:	**Department**	**Patent Status**
Dr. Mia Levite	Neurobiology	N/A
Title	**Anti-glutamate Receptor GluR3B for Diagnosis, Research and Drug Discovery in Epilepsy**	
Link	http://yedarnd.com/technologies/anti-glutamate-receptor-glur3b-diagnosis-research-and-drug-discovery-epilepsy	

Summary

A monoclonal antibody against GluR3B, a peptide found in epilepsy patients, and especially in patients suffering from intractable, resistant forms of the disease, could be used in diagnosis kits as well as in drug development for this form of "autoimmune epilepsy".

Applications

1. Producing a new kit for epilepsy patients, able to detect GluR3b Ab's and thus GluR3-mediated neuropathology

The anti GluR3B monoclonal Ab could be used for developing a new diagnostic kit to detect neuropathogenic human anti-GluR3B in serum and CSF of patients with epilepsy. The patient's GluR3B Ab's would compete and displace the GluR3B mAb's of its ligand: the GluR3B peptide. The presence of GluR3B Ab's in a patient, would indicate that autoimmunity against GluR3 may underlie the patient's neuropathology and a) would suggest the initiation of an immune-based therapy b) prevent useless and dangerous brain surgery c) prevent non-effective medication.

2. Drug design for GluR3-mediated neuropathology

The unique GluR3B monoclonal antibody could be used to screen a potential drug for 'Autoimmune Epilepsy'. The GluR3B monoclonal antibody could be used to screen for a molecule (i.e. Anti-idiotypic antibodies) that would block the GluR3 autoantibodies and their detrimental neuropathological effects.

3. Research tool for a kaleidoscope of purposes, including:

Detection of the GluR3 glutamate receptor subtype on various target cells.

Studies of the properties of the Glutamate/AMPA receptor subtype 3.

Studies of the Glutamate-liked agonist activity of the GluR3B monoclonal antibody, and of the GluR3 receptor ion channel gating properties.

Advantages

N/A

Technology's Essence

Scientists from the Weizmann Institute of Science have discovered a unique anti-GluR3B monoclonal antibody Glu 149/29/61.

NO.	Field	Technology Number
32	Biotechnology, Pharma and Diagnostics	1397
Principal Investigator:	**Department**	**Patent Status**
Prof. Moshe Oren	Molecular Cell Biology	N/A
Title	**Monoclonal Anti-Ubiquitinated histone H2B antibody**	
Link	http://yedarnd.com/technologies/monoclonal-anti-ubiquitinated-histone-h2b-antibody-1	

Summary

A novel antibody which can be used, for the first time, to recognize ubiquitinated histone 2B. This technology is novel in its ability to recognize proteins and their destinations, and may serve in diagnostics and immunoprecipitation processes.

Applications

Primary applications in research. Use as a detection tool in western blotting, immunoprecipitation and chromatin immunoprecipitation. Might be used for monitoring processes associated with modulations of ubiquitinated-H2B levels.

Advantages

N/A

Technology's Essence

The invention involves the generation of antibodies specific to ubiquitinated-H2B which selectively recognize H2B when it is ubiquitinated but not H2B in its unmodified state, or ubiquitin unconjugated to H2B.

NO.	Field	Technology Number
33	Biotechnology, Pharma and Diagnostics	1424
Principal Investigator:	**Department**	**Patent Status**
Prof. Idit Shachar	Immunology	Granted US 7919077
Title	**CCL2 for the Treatment of Inflammation**	
Link	http://yedarnd.com/technologies/ccl2-treatment-inflammation-0	

Summary

A method to treat inflammatory disorders

Malfunctions of the immune system are responsible for a series of inflammatory disorders. Two such disorders are rheumatoid arthritis and asthma, encompassing together approximately 23 million Americans. No definitive treatment is currently available for these diseases, and therefore they remain chronic diseases which require life long treatment, accompanied with inconvenient use of drugs together with unwanted side effects. The present invention offers a method to treat inflammation by a molecule that down-regulates the movement of immune cells.

Applications

Treatment of inflammation associated with allergy and autoimmune diseases

Advantages

Treatment of a wide variety of diseases using a single molecule (CCL2)

No associated side-effects

Technology's Essence

CCL2 is well known to specifically attract T cells. This molecule was found to be involved in various inflammatory responses. In the current technology it is suggested that administration of low levels of CCL2 (rather than its inhibition) may be used to effectively reduce T cell migration and homing into lymph nodes, and as such may be clinically beneficial as an anti-inflammatory agent in inflammatory diseases.

NO.	Field	Technology Number
34	Biotechnology, Pharma and Diagnostics	1441
Principal Investigator:	**Department**	**Patent Status**
Prof. Idit Shachar	Immunology	Granted US 8686121; 9109029
Title	**CD84 - a Novel Regulator of B-CLL Survival**	
Link	http://yedarnd.com/technologies/cd84-novel-regulator-b-cll-survival	

Summary

New protein as a target to treat B cell-related cancer.

Chronic lymphocytic leukemia (CLL), a malignant disease characterized by the accumulation of B lymphocytes in the blood, lymphoid organs, and bone marrow, is the second most common type of leukemia in adults, accounting for about 7,000 new cases of leukemia each year. Presently, there is no cure for CLL, and the overall goal of leukemia treatment is to bring about a remission. Therefore, identifying new proteins that may serve as a target for inducing cell death in the malignant cells is highly desirable. The present technology identifies a new regulator protein that is essential for the survival of CLL cells.

Applications

Treatment of CLL, as well as other B cell-related cancers (e.g. gastric cancer and renal cell carcinoma), by blocking CD84 activity

Diagnosis of CLL

Advantages

Very specific to malignant B cells

Diagnosis, and therefore treatment, can be made at early stages of the disease

Technology's Essence

B cells taken from CLL patients have a high level of the protein CD84. Stimulation of CD84 upregulates the survival of B-CLL. However, inhibition of CD84 activity with a blocking antibody downregulates the expression of another protein which controls B-CLL survival, thus inducing cell death. Therefore, the present invention reveals CD84 as a regulator of B-CLL survival

NO.	Field	Technology Number
35	Biotechnology, Pharma and Diagnostics	1245
Principal Investigator:	**Department**	**Patent Status**
Prof. Ruth Arnon	Immunology	Granted US 7786279; 8357789; 9029526
Title	**Aptamer Blocks the Invasion of The Influenza Virus Into Target Cells**	
Link	http://yedarnd.com/technologies/aptamer-blocks-invasion-influenza-virus-target-cells-1	

Summary

N/A

Applications

The novel DNA Aptamer is a promising candidate for therapeutic as well as diagnostic uses: Therapeutic: A novel therapy for Influenza Diagnostics: Detection of Influenza infection in vertebrates such as avian, swine and human

Advantages

N/A

Technology's Essence

Scientists at the Weizmann Institute of Science describe a novel oligonucleotide, also known as an Aptamer, which has been designed to complement the receptor-binding region of the influenza haemagglutinin molecule. It was constructed by screening a DNA library and processing by the SELEX procedure. This DNA Aptamer comprises of a polynucleotide sequence that can bind to a polypeptide within the binding region of the influenza virus to the host cell. The proposed mode of action of this Aptamer is by blocking the binding of influenza virus to target cell receptors and consequently preventing the virus invasion into the host cells. Aptamer is capable of inhibiting the haemagglutinin capacity of the virus and the viral infectivity in vitro. Furthermore, it was shown in an animal model to inhibit viral infection by different influenza strains, as manifested by up to 99% reduction of virus burden in the lungs of treated mice.

NO.	Field	Technology Number
36	Biotechnology, Pharma and Diagnostics	1450

Principal Investigator:	Department	Patent Status
Prof. Talila Volk	Molecular Genetics	Granted

Title	**Imaging of BBB Abnormalities in Schizophrenia and other neurodegenerative diseases**
Link	http://yedarnd.com/technologies/imaging-bbb-abnormalities-schizophrenia-and-other-neurodegenerative-diseases-1

Summary

An MRI-based Non-invasive real-time depiction of Blood-Brain Barrier (BBB) abnormalities that enables a wide range of diagnostic, therapeutic and drug development applications. The BBB is a capillary barrier that protects the brain from fluctuations in blood chemistry and passage of certain particles between bloodstream and the brain. Selective delivery of compounds across the BBB by means of temporary/local BBB disruption is an emerging field. Therefore, means to monitor the BBB function non-invasively and in real-time are essential. Using existing MRI systems and state-of-the-art analytical tools, the methodology enables dynamic depiction of BBB physiological behavior, providing means to monitor changes in BBB permeability as wells as characterization of CNS pathologies.

Applications

Assessment of CNS disorders. Diagnosis, Staging etc.
Monitoring the development of CNS disorders & response to treatment
Monitoring the effects of compounds or technologies on the BBB
Determine BBB function under certain physiological conditions
Drug development: Modification of molecules to improve passage through the BBB.
Apply for the development of compounds/devices that affect BBB functioning.

Advantages

Non-invasive, real-time, 3D depiction of BBB functioning
Sensitivity to slight BBB abnormalities, undetected by conventional MRI
Acquired in parallel to conventional MRI enabling high resolution anatomical depiction
Can be acquired on available conventional clinical/pre-clinical MR systems using conventional data acquisition software

Technology's Essence

A methodology for analyzing the blood-brain barrier's behavior, based on a detectable standard dose of MRI contrast agent. The methodology uses plurality of MRI images acquired from a subjects brain over a predetermined time period, in order to asses BBB function in a uniquely sensitive manner. The system offers a combination of a data acquisition protocol and an offline software package, operating as an add-on□ to existing MRI systems. The system compares series of MRI constructed intensity maps, using different metrics to sensitively detect dissimilarities.

NO.	Field	Technology Number
37	Biotechnology, Pharma and Diagnostics	1386
Principal Investigator:	**Department**	**Patent Status**
Prof. Roy Bar-Ziv	Materials and Interfaces	Granted
Title	**Autonomous Cell-State Sensing Device**	
Link	http://yedarnd.com/technologies/autonomous-cell-state-sensing-device	

Summary

A simple system for diagnosing the state of a cell.

The state of a cell can be diagnosed by monitoring the activity patterns of its various pathways. In most cases it is essential to monitor the activity of several genes in order to accurately determine a cell state. Ex vivo techniques allow identification of cell states not by the cell itself, but rather by external observation, and schemes for in vitro autonomous diagnosis are yet to be implemented in living cells. Therefore, a general synthetic approach for diagnosing natural cell states is needed. In the outlined technology the state of a cell is diagnosed internally by the cell itself, using a simple genetic system that measures the integrated activity of a few pre-defined genes.

Applications

Identification of aberrant versus normal growth of cells

Advantages

Detection of a cell's state is autonomous, without external intervention

The systems sensitivity is adjustable to detect states with limited dynamic range of inputs

The systems output depends only on the activity of input pathways, not on their identity, i.e. it can be used to diagnose any pair of input pathways

Technology's Essence

The state of a cell is defined by its phenotypic and genotypic properties. It can be diagnosed by the unique activity pattern associated with that state. The current technology offers an autonomous cell-state determination in yeast, by defining a minimal set of genes, whose concurrent activity pattern provides precise identification of the state of interest. The integrated readout is obtained by coupling the activity of the input genes. The products of these two genes are used to drive the expression of a reporter or effector gene.

NO.	Field	Technology Number
38	Biotechnology, Pharma and Diagnostics	1407
Principal Investigator:	**Department**	**Patent Status**
Prof. Avigdor Scherz	Plant Sciences	Granted US 8629259
Title	**Thermotolerant Organisms**	
Link	http://yedarnd.com/technologies/thermotolerant-organisms-1	

Summary

Thermotolerant photosynthetic organisms endure worsening climate conditions such as increased temperatures and higher levels of CO2. These novel organisms maintain photosynthetic activity and growth under a wide temperature range (15-45oC) as opposed to their wild-type counterparts. Thermotolerant organisms also exhibit higher transparency to light. Photosynthetic efficiency is maintained even though they produce and utilize less chlorophyll molecules; therefore less surface area is required for optimal cultivation. Furthermore, increased CO2 concentrations are preferable for thermotolerant organisms□ efficient photosynthesis. The innovative solution discovered at The Weizmann Institute, involves replacement of 1-2 amino acid residues in a protein motif within the D1 protein subunit of Photosystem Ⅱ (the protein complex responsible for the conversion of solar energy to a useful form of energy by photosynthesis). Such a solution has the potential to provide platforms for food production and sustainable energy in regions with harsh climate conditions that until today, were deemed unfit for cultivation.

Applications

Bacterial platform to produce biomass or materials (e.g. nutraceuticals) in higher temperatures and higher CO2. Food and biofuel production: adaptation of crops to harsh climates.

Advantages

Enhanced Thermal stability and plasticity of the modified organisms to a much broader range than observed for the native organisms. Greater Light penetration (e.g. in ponds) without losing photosynthetic efficiency - thermotolerant organisms maintain efficient activity with less chlorophylls thus allowing greater transmission of light to deeper spaces. Thermotolerant organisms withstand high CO2 concentrations.

Technology's Essence

Professor Avigdor Scherz and his team focused on the sequences of the two major protein subunits D1 and D2 found in all purple bacteria PSII reaction centers. Two sites, D1-209 and D1-212, were found to show consistent changes between mesophilic, thermotolerant and thermophilic organisms including cyanobacteria, algae and green plants.

NO.	Field	Technology Number
39	Biotechnology, Pharma and Diagnostics	1433
Principal Investigator:	**Department**	**Patent Status**
Prof. Steven J. D. Karlish	Biological Chemistry	Granted US 7888059; 7888059
Title	**Small molecule as a potential treatment for Glaucoma**	
Link	http://yedarnd.com/technologies/small-molecule-potential-treatment-glaucoma-0	

Summary

Glaucoma is a common cause of blindness in industrialized countries and is the most frequent cause of irreversible blindness worldwide. Since raised intraocular pressure (IOP) has been implicated as the major risk factor, the main goal of all glaucoma therapies is to reduce IOP sufficiently to prevent continuous irreversible retinal cell damage. All the existing medications have local and systemic side effects, from eye burning to breathing difficulties. Therefore there is a clear need for a new generation of glaucoma drugs with a safer profile. Researches at Prof. Steve Karlish's lab developed novel derivatives of Digoxin that can be topically applied to the eyes. The current technology is based on derivatives of Digoxin, an inhibitor of the Na-K-ATPase pump, which is critical for the production of the eye fluids. The novel derivatives of Digoxin present higher selectivity towards the 2 isoform of the Na-K-ATPase pump that is more prevalent in the eye epithelium. Importantly, this molecular specificity offers a well-tolerated safety profile. Overall, this technology offers an effective reduction in ocular hypertension, the major risk factor in glaucoma, with diminished local side effects.

Applications

2-selective inhibitors effectively reduce IOP, and are therefore suitable for treating glaucoma and other ocular hypertension-associated diseases.

Advantages

2-selective inhibitors cause diminished local side effects and reduced systemic toxicity compared to digoxin.

The new agents can be administered both in a local (topical gel, eye-drop solution, etc.) or systemic fashion (oral administration or injection).

The new agents can be synthesized in a simple process.

Technology's Essence

The Na-K-ATPase consists of and subunits. Each subunit has several isoforms, differentially expressed in a tissue-specific fashion. The 2 isoform is the predominant isoform in the epithelium in the eye. The Karlish group have developed topically-applied inhibitors that are selective for the 2 isoform of Na-K-ATPase. These novel 2-selective inhibitors, derivatives of Digoxin and Digitoxin, show an increased selectivity for 2 over 1, up to about 8-fold, making them twice more selective than Digoxin. These novel inhibitors can penetrate the intact eye and effectively reduce IOP with diminished local side effects and systemic toxicity.

NO.	Field	Technology Number
40	Biotechnology, Pharma and Diagnostics	1155

Principal Investigator:	Department	Patent Status
Prof. Yechiel Shai	Biological Chemistry	Granted US 7671011; 8445 636

Title	Novel Antifungal and Antimicrobial Lipopeptides
Link	http://yedarnd.com/technologies/novel-antifungal-and-antimicrobial-lipopeptides-1

Summary

Innovative antimicrobial drugs.
The market size for antimicrobial agents is now greater than $25 billion per year. However, the global emergence of resistance to antimicrobial agents is increasingly limiting the effectiveness of current drugs. Novel therapeutic approaches that can overcome multidrug-resistant bacteria are therefore in great demand. The present technology utilizes novel lipopeptides with new mode of action that exhibit potent anti-fungal and anti-bacterial activities against a broad spectrum of drug-resistant strains

Applications

Therapeutics. Disinfectants. Food preservatives.

Advantages

Broad range of antibacterial and anti fungal activity, also effective against resistant strains.
A unique mode of action that reduces the likelihood of developing resistant strains.
The structure of the molecules allows high versatility that may create a broad range of molecules with unique properties.
A simple and low cost production process.
Long shelf life.

Technology's Essence

Naturally occurring antimicrobial peptides, which are part of the innate immunity of all organisms, have the ability to disrupt the microorganism's membrane thereby inducing cell lysis. This effective mode of action reduces the probability for new resistant strains to emerge. The present invention relates to a novel family of potent antimicrobial peptides with unique structural properties that can be utilized to address particular therapeutic needs.

NO.	Field	Technology Number
41	Biotechnology, Pharma and Diagnostics	1446
Principal Investigator:	**Department**	**Patent Status**
Prof. Rony Seger	Biological Regulation	Granted US 8748371
Title	**Inhibition of Nuclear Entry of MAPK Cascade Proteins as a Novel Mechanism for Treating Cancer**	
Link	http://yedarnd.com/technologies/inhibition-nuclear-entry-mapk-cascade-proteins-novel-mechanism-treating-cancer-0	

Summary

Peptide sequences for efficient inhibition of nuclear translocation of proteins.

The ability to regulate cellular localization of a biological component is important for many functions such as gene therapy, protection from toxic chemicals, transport of anti-cancer agents, and possibly preventing nuclear translocation of oncogenes. To ensure accurate cellular functioning, the spatial distribution of proteins needs to be delicately regulated and coordinated. This is particularly apparent in many signaling proteins that dynamically and rapidly change their localization upon extracellular stimulation. The present invention provides peptides that may be used to regulate the nuclear translocation of proteins that endogenously comprise such nuclear translocation signals.

Applications

Inhibition of translocation of endogenous oncogenes and thereby the transcription they induce.

Advantages

Regulation of the level of nuclear targeting activity by selection of different amino acids in the peptide sequences.

Peptides can be modified in order to make them more stable in the body.

Modulation of the nuclear activities of proteins without harming their cytoplasmic activities.

Technology's Essence

The current invention identifies a 3-amino acid domain (Ser-Pro-Ser, SPS), which is a nuclear translocation signal present in signaling proteins such as extracellular signal-regulated kinase (ERK2) protein, SMAD3 and mitogen-activated protein kinase 1 (MEK1). SPS participates in nuclear translocation upon extracellular stimulation. Since several of these proteins are involved in the regulation of cellular proliferation and oncogenic transformation, the SPS domain can compete with the translocation machinery and therefore prevent the translocation of the proteins into the nucleus. As was shown in animal models, inhibiting this mechanism has an advantage over other ways of inhibition as it doesn't lead to a negative feedback loop which may enhance the production of the protein.

NO.	Field	Technology Number
42	Biotechnology, Pharma and Diagnostics	1618
Principal Investigator:	**Department**	**Patent Status**
Prof. Yechiel Shai	Biological Chemistry	Pending
Title	**Peptides boost immunity**	
Link	http://yedarnd.com/technologies/peptides-boost-immunity	

Summary

A novel method is disclosed here for boosting the immune response, useful not only for the treatment of microbial and chronic viral infections, but also for activating the immune system against cancer cells. TLR-4 is a central player in the innate immune system as it specifically recognizes lipopolysaccharide (LPS), the major cell wall component of Gram-negative bacteria, and activates the immune system. Newly developed peptides derived from the N-terminus of a TLR-4 trans-membrane domain are capable of activating TLR-4 mediated immune response, thus useful both as stand-alone treatments and as vaccine adjuvants, increasing the immunogenicity of an antigen in a vaccine. Taken together, the newly developed peptides are useful for the treatment and prevention of a large variety of infections, such as microbial (e.g. Salmonella, Escherichia, Pseudomonas), viral (including HIV, Hepatitis and Influenza) and fungal infections. Further, they are useful in the treatment and prevention of a wide variety of cancers.

Applications

Treatment for a wide variety of infectious diseases and cancers.
Prophylaxis for a wide variety of infectious diseases and cancers, as an adjuvant administered together with specific antigen.

Advantages

Treats a wide variety of bacterial, viral and fungal infections.
Suitable both as a treatment and prophylaxis.
Boosts the endogenous immune system
Peptides are easy to synthetize and purify
Patient-friendly administration, either systemic or local.

Technology's Essence

The technology is based on the discovery that peptides derived from the N-terminus of a TLR-4 TM domain or their analogs are capable of activating TLR-4 mediated immune response. These peptides activate TLR-4 receptor, possibly by dimerizing within the cell membrane and stabilizing the TLR-4 dimer. Through TLR-4 activation, these peptides activate macrophages to secrete TNF-alpha, thereby stimulating the immune system. In addition, the ability of these peptides to modulate the immune system's innate response renders them useful as vaccine adjuvants, increasing the immunogenicity of an antigen in a vaccine.

NO.	Field	Technology Number
43	Biotechnology, Pharma and Diagnostics	1667
Principal Investigator:	**Department**	**Patent Status**
Prof. Irun R. Cohen	Immunology	Pending
Title	**Type I diabetes - BETA cells regeneration**	
Link	http://yedarnd.com/technologies/type-i-diabetes-beta-cells-regeneration-0	

Summary

Innovative treatment for beta cell regeneration in longstanding diabetics

Type 1 Diabetes Mellitus (T1D) is caused by the autoimmune destruction of pancreatic insulin-producing beta cells. It is an incurable disease and cannot be prevented. While the existing treatments can arrest or inhibit the destruction of beta cells, currently no therapy exists that is effective in the millions of longstanding T1D patients, who have no residual beta cells.

A novel method is presented here for treating established diabetics. It is based on the surprising discovery that DiaPep277, already proven effective in arresting the autoimmune destruction of residual beta cells, is capable of inducing beta cell regeneration in NOD mice with advanced T1D, thus rendering DiaPep277 suitable for treating longstanding T1D patients.

Applications

A method to treat established diabetics to induce regeneration of beta cells.

Advantages

Provides treatment for a segment of the diabetic patients which currently have no treatment available.

Easier to approve as DiaPep270 was already proven successful in phase III clinical trials for arresting the process of beta cell destruction.

Technology's Essence

The proposed technology demonstrates that DiaPep277 is capable of inducing beta cell regeneration after the initial supply of beta cells is gone.

DiaPep277, a p277-derived synthetic peptide administered in a digestible lipid vehicle such as Lipofundin, was shown to be effective in treatment of newly-diagnosed T1D patients by modulating and arresting the autoimmune destruction of residual beta cells. It has successfully completed a phase III clinical trial. However, DiaPep277 was never suspected to be effective in treating patients with advanced T1D who have no residual beta cells. Surprisingly, it was found in a study conducted by Prof. Cohen and his team that under a different dosage regimen, DiaPep277 is capable of inducing beta cell regeneration in NOD mice with advanced T1D. Specifically, the treated mice show increased survival, decreased blood glucose levels, and higher levels of C-peptide, a biomarker for endogenous insulin production.

NO.	Field	Technology Number
44	Biotechnology, Pharma and Diagnostics	1632
Principal Investigator:	**Department**	**Patent Status**
Dr. Eran Hornstein	Molecular Genetics	Pending
Title	**Repositioning of small molecule for ALS treatment**	
Link	http://yedarnd.com/technologies/repositioning-small-molecule-als-treatment-0	

Summary

Amyotrophic lateral sclerosis (ALS, also known as Lou Gehrig□s disease) is a progressive neurodegenerative disease that leads to paralysis, due to the death of motor neurons in the spinal cord and brain. There is no known cause, cure or effective treatment for the disease. Rilutek® (riluzole) is the only approved drug prescribed for the treatment of ALS. However, Rilutek does not improve patient quality of life or survival. Prof. Hornstein and his team have discovered that microRNAs (miRNA) are globally downregulated in motor neurons of sporadic and familiar ALS patients and in ALS cell-culture model. Remarkably, they demonstrated that the deleterious effect of ALS-causing mutations on miRNA processing could be reversed by Enoxacin, an antibiotic known to increase miRNA levels via upregulation of Dicer1, a key player in miRNA maturation. This discovery establishes Dicer1 as a new target for ALS drug development and holds a potential for an effective treatment for ALS.

Applications

Effective drug for ALS, a disease for which no current effective drug or treatment are available

Advantages

A novel mechanism of action, which potentially addresses the pathogenesis of the disease. Low incidence of mild and transient side effects such as rash, nausea, headache and dizziness. Enoxacin is already FDA approved as antibiotics (approved in Europe, removed from shelf in USA).

Technology's Essence

The proposed technology is based on the discovery that microRNAs (miRNA) are globally downregulated in motor neurons of sporadic and familiar ALS patients and in cultured neurons, which express ALS-causing mutant forms of TDP-43, FUS or SOD1. Prof. Hornstein and his team further revealed that while mature miRNAs were downregulated, the levels of their cognate pre-miRNA precursors were upregulated by ectopic expression of ALS-causing mutant TDP-43 or FUS. Finally, they have demonstrated that the deleterious effect of the ALS-causing mutations on miRNA□processing could be reversed by Enoxacin, a Fluoroquinolone antibiotic, known to increase miRNA levels via enhancement of Dicer1 activity, which plays a key role in miRNA maturation.

NO.	Field	Technology Number
45	Biotechnology, Pharma and Diagnostics	1673
Principal Investigator:	**Department**	**Patent Status**
Prof. Anthony H. Futerman	Biological Chemistry	Pending
Title	**Long chain sphingoid as preventing infection**	
Link	http://yedarnd.com/technologies/long-chain-sphingoid-preventing-infection-0	

Summary

CF is the most common autosomal recessive disorder in western countries, affecting approximately 30,000 people in the US alone. A major risk in CF arises from chronic bacterial lung infections, affecting 80% of CF patients by the age of 25. Bacterial lung infections are also of major clinical importance in patients with chronic obstructive pulmonary disease (COPD), trauma, burn wounds, sepsis, or in patients requiring ventilation. The infections are currently treated with antibiotics, which rapidly become inefficient as resistant bacteria strains arise. The present technology suggests a novel therapeutic approach for the prevention and treatment of bacterial lung infection in susceptible populations, especially CF patients

Applications

Alternative treatment for bacterial lung infections.

A prophylaxis for patients susceptible to bacterial lung infections

Advantages

A novel therapeutic approach to prevent or cure bacterial lung infection.

The new therapy is based on reinforcement of the physiological innate immunity rather than on antibiotics.

The new therapy can be easily administered, via inhalation.

FTY720, a SPH analog, is already in clinical use for treating multiple sclerosis.

Technology's Essence

Sphingosine (SPH), a natural bactericidal agent which acts as a part of the human innate immune system in the skin, was found to be an effective treatment and prophylaxis for bacterial lung infections in cystic fibrosis (CF) mice. The new technology is based on the discovery that both CF human patients and CF mice display reduced rates of SPH in the airways. Moreover, normalizing SPH levels by inhalation prevents or cures the infections in CF mice, thus rendering SPH and its analogs a potent therapeutic agent for CF patients, an alternative to antibiotics.

NO.	Field	Technology Number
46	Biotechnology, Pharma and Diagnostics	1639
Principal Investigator:	**Department**	**Patent Status**
Prof. Yechiel Shai	Biological Chemistry	Pending
Title	**Short Lipopeptide inhibitor for HIV-1**	
Link	http://yedarnd.com/technologies/short-lipopeptide-inhibitor-hiv-1-0	

Summary

Sphingolipid-peptide conjugates with potent anti-viral activity.
According to the WHO, 34 million people around the world are afflicted with HIV, the causative agent of AIDS, with approximately 2.5 million new infections diagnosed each year. The development of new drugs against HIV has been the focus of intense research since its discovery. The market size of HIV-1 treatment is indeed significant with drug sales expected to rise from $13.3 bn in 2011 to $16.7 bn in 2020 in the Western world alone. Nevertheless, there is a highly unmet need for innovative HIV treatment approaches. One such approach is the design of early entry inhibitors that are able to block viral fusion and entry into the host cell. The present technology presents sphingolipid-peptide conjugates (sphingo-peptides) with a potent capacity to interfere with HIV viral fusion.

Applications

Design of novel HIV therapeutics.
Extension of half-life of current HIV fusion inhibitors.
Topical blockers of viral transmission.

Advantages

Blocking viral entry prevents all subsequent intracellular steps, most importantly viral genome integration.
Sphingolipid conjugates improve efficacy and half-life of current HIV fusion inhibitors.
Sphingopeptides were shown to be effective against certain drug-resistant strains.
A unique mode of action that reduces the likelihood of developing resistant strains.

Technology's Essence

The first step in the life cycle of enveloped viruses such as the HIV-1 is entry into their host cells by membrane fusion. Therefore, the dynamic process of HIV fusion and entry represents a valid target for rational drug design. A team of researchers at the Weizmann Institute has developed unique sphingolipid-peptide conjugates that block the fusion of the HIV virus to its host cell membrane. Remarkably, the sphingolipid moiety endowed potent anti-viral activity to otherwise poorly and nonactive peptides. Moreover, the sphingo-peptide inhibitors were shown to be highly effective against both wt as well as drug-resistant HIV strains.

NO.	Field	Technology Number
47	Biotechnology, Pharma and Diagnostics	1690
Principal Investigator:	**Department**	**Patent Status**
Dr. Rotem Sorek	Molecular Genetics	Pending
Title	**Bacterial Anti-Phage Defense Systems**	
Link	http://yedarnd.com/technologies/efficient-production-recombinant-proteins-1	

Summary

Optimal growth and metabolic activities of Lactic Acid Bacterial (LAB) starters are critical for assuring high-quality fermentation in the manufacturing process of numerous dairy products. Despite extensive efforts, phage infection of starter cultures for dairy processing remains the most common cause of slow or incomplete fermentation and product downgrading. Standard anti-phage measures (sanitation, culture handling) fail to provide sufficient protection, exposing the production process to massive economic setbacks.

Extensive R&D efforts have led to the discovery of phage resistance systems, however many phages can circumvent these systems, and in addition not all LABs can accommodate them. Therefore, there is a strong need for additional defense systems that could naturally protect LABs against phages.

The Sorek laboratory at the Weizmann Institute of Science has recently identified hundreds of novel functional toxin/antitoxin systems in bacterial genomes. These systems were discovered using analysis of data from millions of shotgun cloning experiments across 388 bacterial species. Acting as an abortive infection agent to prevent phage spread, some of these systems were already validated as conferring resistance against phage infection upon introduction to E.coli cells.

In another novel technology, researchers at Dr. Rotem Sorek's lab identified a novel anti phage gene cassette, termed BREX (Bacteriophage Exclusion), which confers complete or partial resistance against phages spanning a wide phylogeny of phage types, including lytic and temperate ones.

Applications

Tools for conferring anti-phage traits to bacterial starters.

Advantages

Provides efficient phage-resistance features.

Robust: confers resistance to a broad range of phages, including both lytic and temperate ones.

General: the same defense system may be applied in various cultures, not confined to specific strains.

Novel systems, provides a fresh approach to the field of phage resistance

Technology's Essence

Toxin/antitoxin (TA) modules, composed of a toxic protein and a counteracting antitoxin, are proposed to function in phage defense via abortive infection.

NO.	Field	Technology Number
48	Biotechnology, Pharma and Diagnostics	1601
Principal Investigator:	**Department**	**Patent Status**
Prof. Yosef Yarden	Biological Regulation	Pending
Title	**Therapy for early stage Ductul Carcinoma In Situ (DCIS) breast cancer**	
Link	http://yedarnd.com/technologies/therapy-early-stage-ductul-carcinoma-situ-dcis-breast-cancer	

Summary

A potent combination therapy against non-invasive breast cancer. Among the different subtypes of breast cancer, ductal carcinoma in situ (DCIS) represents an intermediate step between normal breast tissue and invasive breast cancer. Currently, about 25% of breast cancers that are diagnosed in the US are DCIS. DCIS is commonly treated by surgical intervention followed by adjuvant radiation therapy. However, a significant fraction of the DCIS lesions, which display HER2 gene amplification, are associated with increased relapse rate following surgery. Therefore, in cases of HER2-overexpressing DCIS a molecularly targeted therapy might be necessary for complete eradication of microscopic remnants following surgical tumor removal. The current technology presents an potential DCIS therapeutic strategy that collectively targets the functionally linked HER2 and Notch pathways.

Applications

Combination therapy for DCIS patients following surgical tumor removal. Classification of DCIS patients according to HER2 Notch activation patterns to identify patients with increased risk of relapse after surgery. Diagnostic antibodies to NRG4 to screen for cancer cell subtypes that express/over-express NRG4. NRG4 fusion conjugates, where NRG4 acts as a vehicle to direct the conjugate to cells specifically expressing the receptor ErbB4.

Advantages

Targeted cancer therapies will give doctors a better way to tailor cancer treatment. Targeted cancer therapies hold the promise of being more selective, thus harming fewer normal cells, reducing side effects, and improving the quality of life. The proposed treatment strategy may prove beneficial in DCIS patients with poor prognosis.

Technology's Essence

The HER2/Neu oncogene, a member of the HER/ErbB signaling network, encodes a receptor-like tyrosine kinase, whose overexpression in breast cancer predicts poor prognosis and resistance to conventional therapies. Pre-invasive lesions, such as DCIS, overexpress HER2 at higher frequency than invasive ones. Another signal transduction pathway critical for breast cancer progression comprises Notch family receptors and their membrane-bound ligands. In the current technology, a team of researchers from the Weizmann Institute of Science uncovered that overexpression of HER2 in a novel experimental model of DCIS leads to transcriptional upregulation of Notch pathway components, resulting in enhanced tumor cell survival and proliferation.

NO.	Field	Technology Number
49	Biotechnology, Pharma and Diagnostics	1650
Principal Investigator:	**Department**	**Patent Status**
Prof. Ron Milo	Plant Sciences	Pending
Title	**Cost-Effective Astaxanthin Production in Bacteria**	
Link	http://yedarnd.com/technologies/cost-effective-astaxanthin-production-bacteria	

Summary

Efficient Production of natural Astaxanthin in bioengineered bacteria is a game changer for the nutraceuticals industry. The market-pull for natural Astaxanthin is much greater than the supply. Synthetic Astaxanthin is produced from petrochemical sources; it contains unwanted stereoisomers and is rejected by consumers who prefer natural Astaxanthin. Production of natural Astaxanthin in microalgae is laborious, expensive, and time-consuming. Researchers at the Weizmann Institute used a combinatorial approach to construct bioengineered operons capable of modulating the expression levels of enzymes involved in the production of Astaxanthin. By combinatorial pairing of these genes in E. coli, they achieved natural Astaxanthin production 4-fold higher than previously reported. The innovative method can challenge the deficiencies of natural Astaxanthin production in microalgae. Following scale-up and industrial development of the proprietary process, production of natural Astaxanthin has the potential to be considerably cheaper and competitive with the cost of synthesizing Astaxanthin.

Applications

Cost-effective Production of natural Astaxanthin for the nutraceuticals industry, animal feed industry, and others. A doorway to the generation of many future products in E. coli, specifically metabolites that are produced in elaborate metabolic pathways.

Advantages

Full control over carotenoid accumulation profile. Cheaper, straightforward generation of Astaxanthin in E. coli as opposed to generation in algae which involves high raw materials cost, land usage, air emissions etc. Natural Astaxanthin as opposed to synthetic, uncontaminated with intermediate compounds and stereoisomers.

Technology's Essence

Researchers employed a method that uses the relatively short Ribosome Binding Site (RBS) sequence in a combinatorial manner. The methodology involves combinatorial pairing of target genes (Astaxanthin metabolic pathway enzymes) with a small set of RBS sequences and assembling them into a library of synthetic operons to explore protein expression space and to locate desired phenotypes in bacteria. The researchers used a small set of RBS sequences to modulate in parallel the protein expression levels of multiple genes over several orders of magnitude. Using this approach, they were able to efficiently scan a large fraction of the Astaxanthin metabolic expression space with a manageable set of tested genotypes.

NO.	Field	Technology Number
50	Biotechnology, Pharma and Diagnostics	1610
Principal Investigator:	**Department**	**Patent Status**
Dr. Eran Hornstein	Molecular Genetics	Granted US 8951983
Title	**miRNA function in Insulin associated medical**	
Link	http://yedarnd.com/technologies/mirna-function-insulin-associated-medical-1	

Summary

A novel method for increasing Insulin content in pancreatic beta cells. In healthy individuals, Insulin is produced by beta cells of the pancreas. In people with type 1 diabetes mellitus (T1DM), these cells do not produce enough Insulin to effectively fine-tune blood sugar levels. In the US alone there are up to 3 million affected individuals with 30,000 new cases diagnosed each year. Worldwide, T1DM incidence has been increasing in recent years by 2% to 5%. Traditionally treated by multiple daily injections of recombinant Insulin, T1DM management represents a significant burden to both patients and the healthcare system. Recent data estimate that T1DM costs the US ~$15 billion annually in medical costs and lost income. Thus, novel therapeutic approaches to amplify Insulin production in diseased beta cells or to replace them entirely are in great need. The present technology describes a cell-based method to enhance beta cell differentiation and Insulin production by the downregulation of a pancreas-enriched microRNA.

Applications

Cell replacement therapy: directed differentiation of stem cells towards a beta cell fate followed by transplantation of these engineered cells into patients.

These methods can potentially be applied to other Insulin deficiency-related conditions such as diabetes mellitus type 2, metabolic syndrome and obesity.

Advantages

Simple and robust method for accelerating beta cell differentiation.

Cell base therapy for diabetes.

Increasing Insulin level.

Technology's Essence

A research team headed by Dr. Hornstein from the Weizmann Institute has discovered an essential role for microRNA-7 (miR-7), a microRNA that is highly and selectively expressed in the endocrine pancreas, in the regulation of beta cell differentiation. By down-regulating the expression of miR-7, the researchers were able to accelerate beta cell differentiation, and concomitantly to augment their Insulin production rate. The data gained from these studies can be further utilized in cell-based therapy applications to restore Insulin production in damaged beta cells, or alternately to replace these cells with stem cells coaxed to differentiate towards a beta cell fate.

NO.	Field	Technology Number
51	Biotechnology, Pharma and Diagnostics	1662
Principal Investigator:	**Department**	**Patent Status**
Prof. Lea Eisenbach	Immunology	Pending
Title	**Affinity Maturated T-Cell Receptor**	
Link	http://yedarnd.com/technologies/affinity-maturated-t-cell-receptor-0	

Summary

Immunotherapy, that is the use of the immune system to treat cancer, is currently a leading candidate in the combat against cancer. Unlike the toxic effects of both chemotherapy and radiation, immunotherapy is considered to have mild side effects due to its ability to differentiate between healthy and cancerous cells. Also, the therapeutic role of the immune system is an essential element in the healing process due to bone marrow transplantation for hematologic malignancies. However, a more efficacious and less toxic T cells based treatment is required. Effective therapy depends on the functional avidity between T cell receptors (TCRs) and peptide-MHC complex (pMHC). However the natural affinity of TCR is low and they do not naturally undergo the processes that improve antibody affinity, such as somatic hypermutation (SHM). Currently there is no method of increasing the affinity of a TCR to its ligand. Moreover there is no knowledge on how use affinity maturated TCRs for creating anti-tumor reactive cells. This technology presents a method of increasing the affinity of a TCR to its ligand. This is done by subjecting TCR genes to SHM via the enzyme Activation Induced cytidine Deaminase (AID). The technology further provides affinity maturated TCRs (in cell- bound or in soluble form) and their pharmaceutical potential for immunotherapy.

Applications

Generating anti-tumor T cells
Generating T cells reactive against selected antigen

Advantages

Rapid, Effective

Technology's Essence

This novel technology reveals that the affinity of a TCR to its ligand may be increased remarkably by subjecting TCR genes to SHM, directed by AID.
First a nucleic acid construct encoding a TCR gene is expressed in a host cell. Next SHM is used to introduce mutations to the TCR gene. Last, the the cells will be analyzed for affinity maturation by tetramer staining and subsequently sorted by FACS.
There are three parallel approaches to perform affinity maturation for the TCR: (1) Ex-vivo affinity maturation system, using Tet-regulated expression of AID (2) Ex-vivo affinity maturation system, using controlled expression of AID by mRNA electrophoresis (3) In-vitro affinity maturation system, using extracts from cells that are in SHM and recombinant AID.

NO.	Field	Technology Number
52	Biotechnology, Pharma and Diagnostics	1621
Principal Investigator:	**Department**	**Patent Status**
Dr. Karina Yaniv	Biological Regulation	Pending
Title	**Anti Angiogenic therapy**	
Link	http://yedarnd.com/technologies/anti-angiogenic-therapy-1	

Summary

Novel treatment for angiogenesis-related diseases. Angiogenesis has the growth of new blood vessels from pre-existing vasculature has an essential role in development, reproduction and repair. Pathological angiogenesis is a common theme in a broad range of diseases such as cancer, autoimmune diseases, age-related macular degeneration and atherosclerosis. The global market for angiogenesis stimulators and inhibitors is forecast to reach ~US $50 billion by the year 2015. Most of the currently marketed angiogenesis regulators, such as Avastin, typically display modest efficacy and therefore further highlight the great need for the development of novel therapeutics. The current technology presents a novel method to treat angiogenesis-related disorders by modulating apolipoprotein B (ApoB).

Applications

ApoB is a potential therapeutic target for the treatment of cancer and other non-neoplastic diseases. ApoB levels may serve as a biomarker for cancer metastasis.

Advantages

The anti-angiogenic effect of LDL administration was demonstrated in vivo, in zebrafish models, as well as in vitro, in relevant human cells lines. Regulation of ApoB levels may be applied to treat a broad range of angiogenesis-dependent diseases. Detection of ApoB levels can be readily achieved by analysis of body fluids such as blood and plasma.

Technology's Essence

Using a high-throughput genetic screen for vascular defects in zebrafish, researchers at the Weizmann Institute of Science have identified a genetic mutation that leads to excessive angiogenesis. The mutated gene is responsible for the assembly of ApoB-containing lipoproteins such as LDL, otherwise known as the bad□cholesterol. The group has found that low levels of LDL promote the formation of new blood vessels by directly interacting with the VEGF pathway. The outlined technology offers methods to modulate the levels of ApoB in order to stimulate, or inhibit angiogenesis, dependent on the therapeutic strategy. For example, inhibition of angiogenesis by increasing ApoB levels may repress tumor growth and attenuate its metastatic potential. In another application of this technology, increased circulating levels of ApoB can serve as a biomarker for the overproduction of blood vessels, thus enabling early diagnosis of pathogenic states in angiogenesis-dependent diseases.

NO.	Field	Technology Number
53	Biotechnology, Pharma and Diagnostics	1671
Principal Investigator:	**Department**	**Patent Status**
Dr. Jacob (Yaqub) Hanna	Molecular Genetics	Pending
Title	**Fully Naive Induced Human Pluripotent Stem Cells (iPSC)**	
Link	http://yedarnd.com/technologies/fully-naive-induced-human-pluripotent-stem-cells-ipsc-1	

Summary

A novel method to revert human iPSC to a fully naive state, retaining stable pluripotency. The feasibility for the existence of ground state naive pluripotency in human embryonic stem cells (hESC) has long been researched. This innovative technology supplies the composition of chemically defined conditions required for derivation and long term maintenance of such cells, without genetic modification.

Human naive pluripotent cells can be robustly derived either from already established conventional hESC lines, through iPSC reprogramming of somatic cells, or directly from ICM of human blastocysts. The new human pluripotent state was isolated and characterized; it can open up new avenues for patient specific disease relevant research and the study of early human development.

Applications

Reprogramming kits - Somatic cells to iPSC at near 100% efficiency (7days), iPSC to fully naive state.

Advantages

Deterministic iPSC reprogramming with no genetic modification required.
Stable pluripotency, with low propensity for differentiation
Reagents available off-the-shelf.

Technology's Essence

Hallmark features of rodent naive pluripotency include driving Oct4expression by its distal enhancer, retaining a pre-inactivation state of X chromosome in female pluripotent cell lines amongst others. Naive mouse ESCs epigenetically drift towards a primed pluripotent state; while human embryonic stem cells (hESCs) share several molecular features with naive mESCs (e.g. expression of NANOG, PRDM14 and KLF4 naive pluripotency promoting factors), they also share a variety of epigenetic properties with primed murine Epiblast stem cells (mEpiSCs). These observations have raised the question of whether conventioal human ESCs and induced pluripotent stem cells (iPSCs) can be epigenetically reprogrammed into a different pluripotent state, extensively similar with rodent nave pluripotency. Researchers at the Weizmann Institute discovered that supplementation of certain chemically defined conditions, synergistically facilitates the isolation and maintenance of pluripotent stem cells that retain growth characteristics, molecular circuits, a chromatin landscape, and signaling pathway dependence that are highly similar to naive mESCs, and drastically distinct from conventional hESCs.

NO.	Field	Technology Number
54	Biotechnology, Pharma and Diagnostics	1633
Principal Investigator:	**Department**	**Patent Status**
Prof. Yosef Yarden	Biological Regulation	Pending
Title	**Novel Aptamer for cancer theraphy**	
Link	http://yedarnd.com/technologies/efficient-production-recombinant-proteins-1	

Summary

The ErbB family consists of four structurally related receptor tyrosine kinases. Excessive ErbB signaling is associated with enhanced tumorogenesis, and as such serves as a major therapeutic target in a wide array of solid tumor cancers. A member of this family, the human epidermal growth factor receptor 2 (ErbB-2/HER2), is overexpressed in a variety of human cancers, including breast and gastric tumors. ErbB-2/HER2 amplification correlates with elevated metastatic activity and poor prognosis. An innovative and highly potent approach for cancer treatment is proposed here, based on delivering novel nucleic acid-based entities called aptamers targeting ErbB-2/HER2. Remarkably, the antitumor effect exerted by the multimeric anti-ErbB-2/HER2 aptamers is twofold stronger than that elicited by currently available antiErbB-2 monocolonal antibodies.

Applications

A novel class of molecules for the treatment of human cancers exhibiting excessive ErbB-2/HER2 signaling.

Combination with other therapeutic modalities may predictably enhance the antitumor activity of the aptamer.

Aptamers may also be harnessed as carrier molecules to deliver toxic loads into cancer cells.

Advantages

Unlike traditional methods for producing monoclonal antibodies, no organisms are required for the in vitro selection of oligonucleotides. This facilitates the selection and chemical design process of aptamers.

Aptamers are produced chemically in a readily scalable process.

Non-immunogenic.

Unlike other oligonucleotide-based therapeutics (siRNAs, antisense RNA), aptamer therapeutics can be developed for intracellular as well as extracellular or cell-surface targets.

Technology's Essence

Aptamers are single-stranded oligonucleotides that fold into defined architectures and avidly bind to targets such as proteins, with the same effectiveness and affinity associated with mAbs. Using a novel screening technology the research team has identified a multimeric aptamer with pronounced ErbB-2/HER2 inhibitory activity. Preliminary preclinical experiments show that treatment of gastric tumor-bearing mice with trimeric aptamer resulted in reduced tumor growth that was nearly twofold stronger than that achieved with a monoclonal anti-ErbB-2/HER2 antibody.

NO.	Field	Technology Number
55	Biotechnology, Pharma and Diagnostics	1679
Principal Investigator:	**Department**	**Patent Status**
Prof. Yosef Yarden	Biological Regulation	Pending
Title	**Therapy for Triple Negative Breast Cancer**	
Link	http://yedarnd.com/technologies/therapy-triple-negative-breast-cancer-0	

Summary

A novel therapy for Triple Negative Breast Cancer (TNBC) using mAbs combination

Breast cancer is the most common cancer in women worldwide. Triple-negative breast cancer (TNBC) representing about 15% of all breast cancer cases, is the deadliest form of all breast cancer subtypes, and tends to affect women at a younger age. Unfortunately TNBC cannot be treated with the common receptor targeted therapies since it does not express these targets, the estrogen, progesterone and Her2/neu receptors. Therefor systemic treatment options are currently limited to cytotoxic chemotherapy. The lack of effective targeted therapies, resistance to chemotherapy, and early metastatic spread have contributed to the poor prognoses and outcomes associated with TNBC.

The current technology offers a novel therapeutic strategy for TNBC. The application of two novel, noncompetitive antibodies against EGFR, achieves a robust degradation EGFR resulting in tumor inhibition.

Applications

Novel and unique antibody targeted therapy for TNBC.

The novel anti EGFR antibodies can cooperate synergistically with the currently marketed EGFR antibodies.

Advantages

A promising therapeutic scenario to treat TNBC.

Enhanced EGFR degradation and improved anti-tumor activity, in contrast to clinically approved anti-EGFR mAbs, which display no cooperative effects.

Lysosomal EGFR degradation pathway induced by epitope-distinct antibody mixture may potentially lead to improved therapeutic outcome, and reduced resistance.

Technology's Essence

Prof. Yosef Yarden and his team demonstrated that a combination of novel antibodies that target distinct regions on the human EGF receptor resulted in its robust and synergistic down-regulation, leading to pronounced tumor growth inhibition. Furthermore, the combined mAbs induced lysosomal degradation of EGFR, while avoiding the recycling route. Such irreversible mode of EGFR degradation may potentially increase response rate or delay the onset of patient resistance.

Conversely, combining cetuximab and panitumumab, the mAbs routinely used to treat colorectal cancer patients, did not improve receptor degradation because they are both attracted to the same epitope on EGFR.

NO.	Field	Technology Number
56	Biotechnology, Pharma and Diagnostics	1642
Principal Investigator:	**Department**	**Patent Status**
Prof. Deborah Fass	Structural Biology	Pending
Title	**Compositions for inhibitors of QSOX1**	
Link	http://yedarnd.com/technologies/compositions-inhibitors-qsox1-0	

Summary

A potential target for anticancer drug design.

Cancer is the second leading cause of death in the US, accounting for roughly 23% of all deaths (as of 2008), and with estimated cost of care of $157 billion (as of 2010). Despite major advances in the management of cancer, most types of solid tumors remain resistant to conventional treatment modalities. The local microenvironment, or niche, of a cancer cell plays important roles in cancer development. A major component of the niche is the extracellular matrix (ECM), a rich mesh of fibrous proteins surrounding cells that has been shown to exert a protective and supporting effect on cancer progression. Therefore, targeting the ECM represents a novel avenue for rational anticancer drug design. The current technology allows for specific targeting of an enzyme that takes part in ECM assembly and maintenance, and may provide a novel means for combating cancer progression and metastasis emergence.

Applications

Inhibitory antibodies to block QSOX1 catalytic activity in ECM as means to combat cancer progression and metastatic disease. QSOX1 inhibition may also be utilized to treat lamin-associated disease.

Advantages

Since QSOX1 functions outside cells it would be accessible to antibodies that are not readily taken up by cells. Since the microenvironment confers anticancer therapy resistance, a treatment that specifically targets the stromal cells may be synergistically combined with existing therapeutic modalities.

Technology's Essence

A team of researchers at the Weizmann Institute have that a secreted disulfide bond catalyst known as Quiescin sulfhydryl oxidase 1 (QSOX1) is required for proper assembly of the ECM. The main substrates of QSOX1 within the ECM are laminins. Thus, cells lacking QSOX1 show poor incorporation of laminin into the ECM mesh, resulting in decreased cell adherence and perturbed cell migration. Notably, in some cancer types such as pancreatic and breast cancers, QSOX1 and the ECM components it produces are over-expressed. This suggests that modulation of QSOX1 activity may provide a novel means to combating cancer and metastasis. Treatment of cancer cells with a monoclonal QSOX1-targeting antibody effectively blocked cell migration and provides a novel strategy for cancer treatment by QSOX1 inhibition.

NO.	Field	Technology Number
57	Biotechnology, Pharma and Diagnostics	1602

Principal Investigator:	Department	Patent Status
Dr. Rotem Sorek	Molecular Genetics	Pending

Title	Novel Compositions for downregulating bacterial genes
Link	http://yedarnd.com/technologies/novel-compositions-downregulating-bacterial-genes-0

Summary

A novel technology for robust downregulation of bacterial genes.RNAi (RNA interference) is a powerful method for downregulation of gene expression in eukaryotic systems. RNAi-based technologies are extensively applied as scientific research tools, as well as actively explored as promising therapeutic agents. However, although an efficient way to dowregulate bacterial and microbial gene expression has been long sought after, RNAi is not applicable in these species. The present technology offers a rapid and simple means to silence gene products in prokaryotic systems.

Applications

Treatment of bacterial infection, by targeting bacterial genes vital for antibiotic resistance or bacterial virulence. Enhanced biofuel production by targeting genes that interfere with ethanol and/or hydrogen biosynthesis. Generation of improved bacterial strains for the diary industry (e.g. phage-resistant strains). Discerning prokaryotic gene function by silencing the expression of the gene product.

Advantages

The present technology may offer means to treat antibiotics-resistant strains.
Because CRISPR-based technology does not involve □classical□ genetic engineering, the resulting products do not require labeling as 'genetically modified'.
CRISPR-based technology system allows for the development of a rapid, scalable and high-throughput platform to probe the function of genetic circuits in prokaryotes.

Technology's Essence

CRISPR (clusters of regularly interspaced short palindromic repeats) is a recently discovered anti-viral system that functions as the prokaryotic-equivalent of the adaptive immune system. CRISPR provides bacteria with protection against foreign genetic elements such as viruses by incorporating short stretches of invading DNA sequences in genomic CRISPR loci. These integrated sequences are thought to function as a genetic memory that prevents the host from being infected by the viruses and other genetic elements containing this recognition sequence. A team of researchers at the Weizmann Institute, headed by Dr. Rotem Sorek, has developed a unique technology to gain robust and rapid silencing of prokaryotic gene expression by exploiting the CRISPR system capacity to efficiently downregulate gene products. This potent technology can potentially be utilized in a broad range of areas such as in the agriculture, food and pharmaceutical industries as well as in the scientific research arena.

NO.	Field	Technology Number
58	Biotechnology, Pharma and Diagnostics	1555
Principal Investigator:	**Department**	**Patent Status**
Prof. Matityahu Fridkin	Organic Chemistry	Pending
Title	**Elongating drug half life using albumin binding probe**	
Link	http://yedarnd.com/technologies/elongating-drug-half-life-using-albumin-binding-probe-1	

Summary

Albumin binding probe for extending the lifetime of drugs. Most polypeptide drugs, in particular non-glycosylated proteins of molecular mass less than 50 kDa, are short-lived species in vivo having circulatory half lives of 5-20 min. Drug association with endogenous albumin may be suitable for designing an approach to protract the action in vivo of, potentially, any short-lived peptide/protein drug. In doing so two principal obstacles must be overcome: (1) following its conjugation, the probe introduced into a peptide or a protein should have sufficient affinity to albumin to manifest prolonged action in vivo, and (2) in case such covalent introduction results in an inactive product, the latter should be capable to undergo slow reactivation at physiological conditions. The present invention relates to engineering prolonged-acting prodrugs employing an albumin-binding probe that undergoes slow hydrolysis at physiological conditions.

Applications

Prolonging half life of short-lined drugs

Advantages

Prolonging the action of the drug without effecting its activity, A desirable pharmacokinetic pattern

Technology's Essence

Since albumin is long-lived in vivo, drugs and endogenous substances that tightly associate with it have lower clearance rates than that of the unbound substances, and exhibit prolonged lifetime profiles in vivo. The present invention is based on a concept according to which a long chain fatty acid (LCFA) like albuminbinding compound is covalently linked to a short-lived amino-containing drug to form a non-covalent drug conjugate capable of associating with albumin in vivo, i.e., a long-lived prodrug that gradually releases the pharmacologically active constituent. This approach has been successfully implemented with several drugs (e.g. insulin, exendin and gentamicin).

NO.	Field	Technology Number
59	Biotechnology, Pharma and Diagnostics	1153

Principal Investigator:	Department	Patent Status
Prof. Vivian I. Teichberg	Neurobiology	Granted US 7404951; 7767204; 9034319

Title	**A Blood Glutamate Scavenger for the Treatment of Acute Neurodegenerative Disorders**
Link	http://yedarnd.com/technologies/blood-glutamate-scavenger-treatment-acute-neurodegenerative-disorders

Summary

N/A

Applications

The life-saving strategy that we propose is based on the use of blood Glu scavenging agents for the treatment acute neurodegenerative conditions in which the excess Glu present in the brain interstitial fluid is thought to trigger neuronal cell death and its accompanying neuropathological sequelae. It can be applied in stroke, perinatal brain damage, traumatic brain injury, bacterial meningitis, subarachnoid hemorrhage, open heart and aneurysm surgery, and hemorrhagic shock.

Advantages

N/A

Technology's Essence

A team of researchers at the Weizmann Institute have developed a novel neuroprotective strategy which is based on accelerating the naturally occurring brain-to-blood Glu efflux and attain thereby a decrease of deleterious Glu in brain. This was achieved by the intravenous administration of pyruvate and oxaloacetate which, by decreasing blood Glu levels, increase the driving force for the efflux of Glu from brain to blood. These compounds and others that have been developed by this team are acting as Glu co-substrates in the activation of the blood resident enzymes Glutamate-pyruvate transaminase and the Glutamate-oxaloacetate transaminase (GOT) which transform Glu into 2-ketoglutarate. Intravenous pyruvate alone was already proven to decrease the mortality and protect the brain of rats suffering from cardiac arrest or hemorrhagic shock. Thus, in contrast to the widespread effort to design a treatment of neurodegenerative disorders based on drugs that penetrate into the brain, our approach relies on drugs that remain in the blood circulation and boost a natural brain defense mechanism. i.e the brain to blood efflux of excess brain constituents.

NO.	Field	Technology Number
60	Biotechnology, Pharma and Diagnostics	1378

Principal Investigator:	Department	Patent Status
Prof. Ehud Y. Shapiro	Computer Science and Applied Mathematics	Granted US 8962532

Title	Rational design and automated synthesis of DNA libraries
Link	http://yedarnd.com/technologies/rational-design-and-automated-synthesis-dna-libraries-1

Summary

Researchers at the Weizmann Institute developed a novel method to design error-free DNA libraries from error-prone oligonucleotides. The system surpasses existing methods for de novo synthesis of DNA libraries in speed, precision, amenability to automation and ease of combining synthetic with natural DNA fragments. All DNA construction protocols struggle with the cumbersome task of cloning and sequencing synthetic DNA fragments, seeking an error-free one. The problem is worsened for longer synthetic DNA which is more prone to errors. Time spent on error correction, clone selection and sequencing is a major bottleneck that prevents de novo DNA synthesis from becoming a routine procedure in labs. This innovative solution significantly decreases the need for labor-intensive time-consuming error correction methods, cloning and sequencing. Furthermore, efficient editing and reassembly of different genes is made possible due to a smart recursive reconstruction process.

Applications

Design and construction of synthetic biological molecules and organisms. Construction of designer DNA libraries.

Advantages

Applicable in any lab with standard lab equipment. Faster and more precise than existing methods. Amenable to automation, full synthesis in vitro with a modified smPCR protocol. Very simple to combine synthetic and natural DNA fragments. Does not require additional or external methods or reagents for error correction

Technology's Essence

Divide and Conquer (D&C), the quintessential recursive problem-solving technique, is applied in silico to divide the target DNA sequence into overlapping oligonucleotides short enough to be synthesized directly, albeit with errors; error-prone oligonucleotides are recursively combined in vitro, forming error-prone DNA molecules; error-free fragments of these molecules are then identified, extracted and used as new, typically longer and more accurate, inputs to another iteration of the recursive construction procedure; the entire process repeats until an error-free target molecule is formed.

NO.	Field	Technology Number
61	Biotechnology, Pharma and Diagnostics	1173

Principal Investigator:	Department	Patent Status
Prof. Irit Sagi	Biological Regulation	Granted US 7524938; 8841108; 8324355;

Title	**Monoclonal antibodies as potent inhibitors of metalloprotienases**
Link	http://yedarnd.com/technologies/monoclonal-antibodies-potent-inhibitors-metalloprotienases-1

Summary

Targeting of an inhibitory antibody to the catalytic cleft of metalloenzymes. Metalloenzymes are important medicinal targets for conditions ranging from pathogenic infections to cancer. Inhibitory monoclonal antibody (mAb) scaffolds are often used to achieve selective molecular blocking of various metalloenzyme targets. However, antibodies' potency is often limited by the low immunogenicity of functional sites residing in protein clefts. The present technology consists of a novel approach for generating highly potent and selective inhibitory mAbs (metallobodies) targeting functional metallo-sites.

Applications

Treatment of inflammatory bowl disease. A general strategy in the field of function blocking/therapeutic antibodies targeted at enzyme catalytic metal sites

Advantages

This approach enables direct antibody targeting to the enzymatic active site as well as the its surface. The antibody recognizes only the active form of the metalloproteinase

Technology's Essence

Specific targeting of inhibitory antibodies to enzymatic active sites is invaluable both for research purposes, and as clinical diagnostic and therapeutic reagents. The innovative immunization strategy implemented in the current technology utilizes smart metallo-site mimicry organic molecules, followed by whole metalloenzyme of interest to stimulate affinity maturation towards metal-ion epitope and additional surface epitopes in the context of the whole molecule. This immunization procedure yielded prototype function blocking metallobodies targeting the catalytic zinc ion in matrix metalloproteinase-9 (MMP-9), an enzyme associated with inflammatory conditions and invasion diseases. As it was estimated that over 30% of known proteins require metal cofactors for proper functionality, this approach may provide a wide range of applications.

NO.	Field	Technology Number
62	Biotechnology, Pharma and Diagnostics	1656
Principal Investigator:	**Department**	**Patent Status**
Prof. Eitan Reuveny	Biological Chemistry	Pending
Title	**GIRK4 as a target for autoimmune diseases**	
Link	http://yedarnd.com/technologies/girk4-target-autoimmune-diseases-0	

Summary

In the new discovery, GIRK4, a potassium ion channel, was found to be expressed in regulatory B cells and to have an important role in modulating the immune response. GIRK4 inhibitors or the absence of GIRK4 diminished B- and T-cell migration and T-cell stimulation and decreased the efficiency of antigen presenting activity (APC), thus decreasing immune system activation. In a widely accepted animal model for MS, GIRK4 knockout mice (GIRK-/-mice) displayed delayed onset reduced severity of clinical symptoms associated with brain inflammation. The ability of GIRK4 inhibitors to reduce the stimulation of the immune system and to diminish inflammatory response renders them potential drugs for autoimmune or inflammatory diseases such as multiple sclerosis (MS), inflammatory bowel diseases (IBD) and Diabetes type 1 diseases which together affect 5 million people in the US alone.

Applications

A novel target and potential drugs for immune disorders therapy, including autoimmune or inflammatory diseases, and transplant rejection. A method for identifying a B cell as a regulatory B cell simply by using antibodies, useful in both research and as a diagnostic tool.

Advantages

N/A

Technology's Essence

The proposed technology is based on the discovery that GIRK4, a potassium ion channel, is expressed in regulatory B cells and has a role in modulating the immune response. Prof. Reuveny and his team have been studying potassium ion channels for a long time. Unexpectedly, they have found that one of these channels, GIRK4, is specifically expressed in regulatory B cells, and can therefore be used in research and in diagnostics as a membrane marker for this sub-population, which currently lack a direct marker. By using GIRK4 knock-out mice and GIRK4 inhibitors, Prof. Reuveny and his team further demonstrated that GIRK4 is associated with B and T cells migration and with T cell stimulation and affect antigen presenting activity (APC). Preliminary preclinical experiments have shown that in Experimental Autoimmune Encephalomyelitis (EAE), the most common animal model for MS, GIRK4 knockout mice (GIRK-/-mice) display delayed onset reduced severity of clinical symptoms associated with brain inflammation accompanying EAE as compared to wild type mice.

Chemistry and Nanotechnology (31개)

NO.	기술번호	기술명	비고
63	1643	Method of isolating distinct cells type	
64	1730	Carbon nanotube based transistor device	자문위 추천기술('1.25)
65	1615	Metal coated WS2 nanotubes for catalysis	
66	1568	Multi state organic molecules for sequential logic circuits	
67	1392	Water Treatment in Aerobic Conditions	자문위 추천기술('1.25)
68	1380	Molecular Electro-Optical Devices	
69	1265	Remediation of Polluted Water by Reductive Transformation Reactions	
70	1715	Na batteries electrode material based on inorganic nanoparticles	
71	1684	Metal Organic Frameworks (MOF) for Gas Adsorption	
72	1614	New catalytic process to grow inorganic nanotubes	
73	1722	Aerobic Carbon-Carbon Bond Cleavage of Alkenes to Aldehydes and Ketones	
74	1716	Production of Syngas from biomass	
75	1644	Magnetic memory without a permanent magnet	
76	1507	Production of Amines from Alcohol and Ammonia	
77	1559	Desulfurization of Fuels	
78	1566	Inorganic Fullerence Coating for Medical Devices	
79	1482	Conductive Inorganic Fullerenes and Nanotubes	
80	1551	Ruthenium atalysts for Formation and/or hydrogenation of esters, amides and their derivatives	
81	1561	Aerobic oxidation of alcohols to aldehydes	
82	1102	New Method for the Production of Aryl Alkenes by Oxidative Coupling of Arenes and Alkenes	자문위 추천기술('1.25)
83	1184	The MOCSER: a novel hybrid chemical-electronic detector	자문위 추천기술('1.25)
84	1394	A Method for the Removal of CO2 by Mineral Carbonation	자문위 추천기술('1.25)
85	1428	Organic Dyes	
86	1124	Molecular Diagnostics Utilizing High Throughput LSPR (Localized Surface Plasmon Resonance)	자문위 추천기술('1.25)
87	1399	Super Pyroelectricity	
88	1448	A New Catalyst for producing Amides from Alcohols	자문위 추천기술('1.25)
89	1646	A Rapid Freeze Quench Device	
90	1597	An efficient electro mechanical metal oxide	
91	1468	From Hydrophobic to Hydrophyllic and back again	자문위 추천기술('1.25)
92	1564	Recyclable membranes for size-selective separation of nanoparticles	
93	1506	Efficient Electrolysis of CO2	

NO.	Field	Technology Number
63	Chemistry and Nanotechnology	1643
Principal Investigator:	**Department**	**Patent Status**
Prof. Dr.Yoav Soen	Biological Chemistry	Pending
Title	**Method of isolating distinct cells type**	
Link	http://www.yedarnd.com/technologies/mouse-ige-and-anti-mouse-ige-monoclonal-antibodies	

Summary

Improving beta cell isolation and purification techniques is a critical step towards the development of new cell-based therapies, diagnostic applications and diabetes research. Pancreatic Islets are composed of mixed cell populations, among them beta cells, which represent a major focus of interest due to their participation in the pathology of diabetes. Various techniques have been suggested to accomplish this step, yet efficient and robust isolation of beta cells remains a challenging task. The present invention provides an efficient tag-free isolation method for pancreatic cell sub-types, based on separation according to a newly identified collection of surface markers. These markers are tightly correlated with specific functions, such as insulin production, ensuring enrichment of the desired functionality. Probing against the newly identified markers in a combinatorial manner allows high degree of purity without compromising the yield, significantly increasing the amount of purified cells. Finally, the method is compatible with both extracts of pancreatic tissues and stem cells derived cultures, the latter set up high expectations in the diabetes therapy field.

Applications

A kit for isolation of distinct pancreatic cell subtypes

Advantages

High purity without compromising the yield of isolated cells.

Compatible with a variety of heterogeneous sources including cells extracted from pancreatic tissue, committed lineages of stem cells and cultures of differentiated stem cells.

Technology's Essence

Using an innovative high throughput screen, linking specific cell surface markers with a particular functionality (e.g. insulin production), a collection of markers not previously identified in connection with pancreatic cells or with diabetes was found to be consistently expressed in human islets. Cell isolation according to the selected markers is performed by exposing the heterogeneous source of cells to specific antibodies that recognize these markers, followed by a choice of sorting techniques such as fluorescence activated cell sorting (FACS). The innovative concept of this method is the use of marker combinations, iterating the selection.

NO.	Field	Technology Number
64	Chemistry and Nanotechnology	1730
Principal Investigator:	**Department**	**Patent Status**
Prof. Shahal Ilani	Condensed Matter Physics	N/A
Title	**Carbon nanotube based transistor device**	
Link	http://yedarnd.com/technologies/carbon-nanotube-based-transistor-device	

Summary

Production of carbon nanotube based transistors through a process comprised of identification, selection, and placement of pristine carbon nanotubes in conjunction with standard electrical circuitry. Semiconductor devices are vital to everyday life, however conventional semiconducting materials are quickly approaching their limitations. As devices transition from the microscale to the nanoscale, new techniques for their assembly and testing of their properties must be created. Controllable nanofabrication methods are of increasing importance across a wide field of electronics in everything from energy efficient LEDs in flat-screen monitors to transistors for ultra-powerful computers. Our process presents a novel method for producing high quality nanoscale carbon nanotube based transistors. These methods will be of the utmost importance in the forthcoming nano-revolution.

Applications

Produce flawless carbon nanotubes, Identify, select, and position nanotubes with precision, Room temperature operation, High sensitivity, High resolution

Advantages

Single electron transistor (SET) nanoscale imaging
Novel nano-electromechanical devices

Technology's Essence

The principle behind this technology is two-fold: 1) Synthesis and selection method of flawless carbon nanotubes, and 2) their combination with nanoscale electric circuitry to form fully controlled composite nanoscale electronic device. Selection of the carbon nanotube(s) is assisted by a scanning probe microscope (SPM). A composite electronic device is assembled from two separated chips; a nanotube chip where nanotubes are grown over wide trenches, and a standard circuit chip with electrode contacts surrounding the gates to be measured. The nano-assembly is achieved by inserting an SPM cantilever into a trench on the nanotube chip and placing the circuit chip over a suitable nanotube. Once in place, the nanotube is cut locally by passing a strong current between the electrode contacts, and the composite chip is formed. This composite electronic device can be used to map electronic potentials with high resolution of 100 nm, high sensitivity of 1microV/Hz1/2, at frequencies of 100 MHz and more and all this at room temperature.

NO.	Field	Technology Number
65	Chemistry and Nanotechnology	1615
Principal Investigator:	**Department**	**Patent Status**
Prof. Reshef Tenne	Materials and Interfaces	Pending
Title	**Metal coated WS2 nanotubes for catalysis**	
Link	http://yedarnd.com/technologies/metal-coated-ws2-nanotubes-catalysis	

Summary

A new process for the production of catalytic metal coated WS2 nanotubes, using cobalt, palladium, nickel, chromium and noble metals.

These metal coated nanotubes were shown to have catalytic activity in different organic reactions including degradation of known organic contaminants (Co coated) and Suzuki and Heck coupling reactions (Pd coated).

Since catalytic chemical reactions are at the heart of many processes and industries, and efficient catalysis is essential for both economic and environmental reasons, this development of a new catalytic platform bears a potential to influence many diverse markets.

Applications

New and efficient Pd-based catalysts for diverse reactions.

New and efficient crude oil HDS catalysts.

New and efficient wastewater purification catalysts.

Production of activated hybrid WS2 nanotubes with new properties.

Tailoring catalytic nanotubes with different band gaps adjusted to different activation and catalysis applications.

Advantages

Formation of highly active catalytic nanotubes, Utilization of the nanotubes' very large surface area, Recruiting specific nanotube semiconducting characteristics for special catalysis requirements

Technology's Essence

The invention involves deposition of metal nanoparticles on prepared WS2 nanotubes (INT-WS2) in a two stage process involving Pd-nanocrystallites assisted activation followed by electroless plating. In this process WS2 nanotubes are synthesized according to known procedures. The nanotubes are then covered by metal nanoparticles in a simple and straightforward procedure resulting with highly active nanotubes which can be utilized as catalysts for various chemical reactions. This new hybrid technology opens the way to a new family of highly efficient, tunable catalysts; the INTs large surface area, specific band gap design and choice of metal result in an ability to produce unique tailor-made catalysts, applicable to many different industries.

NO.	Field	Technology Number
66	Chemistry and Nanotechnology	1568
Principal Investigator:	**Department**	**Patent Status**
Prof. Milko E. Van der Boom	Organic Chemistry	Granted US 8917539
Title	**Multi state organic molecules for sequential logic circuits**	
Link	http://yedarnd.com/technologies/multi-state-organic-molecules-sequential-logic-circuits	

Summary

A new multi-state molecular building block for tomorrow's electric circuits and memory storage devices was realized. Information technology is the core of many industries today. The main challenge facing this industry is the need for miniaturization, due to an ever increase in information density. Molecular information processing and storage is becoming a logical candidate to replace the available methods, by use of molecules as building blocks for□bottom up approaches. A memory device that exists in multiple stable states with a molecular based assembly was prepared. This can offer new ways in which information is processed (multiple-threads) as well as increasing the information density in random access memory (RAM), storage devices and methods.

Applications

Binary and ternary Static Random Access Memory, Multi-State Dynamic Random Access Memory, Multi-State Flash Memory, Multi-State Solid State Drive (SSD), Multi-State Information Processing Units

Advantages

Low manufacturing cost, Robustness, Optical read out allows fast data transfer, and non destructive information access, Short response time and fast read-out, System is easy to reset, Little material is needed/ environmentally friendly, The system can be integrated with other electronic circuits, Multi-valued information storage, Increase in information density, with no need for additional spatial requirements, Alternative to silicon technology

Technology's Essence

Electronically addressable multi-state memory for sequential logic flip-flop, flip-flap-flop circuits, and higher order switchable memory circuits, can be constructed by materials composed of a molecular based assembly that can exist in multiple states. Since the optical output is a precise function of the applied voltage, multi-valued information can be written on to the assembly by applying specific potential biases. The read and write cycle is completed by monitoring the induced optical changes of the system. This system uses the same electrical inputs as conventional memory devices and uses an optical read-out which is non destructive and fast. The properties of the device can be used to create an apparatus for information storage especially with respect to developing solid-state drives in computers (SSDs).

NO.	Field	Technology Number
67	Chemistry and Nanotechnology	1392
Principal Investigator:	**Department**	**Patent Status**
Prof. Brian Berkowitz	Environmental Science and Energy Resources	Pending
Title	**Water Treatment in Aerobic Conditions**	
Link	http://yedarnd.com/technologies/water-treatment-aerobic-conditions	

Summary

A catalytic based reaction for the treatment of industrial waste water. Millions of tons of organic chemical compounds - including solvents, petrochemicals, agrochemicals, and pharmaceuticals - are produced every year by a wide variety of chemical industries. Two immediate problems arise: 1. Industrial production of these chemicals and/or other products leads to effluent streams - highly toxic, contaminated aqueous solutions - from factories. These effluents must be treated prior to release of the water back into the environment. 2. Following use, these chemicals (e.g., agrochemicals, pharmaceuticals) become serious pollutants as they eventually find their way into the soil, sediment, and surface and/or groundwater environments. Current treatment methods are severely limited. Treatment of effluent streams by, e.g., filtration, photocatalysis, or bioreactors is often highly ineffective - the waste compounds not being easily captured, degraded or transformed - and/or prohibitively expensive.

Applications

Detoxification of industrial effluents, especially from petrochemical, agrochemical and pharmaceutical industries

Waste water decontamination

In situ and ex situ remediation of water polluted by organic and other contaminants

Advantages

Cost efficient, Quick

Technology's Essence

Researchers at the Weizmann Institute of Science have developed a new process for degradation and/or treatment of practically any organic contaminant in aqueous solutions under oxidizing (aerobic) conditions. A suite of catalytic materials has been developed which allows both in situ and ex situ remediation of polluted water by oxidative chemical degradation of contaminants. The technology eliminates or reduces a broad range of water pollutants - industrial organic solvents, petrochemicals, agrochemicals and pharmaceuticals (e.g., endocrine disruptors such as antiobiotics and hormones) - and is particularly effective for treating concentrated industrial effluents, under technically convenient conditions. The reaction products consist essentially of benign materials.

NO.	Field	Technology Number
68	Chemistry and Nanotechnology	1380
Principal Investigator:	**Department**	**Patent Status**
Prof. Milko E. Van der Boom	Organic Chemistry	Granted US 8722879; 8865890
Title	**Molecular Electro-Optical Devices**	
Link	http://yedarnd.com/technologies/molecular-electro-optical-devices	

Summary

Novel molecular thin films for optoelectronics: organic, low-voltage films, allow for unprecedented control of the films optical response properties. The films are stable in different metal oxidation states and are therefore ideal for use with non-volatile memory devices.

Applications

The specific scientific and technology issues addressed in the patent are relevant both to the design and synthesis of efficient "all-organic" low-voltage devices, of great interest for optical telecommunications, electronic switching applications, sensors, and non-volatile (FLASH) memory devices. Flash memory is the essential component in solid-state hard disks and digital cameras. Other applications, include: Electronic Ink, memory elements (rewritable memory, read-only-memory and write-once-read-many memory), Displays, Gas sensors, Detection of ppm levels of water in organic solvents, Detection of NO+ in sub-ppm levels, Spectral filters, (Spatial) light modulators.

Advantages

Fully reversible optical response, Stable in both states, Low voltage operation

Technology's Essence

The invention deals with design, synthesis, and electrochemical switching of optical properties of molecular thin films for opto-electronics. The straightforward design of our films (attached to transparent conducting electrodes) offers unprecedented electrochemical control of thin film optical response properties. Fully reversible optical responses occur with variation of the metal oxidation state. The films are stable in both oxidation states. The low-voltage operation of 1.5 V necessary to trigger the charge storage and the optical responses in combination with the high stability may make this system an ideal candidate for the formation non-volatile memory devices. The same system can be used for optical and electronic detection of various compounds, including water and NO+.

NO.	Field	Technology Number
69	Chemistry and Nanotechnology	1265
Principal Investigator:	**Department**	**Patent Status**
Prof. Brian Berkowitz	Environmental Science and Energy Resources	Granted US 8366940; 8598062
Title	**Remediation of Polluted Water by Reductive Transformation Reactions**	
Link	http://yedarnd.com/technologies/remediation-polluted-water-reductive-transformation-reactions	
Summary		
N/A		
Applications		
N/A		
Advantages		
N/A		
Technology's Essence		
N/A		

NO.	Field	Technology Number
70	Chemistry and Nanotechnology	1715
Principal Investigator:	**Department**	**Patent Status**
Prof. Reshef Tenne	Materials and Interfaces	Pending
Title	**Na batteries electrode material based on inorganic nanoparticles**	
Link	http://yedarnd.com/technologies/na-batteries-electrode-material-based-inorganic-nanoparticles	

Summary

Preparation of Re-doped inorganic MoS2 nanoparticles with good sodium ion reversible intercalation properties, to be used as cathode material for next generation sodium ion batteries.

Lithium ion batteries (LIB) are currently the leading energy storage solution used in many applications. But lithium is both toxic and limited in quantity (hence expensive) and cannot supply the growing demand for energy storage units as well as the need for cleaner and safer technologies.

Sodium ion batteries (SIB) are attractive new generation batteries as they incorporate the much less toxic and much more abundant sodium ion.

Our novel nanoparticles were shown to have competitive electrochemical performances with specific capacity of about 130 mAh/g at 2C and 74 mAh/g at high discharge rate of 20C.

Applications

Electrode material for sodium ion batteries

Possible applications in magnesium ion batteries

Advantages

Competitive specific capacity

Improved electrical conductivity towards Na ions

Technology's Essence

The cathode material's reversible intercalation capacity plays a significant role in determining the total capacity of an energy cell. Intercalation requires entering of ions into the electrode material through diffusion channels.

The faceted structure of inorganic nanoparticles (IF) induces intrinsic dislocations and stacking faults which serve as ion diffusion channels. Doping of the nanoparticles increases both conductivity, due to n-type doping of the Mo metal, and the number of structural defects (hence diffusion channels), resulting in total increased electrical conductivity.

The synthetic procedure for producing Re-doped MoS2 nanoparticles is straightforward, based on known and published protocols.

NO.	Field	Technology Number
71	Chemistry and Nanotechnology	1684
Principal Investigator:	**Department**	**Patent Status**
Prof. Milko E. Van der Boom	Organic Chemistry	N/A
Title	**Metal Organic Frameworks (MOF) for Gas Adsorption**	
Link	http://yedarnd.com/technologies/metal-organic-frameworks-mof-gas-adsorption	

Summary

Gaseous energy sources such as hydrogen and natural gas (predominantly methane) encompass an intrinsic transport problem because of their volatility and flammability. Adsorption of the gas on a solid material (such as MOF) facilitates safe, light and economical transport of the gas. This is especially significant in the huge natural gas (NG) market where solutions are required for storage and transport of the gas whether from NG reservoirs in high pressure giant tanks or as a compact low pressure NG tank for small vehicles and other NG powered devices.

The invention involves a new method for the formation of uniform metal organic frameworks (MOFs) at quantitative yields and in a controlled manner.

These MOFs can be tailored to adsorb specific gases for low pressure - high volume storage and transport applications.

Applications

Low pressure, high volume gas storage and transportation

Safe storage of toxic or otherwise dangerous gases

Low energy solid phase gas separation and purification

Production of MOF-based catalysts

Advantages

Uniform crystallite morphology, A quantitative process, Ability to design and control product structure, Control of pore size, Single step process, No additives

Technology's Essence

The invention comprises a new solvothermal synthetic procedure in which specific metal ions are selected to react with specific organic ligands to form uniform sub-microstructured MOFs with a narrow size distribution and without the need for a modulator to define the crystal morphology.

Controlling the selected reagents as well as the specific reaction conditions influences the resulting crystallites formed and enables a fine selection of the desired structure.

MOFs prepared this way have exceptional uniformity profiles of size and shape and can be tailored to selectively adsorb specific gases for low pressure - high volume storage and transport applications.

NO.	Field	Technology Number
72	Chemistry and Nanotechnology	1614
Principal Investigator:	**Department**	**Patent Status**
Prof. Reshef Tenne	Materials and interfaces	N/A
Title	**New catalytic process to grow inorganic nanotubes**	
Link	http://yedarnd.com/technologies/new-catalytic-process-grow-inorganic-nanotubes	

Summary

A new process for the synthesis of MoS2 nanotubes using lead as a growth promotor. This procedure facilitates the large scale production of MoS2 nanotubes, as previous scaling-up attempts were proven problematic, and can be implemented in production of other INTs, such as NbS2 and TaS2, which is currently not possible. In view of the expanding market of composite materials with improved mechanical, electrical and thermal properties, and considering the inherent advantages of production and stability of inorganic nanotubes compared with the organic ones, there is a growing need for implementing new production processes of nanomaterials.

Applications

Large scale production of INTs, Production of new INTs with new properties

Advantages

Scalable synthesis of inorganic nanotubes, Production of new INT's not possible so far

Technology's Essence

The invention involves introducing soft metals (Pb, Bi and others- denoted "A") in catalytic amounts to the metal-chalcogenide (denoted "MX2" with X=S, Se) raw material. The soft metals act as growth promotors to the metal-sub-oxide phase, in presence of oxygen (as water vapor or soft-metal-oxide) facilitating the formation of metal-sub-oxide nanowhiskers, which then function as scaffolds for the formation of the desired metal-chalcogenide nanotubes. The result is formation of MX2 nanotubes containing a minute amount of M-doping and intercalation. This novel technology entails great potential in the growing market of inorganic nanotubes, with applications in lubrication (oils, automotive, cosmetics, pharmaceuticals, medical devices and more), shock absorption, composites, coatings and their applications in multiple industries, and more.

NO.	Field	Technology Number
73	Chemistry and Nanotechnology	1722
Principal Investigator:	**Department**	**Patent Status**
Prof. Ronny Neumann	Organic Chemistry	Pending
Title	**Aerobic Carbon-Carbon Bond Cleavage of Alkenes to Aldehydes and Ketones**	
Link	http://yedarnd.com/technologies/aerobic-carbon-carbon-bond-cleavage-alkenes-aldehydes-and-ketones-0	

Summary

Our technology provides a new type of oxidative cleavage reaction of organic compounds with highly selective product formation. Polyoxometalate (POM) catalysts have become well-known for their utility and diversity in specific reactions. Through the elucidation of POM catalytic pathways, greater versatility has been achieved. This technology is one such application of a novel POM catalyst and is exploited to cleave carbon-carbon double bonds in alkenes (olefins) through an aerobic oxidation reaction. Oxidation reactions are of particular interest because they are difficult to achieve on an industrial scale while maintaining green chemistry practices.

Applications

As a novel catalyst in industrial organic chemistry processes
Sold as a stand-alone catalyst for laboratory or individual use

Advantages

Environmentally friendly oxidation reaction
Easy catalyst regeneration

Technology's Essence

Our approach is motivated by societal considerations that demand environmentally benign and sustainable solutions for oxidative reactions. As such, we have developed a scheme to react NO2 with a transition-metal-substituted POM which yields a metal-nitro intermediate that is competent for forming the precursors for oxidation with molecular oxygen, O2, to have a final product of ketones and/or aldehydes, and regenerate the POM catalysts. This method has preference towards di/tri-substituted alkenes. High yields of ketones or aldehydes have been produced and the POM catalyst is regenerated without further oxidation to carboxylic acids, as is typical with other oxidative catalysts. The selective cleavage of carbon-carbon double or triple bonds with metal-nitro or metal-nitrito compound has not been reported. This exciting new discovery could lead to a wide variety of organic reactions not previously possible, along with revolutionary green oxidative chemistry techniques.

NO.	Field	Technology Number
74	Chemistry and Nanotechnology	1716
Principal Investigator:	**Department**	**Patent Status**
Prof. Ronny Neumann	Organic Chemistry	Pending
Title	**Production of Syngas from biomass**	
Link	http://yedarnd.com/technologies/production-syngas-biomass	

Summary

Terrestrial plants contain about 70% hemicellulose and cellulose, which constitute a significant renewable bio-resource with potential as an alternative to petroleum feedstock for carbon-based fuels. Traditional conversion of biomass to liquid fuels has been in the form of ethanol and bio-diesel, but this process is inefficient and much of the starting material is unusable and ultimately becomes waste. Additionally, use of ethanol or bio-diesel is not universal to all engines as vehicles require specialized components to run on these fuels. The presented technology allows for significantly greater efficiency in use of starting material, and the versatile final product of syngas, which can be a fuel itself or used as a fuel precursor in the well-known Fischer-Tropsch process to create hydrocarbons. Alternatively, in a hydrogen economy scenario, this method can also be used to convert carbon monoxide to hydrogen via the water-gas shift reaction. Advantageously, both processes allow for the polyoxometalate (POM) catalyst to be reused without the need for recovery, which enables continuous use in a refinery setting.

Applications

Liquid hydrocarbon fuel synthesis from syngas, Entry into a new market hydrogen production from biomass

Advantages

Efficient and complete breakdown of starting biomass material, Possible to produce hydrogen or syngas as product

Technology's Essence

The technology allows for preparation of syngas by reaction of a carbohydrate with a POM catalyst in the presence of a concentrated acid under anaerobic conditions, to yield carbon monoxide, followed by electrochemical release of hydrogen. This two-step process allows for easy separation and storage of the desired products. An alternative application of the same POM catalyst relates to a method for preparing formic acid in a similar method, but in a solvent consisting of a mixture of alcohol and water. This reaction is based on the unexpected finding that POM catalysts, such as H5PV2Mo10O40, catalyze plant biomass derived polysaccharides of general form (CnH2nOn)m, with high selectivity and efficiency under mild conditions. Formation of CO occurs through an intermediate formation of formic acid and formaldehyde, and transformation of these transition compounds in concentrated acid results in the desired CO product.

NO.	Field	Technology Number
75	Chemistry and Nanotechnology	1644
Principal Investigator:	**Department**	**Patent Status**
Prof. Ron Naaman	Chemical Physics	Pending
Title	**Magnetic memory without a permanent magnet**	
Link	http://yedarnd.com/technologies/magnetic-memory-without-permanent-magnet	

Summary

Computer memory and storage are among the most critical components of today□s consumer electronics and computer technology. Currently available memory and storage technologies have inherent limitations that confine the capacity and speed of access to memory devices. The present innovation is based on Chiral Induced Spin Selectivity (CISS) effect that was established experimentally and theoretically in the last decade, and allows for production of inexpensive, high-density universal memory-on-chip devices. Prof. Naaman and Prof. Paltiel have developed and patented a memory device based on utilizing the Chiral Induced Spin Selectivity effect, using organic chiral molecules to create efficient electron spin filters without the need for permanent magnets. A proof-of-concept Si-compatible device has been assembled and demonstrated in laboratory environment, attesting for the viability of the proposed technology.

Applications

This technology can be applied for production of inexpensive, high-density universal memory-on-chip devices. The technology can be used as superior alternative for both Random Access memory and Flash memory. Consumer electronics devices based on Chiral Memory will offer much larger storage sizes, providing consumers with room for greater amounts of content on their smartphone, tablet and wearable devices. Using Chiral Memory as DRAM replacement for personal computers and especially for server systems will significantly increase capacity and performance of various applications, including Big Data processing.

Advantages

Compared to existing memory and data storage technologies, such as Dynamic Random Access Memory (DRAM), Flash Memory and Magnetic Recording, Chiral memory demonstrates clear advantages: Up to 70 times more storage on the same physical size, Up to 100 times lower energy consumption, Si-Compatible, Overcomes limitations of other magnetic-based memory technologies

Technology's Essence

Chiral Memory technology uses the Chiral-Induced Spin Selectivity (CISS) effect for spin selectivity instead of the common ferromagnetic-based spin filters, thus removing the need for a permanent magnet in a memory device.

NO.	Field	Technology Number
76	Chemistry and Nanotechnology	1507
Principal Investigator:	**Department**	**Patent Status**
Prof. David Milstein	Organic Chemistry	Granted US 8586742; 8779136
Title	**Production of Amines from Alcohol and Ammonia**	
Link	http://yedarnd.com/technologies/production-amines-alcohol-and-ammonia	

Summary

One-step synthesis of primary amines from alcohols and ammonia under mild conditions. Amines are widely used in the production of numerous products for multiple industries and their use is expected to increase. Global amines market is expected to reach over $14 billion by 2020, with an average annual growth of 3.5%. Primary amines are most useful in the larger markets of ethanolamines and fatty amines. Current synthetic methods require harsh reaction conditions, are non-specific and generate toxic waste. The outlined technology utilizes a novel catalyst to synthesize primary amines in a simple single-step fashion directly from alcohols and ammonia.

Applications

Production of primary amines for numerous industries (agrochemicals, surfactants, personal care, water treatment, fine chemicals, plastics, dyes, pigments, food additives and pharmaceuticals)

Advantages

Mild reaction conditions, Single step synthesis, High yields, No solvent required, No toxic reagents or by-products, Ecologically and economically beneficial

Technology's Essence

Amines are a very important family of compounds used in multiple industries. The presented technology uses selective catalytic synthesis of primary amines from primary alcohols and ammonia. This simple, one-step, easily applicable reaction delivers primary amines in good yields, in addition to valuable environmental and economic advantages.

NO.	Field	Technology Number
77	Chemistry and Nanotechnology	1559
Principal Investigator:	**Department**	**Patent Status**
Prof. Ronny Neumann	Organic Chemistry	Pending
Title	**Desulfurization of Fuels**	
Link	http://yedarnd.com/technologies/desulfurization-fuels-1	

Summary

The Weizmann Institute is actively seeking a company interested in commercializing a novel technology that reduces sulfur content in refined fuels. Fossil fuels sources such as oil, coal, natural gas, shales and others contain varying amounts of sulfur compounds. As world reserves of high quality fossil fuels diminish and regulatory standards tighten on reduced levels of sulfur containing emissions, the need for effective methods for removal of refractory sulfides from refined fuels arises. This invention makes use of a catalytic reaction to remove refractory sulfides from refined fuels thereby enabling the reduction and removal of sulfides. The catalyst is then purified by aerobic oxidation (low temperature combustion) and reused.

Applications

Desulfurization of fuels in oil refineries - useful for deep desulfurization of fuels containing relatively small amounts of organic sulfur compounds.

Advantages

High yields of aldehyde product (80-95 mol %), Fast aerobic oxidation of alcohols. Highly specific towards primary alcohols. No need for a base during activation of catalysis.

Technology's Essence

The invention relates to a method for removing heteroaromatic, refractory sulfides down to sub-ppm levels from refined fuels such as gasoline, diesel oil and kerosene. The process uses a heterogeneous catalyst that reacts with the refractory sulfides and oligomerizes or polymerizes them to insoluble polymers that are adsorbed on the catalyst. After use, the catalyst is recovered and purified by low temperature aerobic total oxidation (combustion) reused. This process completes desulfurization of fuels in oil refineries.

NO.	Field	Technology Number
78	Medical Devices	1566
Principal Investigator:	**Department**	**Patent Status**
Prof. Reshef Tenne	Materials and Interfaces	Granted US 7524481;8329138;8518364; 9155595
Title	**Inorganic Fullerence Coating for Medical Devices**	
Link	http://yedarnd.com/technologies/inorganic-fullerene-coating-medical-devices	

Summary

Different dental applications suffer from excessive friction, which severely compromise their function. For orthodontic procedures, friction significantly reduces effectiveness and thereby leads to prolonged treatments. In root canal treatments, NiTi (Nickel-Titanium) endodontic files are prone to fatigue-induced and incidental failure. This invention presents coating with inorganic fullerene-like nanoparticles of WS2 (IF-WS2) impregnated in a metal matrix, as an effective friction-reducing agent. The unique structure of these particles provides them with high lubricity. Consequently, the problem of friction during orthodontic treatment could be minimized, enhancing anchorage control, reducing duration of treatment and decreasing the risk of root resorption. The same coating is shown to significantly improve the lifetime of endodontic files by alleviating fatigue and failure, having vast implications on duration, safety and consequences of root canal treatments

Applications

Friction-reducing coating for orthodontic wires. Friction-reducing coating for NiTi endodontic files.

Advantages

Efficient a significant reduction in the applied friction forces. May be applied on several appliances (wire and bracket or Efs and dental implant) for maximal friction-reducing effect. The coating may be incorporated in the manufacture process of the appliance, and may not require additional manufacture step. Biocompatible Initial tests in animals suggest safety from toxic effects. Does not change the unique characteristics of the NiTi shape memory alloy

Technology's Essence

WS2 fullerene-like nanostructures (IF-WS2) are 20-200nm particles that are formed under certain reducing and sulfidizing conditions and elevated temperatures, from tungsten oxide (WO3) nanoparticles. Good lubricity is attributed to their multiple-layered structure. As the load between rubbed surfaces increases, nanoparticles gradually deform and exfoliate to coat the asperities at the interface. The weak forces between the thin sheets of the exfoliated nanoparticles allow a very low shear force sliding motion between the two contacting bodies.

NO.	Field	Technology Number
79	Chemistry and Nanotechnology	1482
Principal Investigator:	**Department**	**Patent Status**
Prof. Reshef Tenne	Mateirals and Interfaces	Granted US 8329138; 8518364
Title	**Conductive Inorganic Fullerenes and Nanotubes**	
Link	http://yedarnd.com/technologies/conductive-inorganic-fullerenes-and-nanotubes-1	

Summary

Modification of the electronic properties of layered-type semiconductors can be accomplished by doping/alloying of the semiconductor. In the present disclosure we show that doping of MoS2 and WS2 nanotubes/nanoparticles can be accomplished by doping with either Re (n-type) or Nb (p-type) foreign atoms. These nanoparticles combine both superior mechanical properties and high electrical conductivity.

The main market for these kinds of nanoparticles is in thin films that combine superior mechanical and electrical properties. For example, as part of touch screensin addition, polymer nanocomposites containing such nanoparticles can be used among other things in electromagnetic shielding and conductive films for packaging and high performance adhesives. These nanoparticles are expected to reveal interesting catalytic applications, for example to obtain sulfur free gasoline. They can be used in third generation photovoltaic cells, etc.

Applications

Catalytic processes for energy storage and sulfur free gasoline.
Polymer nanocomposites for packaging
Electromagnetic shielding.
Conductive glues/adhesives with superior performance.
Energy storage.

Advantages

The combination of superior mechanical properties and high electrical conductivity offers new kinds of applications in catalysis; energy storage; high performance nanocomposites and in macroelectronics.

Technology's Essence

N/A

NO.	Field	Technology Number
80	Chemistry and Nanotechnology	1551

Principal Investigator:	Department	Patent Status
Prof. David Milstein	Organic Chemistry	Granted US 9045381

Title	**Ruthenium Catalysts for Formation and/or hydrogenation of esters, amides and their derivatives**
Link	http://yedarnd.com/technologies/ruthenium-catalysts-formation-andor-hydrogenation-esters-amides-and-their-derivatives

Summary

A novel set of remarkably efficient catalysts for the synthesis of amines, alcohols, amides and esters under mild conditions with no formation of toxic by-products. Amines, alcohols, amides and esters constitute important classes of compounds serving as basic building blocks for the research, chemicals, pharmaceutical and agrochemical industries. In view of global concerns regarding economy, environment and sustainable energy resources there is an urgent need for implementing new catalytic reactions.

Applications

Synthesis of fundamental chemical building blocks under most favorable conditions for a wide variety of industries.

Advantages

Broad substrate scope, Use of mild conditions (temperature and pressure), No additives required, High selectivity, Excellent yields, No waste generation, New synthetic reactions that were not possible before.

Technology's Essence

In recent years, complexes based on cooperating ligands have exhibited remarkable catalytic activity. These ligands can cooperate with the metal centre by undergoing reversible structural changes during the processes of substrate activation and product formation. Pincer-type Ruthenium complexes and related Borohydride complexes exhibit a new mode of metal-ligand cooperation, involving aromatization dearomatization of ligands, leading to facile activation of C-H, H-H, N-H, O-H bonds, and to novel, environmentally benign reactions catalyzed by Ru. The reactions are preformed under mild conditions (pressure of 10 atm and temperatures of ~1100C). No additional compounds are required (except for Hydrogen in some reactions) and high yields are obtained for a wide variety of products. The use of negligible catalytic amounts (up to 1mol%) minimizes waste formation. Reactions are applicable to many commercially important synthetic materials and can simplify long synthetic procedures of such fundamental building blocks.

NO.	Field	Technology Number
81	Chemistry and Nanotechnology	1561
Principal Investigator:	**Department**	**Patent Status**
Prof. Ronny Neumann	Organic Chemistry	Granted US 8796482
Title	**Aerobic oxidation of alcohols to aldehydes**	
Link	http://yedarnd.com/technologies/aerobic-oxidation-alcohols-aldehydes	

Summary

The catalytic oxidation of alcohols using ground state molecular oxygen, O2, as a primary oxidant has attracted many researchers motivated by the apparent ecological advantage that such a transformation would have compared to other methods. The great significance of this synthetic method is that the selective oxidation of alcohols to aldehydes without over-oxidation to carboxylic acids is challenging. Thus, a technique for the selective and specific oxidation with O2 of primary alcohols to aldehydes can be valuable.

Applications

Synthesis of aldehydes from primary alcohols.

Advantages

High yields of aldehyde product (80-95 mol %)
Fast aerobic oxidation of alcohols.
Highly specific towards primary alcohols.
No need for a base during activation of catalysis.

Technology's Essence

A sandwich type polyoxometalate is used as a ligand to attach a palladium(II) center. This Pd-POM compound is an active catalyst for the fast aerobic oxidation of alcohols. The unique property of this catalyst is its significant preference for the oxidation of primary versus secondary aliphatic alcohols. This is a result of the intrinsically higher probability for oxidation of primary alcohols attenuated by steric factors as borne out by the higher reactivity of for example 1-octanol versus 2-ethyl-1-hexanol. The reaction is highly selective to aldehyde with little formation of carboxylic acid; autooxidation is inhibited. No base is required to activate the alcohol. The fast reactions, where typically lless than 1 hour is needed, appear to be related to the electron-acceptor nature of the polyoxometalate ligand.

NO.	Field		Technology Number
82	Chemistry and Nanotechnoloty		1102
Principal Investigator:		**Department**	**Patent Status**
Prof. David Milsteiny		Organic Chemistry	Granted US 7282618
Title	**New Method for the Production of Aryl Alkenes by Oxidative Coupling of Arenes and Alkenes**		
Link	http://yedarnd.com/technologies/new-method-production-aryl-alkenes-oxidative-coupling-arenes-and-alkenes-1		

Summary

A new high-yield method for producing aryl alkenes. Catalytic carbon-carbon bond formation by C-H activation is a topic of much current interest. Significant progress has been made in recent years in the development of synthetically useful catalytic addition of arenes to alkenes to give the saturated aryl alkenes. Catalytic oxidative coupling to give aryl alkenes, in which the double bond is preserved, is a highly desirable goal. Such a reaction, which does not require the utilization of a reactive substituent and does not produce waste, may have an advantage over other methods for the preparation of aromatic alkenes. While good catalytic activity was achieved with some alkenes, acrylates resulted in low activity. Furthermore, the use of peroxide oxidants and acetic acid solvent in these systems is problematic from the industrial point of view. The present invention consists of a novel oxidative coupling of arenes with alkenes to yield aryl alkenes, in the presence of ruthenium or osmium compounds as catalysts.

Applications

Preparation of various aryl alkenes, which are useful intermediates in the chemical, pharmaceutical and agrochemical industries

Advantages

There is no need for acid solvent or a peroxide
Much lower pressure of CO may be used compared to other methods

Technology's Essence

In the outlined technology it was discovered that aryl alkenes can be produced by reaction of arenes with alkenes in the presence of ruthenium or osmium compounds as catalysts. The reaction can be carried out in the presence of molecular oxygen (O2) as the oxidant. In the absence of O2 the alkene itself serves as the oxidant. For example, reaction of benzene with methyl acrylate and O2 produces methyl cinnamate and water. In the absence of O2 methyl cinnamate and methyl propionate are formed.

NO.	Field	Technology Number
83	Chemistry and Nanotechnology	1184
Principal Investigator:	**Department**	**Patent Status**
Prof. Ron Naaman	Chemical Physics	Granted US 6433356; 8415166; 8415166; 8957460
Title	**The MOCSER: a novel hybrid chemical-electronic detector**	
Link	http://yedarnd.com/technologies/mocser-novel-hybrid-chemical-electronic-detector-1	

Summary

Trace chemical or biological elements can be accurately detected and monitored in the field or at the point of care through use of this new quick, cost-effective platform technology based on a hybrid chemical-electronic detector. Analytes can be measured according to the electrical current changes they induce with high specificity and accuracy at parts-per-billion (ppb) levels.

Applications

Transducer which may be developed to suite: Medical diagnostics: point of care, real time diagnostics of chemical and biological substances. Environmental watch: monitoring air or water pollution, testing for food poisoning. Chemical warfare: detection of chemical agents and explosives. Industry: monitoring industrial processes at real time.

Advantages

N/A

Technology's Essence

Researchers at the Weizmann Institute have developed a platform technology based on novel hybrid chemical-electronic detector MOCSER (MOlecular Controlled SEmiconductor Resistor). The technology is based on a new type of a Gallium Arsenide (GaAs) electronic device covered with a monolayer of sensing molecules. The detection is achieved by measuring the current changes created due to analyte binding. The researchers have succeeded in showing high sensitivity and accuracy of the device down to parts per billion (ppb) levels. They have also demonstrated the possibility for broad applications of this detector by tailoring different sensing molecules on it and measuring various substances.

NO.	Field	Technology Number
84	Chemistry and Nanotechnology	1394
Principal Investigator:	**Department**	**Patent Status**
Prof. Brian Berkowitz	Environmental Science and Energy Resources	Pending
Title	**A Method for the Removal of CO2 by Mineral Carbonation**	
Link	http://yedarnd.com/technologies/method-removal-co2-mineral-carbonation-1	

Summary

An efficient method to reduce CO2 concentration. Climate change is one of the most urgent subjects worldwide, with implications affecting the entire population of the planet. One of the major aspects influencing global warming is the emission of greenhouse gases to the atmosphere. Most of the greenhouse gases emitted due to human activity are related to burning of fossil fuels (e.g., coal, oil, gasoline, natural gas) with the major component being CO2. Furthermore, increased CO2 emissions (due to increased world energy consumption) are expected as the living standard improves in many parts of the world. Consequently, to enable drastic reductions in CO2 emissions it is becoming necessary to capture and sequester CO2. The outlined technology involves a simple precipitation reaction using CO2 to form a stable and inert carbonate compound using that can be stored or discarded.

Applications

In situ and ex situ CO2 sequestration, by conversion to carbonate rock

In subsurface systems, carbonate precipitation can reduce hydraulic conductivity, thus mitigating movement of saltwater or groundwater contaminants

Advantages

Long term stability

Vast capacity of field sites

Potentially economically viable

Potential for treatment of waste air and flue gases

May overcome the problem of CO2 escape during or after sequestration

Technology's Essence

This technology consists of a new method for sequestering CO2 in subsurface geological formations, by converting it into a stable mineral form. CO2 in water results in chemical equilibrium with bicarbonate (HCO3-) and carbonic acid (CO32-). This equilibrium is very sensitive to changes in pH, thus under basic conditions equilibrium considerations favor precipitation of HCO3- and CO32- as carbonate minerals, while under acidic conditions there is release of CO2 by dissolution and dissociation of carbonates. The method can also be adapted for above-ground operation.

NO.	Field	Technology Number
85	Chemistry and Nanotechnology	1428
Principal Investigator:	**Department**	**Patent Status**
Prof. Boris Rybtchinski	Organic Chemistry	Granted US 8399670; 8859772
Title	**Organic Dyes**	
Link	http://yedarnd.com/technologies/organic-dyes-1	

Summary

Selective bromination of perylene diimides under mild conditions.

Perylene diimides (PDIs) are organic chromophores used as industrial dyes, electronic materials and sensors, building blocks for light-harvesting and artificial photosynthetic systems as well as in solar cells. Modifications of the properties of PDIs are usually carried out starting from brominated PDIs, which are the most widely used starting materials for making almost all PDI derivatives. However, conventional procedures for PDI bromination use harsh conditions (concentrated sulfuric acid, elevated temperatures) and result in mixtures of products, hampering wide utilization of PDI derivatives. The present technology offers a highly selective PDI bromination methodology that employs mild conditions.

Applications

Industrial dyeing, Photonic and electronic materials for applications in solar cells, Organic light emitting devices, Organic field effect transistors, Sensors

Advantages

Simple and flexible procedure, Employs mild conditions, Allows selective bromination of PDIs, High-yield procedures, Broad diversity of available PDI-based materials

Technology's Essence

Photophysical and redox properties of PDIs can be conveniently modified through substitutions in the aromatic core. Substitutions in the PDI aromatic system and expansion of the PDI core are usually carried out starting from the halogenated PDIs, particularly brominated ones. The outlined methodology allows for highly selective PDI bromination that employs mild conditions (organic solvent, room temperature), resulting in facile formation of mono and dibrominated perylene diimides. In addition, the selectivity of the reaction toward exclusive dibromination can be controlled through variation of the reaction conditions.

NO.	Field	Technology Number
86	Chemistry and Nanotechnology	1124
Principal Investigator:	**Department**	**Patent Status**
Prof. Israel Rubinstein	Materials and Interfaces	Granted US 8071391; 9164034; 8529988
Title	**Molecular Diagnostics Utilizing High Throughput LSPR (Localized Surface Plasmon Resonance)**	
Link	http://yedarnd.com/technologies/molecular-diagnostics-utilizing-high-throughput-lspr-localized-surface-plasmon-1	

Summary

Label-free detection and monitoring of target molecules, which can be conducted using standard lab equipment. This new method of optical analysis is effective in monitoring the binding of chemically or physically adsorbed molecules, in liquid or gas phase, with measurements carried out continuously in real-time. SPR and LSPR technologies are broadly used in efficient real-time detection and quantification of biomolecules in research environments; however these technologies are too complicated, cumbersome and expensive for routine applications. This novel technology combines real-time, high sensitivity and accuracy of LSPR with low cost and ease of use of other optical assays, such as ELISA. The invention comprises the LSPR transducer element of a gold-island film biosensor, which does not suffer shortcomings such as extreme temperature sensitivity. The gold island film is rapidly integrated into lab consumables via a novel fabrication method, which produces a robust system for high-throughput molecular diagnostics.

Applications

Point of care, real time diagnostics of chemical and biological substances.
Environmental watch: monitoring air or water pollution, testing for food poisoning.
Chemical warfare: detection of chemical agents and explosives.
Real-time monitoring of marine biofouling or industry corrosion processes.

Advantages

Simple operation, versatile and inexpensive method to imbed sensor in standard lab consumables. High-throughput label-free detection with sensitivity comparable to that of SPR. Uses cheap, disposable samples. Can be combined with a variety of biosensing technologies.

Technology's Essence

The method involves evaporation of ultrathin (10 nm) gold films onto inert transparent substrates (e.g., glass, plastic) leading to the formation of a layer of gold islands. Gold-island films provide unique optical properties. Such films show a localized surface plasmon (LSP) absorption peak much less sensitive to the refractive index of the surrounding medium. The LSP absorption band changes upon binding of various molecules to the surface. The binding process can be followed quantitatively by measuring the changes in the gold SP absorption.

NO.	Field	Technology Number
87	Chemistry and Nanotechnology	1399
Principal Investigator:	**Department**	**Patent Status**
Prof. Igor Lubomirsky	Materials and Interfaces	Granted US 8419984
Title	**Super Pyroelectricity**	
Link	http://yedarnd.com/technologies/super-pyroelectricity-0	

Summary

Using a temperature increase to polarize and change the alignment of ferroelectric nano-crystalline grains in infrared sensors, produces pyroelectric current which is 10 to 100-fold larger than can be produced using today's ordinary infrared sensors.

Applications

The invention may be used to produce infrared detectors in the form of single units and detector arrays (focal plates). Detectors using films with polycrystalline domains may effectively operate to the frequency of 105 Hz and are able to withstand large accelerations, which may be particularly useful for mobile systems. The detectors can be constructed to operate within a large temperature range (-10+50 degrees Celsius) without temperature stabilization.

Advantages

Higher sensitivity
Durability
Operative within a wide temperature range

Technology's Essence

A method to create a pyroelectric material that combines a large pyroelectric coefficient and a relatively low dielectric constant. The invention is based on the recently discovered phenomenon of self-organization of ferroelectric nano-crystalline grains into polycrystalline macro-domains. As a result, a thin film comprising of ferroelectric grains splits spontaneously into the regions, in which the directions of the polar axes of the grains become spontaneously correlated. In response to temperature variations, some of the ferroelectric grains undergo a so-called 90-degrees polarization switching and therefore produce pyroelectric current. This current is 10-100 times larger than the that which could be generated in a single crystal of the same material under similar conditions.

NO.	Field	Technology Number
88	Chemistry and Nanotechnology	1448
Principal Investigator:	**Department**	**Patent Status**
Prof. David Milstein	Organic Chemistry	Granted US 8178723
Title	**A New Catalyst for producing Amides from Alcohols**	
Link	http://www.yedarnd.com/technologies/new-catalyst-producing-amides-alcohols	

Summary

A method to produce amides in one step without any unwanted by-products, by coupling of alcohols with amines with the liberation of hydrogen gas, catalyzed by unique ruthenium complexes.

Amides are widely used in the industry (e.g. nylon, Kevlar) and have widespread importance in biochemical and chemical systems (e.g. proteins). Synthesis of amides is mostly based on activated acid derivatives or rearrangement reactions induced by an acid or base, which often produce toxic chemical waste and involve tedious procedures. Therefore, an efficient synthesis that avoids wasteful use of coupling reagents or corrosive acidic and basic media is highly desirable. The current technology allows for the clean production of amides from amines and alcohols.

Applications

Production of amides for various applications (plastic and rubber industry, paper industry, pharmaceutical intermediates, etc.)

Use of the liberated hydrogen (e.g. for the production of ammonia)

Advantages

Clean and selective procedure

Environment friendly reaction (no base or acid promoters are required, no carboxylic acid derivatives, such as acid chlorides, are needed)

Amides and molecular hydrogen are produced in high yields and high turnover numbers directly from alcohols in one step

The liberated hydrogen can be used for different applications

Formation of a variety of amides

Technology's Essence

Amide formation is a fundamental reaction in chemical synthesis. Amides are commonly formed from the reaction of a carboxylic acid derivative with an amine. Instead of using carboxylic acid derivative, in the present invention the amide motif is generated by direct acylation of amines with alcohols. This is possible through the use of a unique catalyst. This method enables the simple and elegant production of amide polymers and industrially important amides.

NO.	Field	Technology Number
89	Chemistry and Nanotechnology	1646
Principal Investigator:	**Department**	**Patent Status**
Prof. Daniella Goldfarb	Chemical Physicsy	Pending
Title	**A Rapid Freeze Quench Device**	
Link	http://yedarnd.com/technologies/rapid-freeze-quench-device-1	

Summary

Dedicated and highly efficient EPR analysis of small volume samples in a range of few µl is now made simple with a novel device invented at the Weizmann Institute of Science. This device features a new ejection mechanism and a unique cold trap which enables collection of all time points in a RFQ series in one continuous experiment. In order to design and develop inhibitors for therapeutic purposes, the reaction mechanisms of enzymes must be understood. For biological applications, a common methodology of addressing this need is combining Rapid Freeze Quench with Electron Paramagnetic Resonance (RFQ)-EPR, which allows the trapping and analysis of short lived intermediates in chemical reactions. However, commercial RFQ-EPR devices are limited for high field EPR applications due to the demand of large sample volumes for each time point. Prof. Goldfarb and her team built a new RFQ apparatus based on microfluidic flow and unique ejection and freezing systems, which can be used for collecting small volume samples in capillaries for high field EPR.

Applications

This technology, combined with the variety of W-band high resolution EPR technique (ENDOR, DEER and ESEEM) enables better mechanistic studies of enzymatic reactions, with an emphasis on structural transformations during the reaction, in an efficient and accurate way.

Advantages

Collecting all RFQ time points in one continues experiment. Produce small volume samples in the range of a few µl, and handles small capillaries, for high field ERP. An improved dead time of ~5ms, relative to the commercial RFQs with a typical dead-time of 5 10 ms. Ease-of-use and speed.

Technology's Essence

The innovative apparatus consists of two main parts: the microfluidic device and the freeze-quench setup. The microfluidic device comprises a mixer, which mixes the two reacting solutions, a flow path where the reaction occurs, and a sprinkler from which the solution is sprayed out of the device. Prof. Goldfarb and her colleagues improved the common mixing device by adding a fast stream of nitrogen gas which mixes with the ejected reaction solution, and sprays the frozen aerosol out in tiny drops at high speed.

NO.	Field	Technology Number
90	Chemistry and Nanotechnology	1597
Principal Investigator:	**Department**	**Patent Status**
Prof. Igor Lubomirsky	Materials and Interfaces	Pending
Title	**An efficient electro mechanical metal oxide**	
Link	http://yedarnd.com/technologies/efficient-electro-mechanical-metal-oxide-0	

Summary

Metal-oxide material generates electromechanical stress an order of magnitude above existing materials.The ability to develop a mechanical stress in response to the application of an external electric field has many uses, and characteristic materials are classified as either piezoelectric or electrostrictive. Modern inorganic piezoelectric devices are used for a wide variety of applications from inexpensive speakers and headphones, to sophisticated sonar transducers. Over the last several decades, these materials have become highly reliable and technologically mature, but the magnitude of the mechanical stress they can generate in response to an input electric signal has reached an upper limit.This innovative technology applies Gadolinium-doped Cerium Oxide (Gd-doped CeO2) to piezoelectric and electrostrictive devices and will enable high-performance electromechanical materials with output capabilities an order of magnitude above existing solutions, in excess of 500 MPa. This could facilitate the next generation of many consumer and industrial electronic devices.

Applications

Wide range of personal electronic devices, Industrial and fine electronics specifically powerful acoustic transducers

Advantages

Generate large displacement and large stress simultaneously, Sensitive and tunable properties

Technology's Essence

In piezoelectric devices, stress develops due to the deformation of a non-centrosymmetric lattice under the application of an electric field. In commercial electrostrictors, or materials with centrosymmetric lattices and very large dielectric constants, an external electric field distorts the unit cells of the lattice, rendering them locally non-centrosymmetric. In both cases, the electromechanical stress develops due to a small displacement of atoms within each unit cell. Increasing the magnitude of the response would lead to more powerful actuators, and permit a decrease in the operating voltage; therefore, the search for novel mechanisms of electromechanical response in solids remains an important objective for both fundamental and applied science. We have demonstrated that Gd-doped CeO2, specifically Ce0.8Gd0.2O1.9, can generate stress an order of magnitude greater than the best electromechanically active materials.

NO.	Field	Technology Number
91	Chemistry and Nanotechnology	1468
Principal Investigator:	**Department**	**Patent Status**
Dr.Boris Rybtchinski	Organic Chemistry	Granted US 8968886
Title	**From Hydrophobic to Hydrophyllic and back again**	
Link	http://yedarnd.com/technologies/hydrophobic-hydrophyllic-and-back-again	

Summary

A simple method of preparing water-stable dianions.
Perylene-diimides (PDIs) are versatile organic dyes, which have been utilized for many applications (e.g. industrial dyes, electronic materials, solar cells, etc.). However, doubly reduced aromatic compounds (aromatic dianions) readily decompose, as they are very reactive with a broad range of compounds (especially water). Such instability is prohibitive for utilization of aromatic dianions. Thus, there is a need to develop compounds having new electronic properties. The current invention is directed toward the preparation of perylene-diimide aromatic dianion compounds, which are stable in aqueous solution.

Applications

Useful for controlled electron storage and release in aqueous media.
The high excitation energy may be utilized in systems of solar energy conversion.
Useful in electrophotography, laser dyes and organic light-emitting diodes.

Advantages

Stability in water
Simple preparation of the dianion
Reversible discharge of excess electrons
High photoredox power

Technology's Essence

Some properties of PDIs can be conveniently modified through substitution in the aromatic core. A PDI derivative decorated with polyethylene glycol groups (PDI-PEG) possesses excellent solubility in water. This solubility allows for use of simple reducing agents and precise control over the stoichiometry of reduction. The current technology consists of a facile reduction in water with sodium dithionite (Na2S2O4) under an inert (N2) atmosphere, thus creating the aromatic dianion. This dianion is stable for months in deoxygenated aqueous solutions. The advantageous characteristics of the PDI dianion compounds can be used for photofunctional and electron transfer systems in aqueous phase.

NO.	Field	Technology Number
92	Chemistry and Nanotechnology	1564
Principal Investigator:	**Department**	**Patent Status**
Prof. Boris Rybtchinski	Organic Chemistry	Granted US 8968886; 9067181
Title	**Recyclable membranes for size-selective separation of nanoparticles**	
Link	http://yedarnd.com/technologies/recyclable-membranes-size-selective-separation-nanoparticles	

Summary

A new recyclable size-selective filtration device.

Particle size, chemical purity and dispersion of nanoparticles crucially determine their optical, electronic and chemical properties. Size-selective separation technologies are becoming increasingly important for the development of nanoparticles with well-defined sizes, which have application in the fields of optoelectronic devices, biomedicine, materials, and catalysis.

Researchers at the Weizmann Institute have fabricated supramolecular ultrafiltration membranes that can be used for filtration and size-selective chromatography of nanoparticles. The membranes are composed of a self-assembled three-dimensional fibrous network that is held together by reversible non-covalent interactions.

The membranes are robust, easy to fabricate, and recyclable.

Applications

Size-selective separation of semiconductor and metal nanoparticles

Uniformity and monodispersity of nanoparticles in solution.

Size exclusion chromatography of nanoparticles in the sub-5-nm size regime.

Advantages

Efficient and inexpensive, Fast and easy fabrication

Recyclable, Self-assembled

Dual application regime: filtration and/or chromatography

Technology's Essence

The recyclable supramolecular membranes are formed from unique perylene derivatives that are large and flat aromatic molecules. These molecules are insoluble in water and form a 3-D network over a solid support, which can be used for the separation of nanoparticles.

The filters can be subsequently recycled from this mixture using an organic solvent (e.g. dichloromethane), which separates the membrane material from the water-soluble nanoparticles, and reused without loss of performance.

This material is hence highly attractive for application in the field of nanotechnology.

NO.	Field	Technology Number
93	Chemistry and Nanotechnology	1506
Principal Investigator:	**Department**	**Patent Status**
Prof. Igor Lubomirsky	Materials and Interfaces	Granted US 8906219
Title	**Efficient Electrolysis of CO2**	
Link	http://yedarnd.com/technologies/efficient-electrolysis-co2	

Summary

A simple electrochemical method and apparatus for the continues production of CO (carbon monoxide) from CO2 as chemical storage for electrical energy and a basic material for further organic products. Constant progress is made in solar and wind alternative energy production. Unfortunately, these systems are weather and time-dependent. Additionally, most of the geographic areas best suited for harvesting these resources are remote from population centers. Therefore the need for a reliable method to store and transport renewable energy is clear. CO can be easily converted into methanol, which is one of the major chemical raw materials and can by itself be used as fuel for diesel engines and the energy source for direct methanol fuel cells (DMFC). At present no reliable method of CO2 to CO reduction is available. Either using low temperatures which leads to low thermodynamic efficiency (<60%), Requires precious metals for electrodes and results in toxic byproducts, or using high temperatures which Requires pure CO2 input and Produces a mixture of CO2 and CO. The current technology describes an efficient, flexible, continues method for production of CO at high temperatures (900oC) without any byproducts or toxic materials.

Applications

Production of CO from CO2, Easy conversion into methanol

Advantages

No precious (Pt, Ag, Au, Pd) metals required, No hazardous chemicals involved, no pollution, Continuous operation is possible, One can use flue gas as a source, Capture of CO2 from air is possible, The system is very compact>20 kW/m3, Operation conditions are very flexible, The process fits existing infrastructure, CO can be easily converted into liquid fuel (CH3OH)

Technology's Essence

The outlined technology overcomes the basic problems of CO production by using molten Li2CO3 as the electrolyte, a Ti container (will not undergo corrosion), Ti cathode (does not catalyze decomposition of CO), and a graphite anode (no chemical reaction with Li2CO3). At 900°C and current density of 0.05-2 A/cm2, this unique system enables a thermodynamic efficiency close to 100%, continues production of CO □ efficiently separating CO2 to CO and O2.


Medical Devices
(67개)

NO.	기술번호	기술명	비고
94	1569	Liposomes highly efficient biocompatible based lubricant material	
95	1533	Treatment of Sleep Disorders	
96	1540	Rotating Field Transcranial Magnetic Stimulation	
97	1408	Assessing Drug Delivery and Resistance to Therapy of Tumor by MRI	
98	1604	Monoclonal Antibodies	
99	1151	Acquisition of Multidimensional NMR Spectra in a Single Scan	자문위 추천기술('1.25)

NO.	Field	Technology Number
94	Medical Devices	1569
Principal Investigator:	**Department**	**Patent Status**
Prof. Jacob Klein	Materials and Interfaces	Pending
Title	**Liposomes highly efficient biocompatible based lubricant material**	
Link	http://yedarnd.com/technologies/liposomes-highly-efficient-biocompatible-based-lubricant-material-0	

Summary

Liposomes are vesicles formed by natural lipids commonly named phospholipids. Phospholipids contain the phosphocholine head group which has great impact on their characteristics. In general the use of natural lipids provides biocompatibility; liposomes are frequently used as drug delivery agents, and we now propose to use them for bio-lubrication purposes. Our phosphatidylcholine liposomes, which are in their more rigid gel phase, form close-packed boundary layers in a hydrated environment. This leads to a striking reduction of the friction coefficient at high pressures because the uniform close-packed arrangement of these liposomes creates a particularly robust layer. These characteristics make these liposomes excellent candidates for use as boundary lubricant materials.

Applications

Bio-lubricant materials for:

Medical applications such as reduction of skinsoreness from rubbing and suppression of plaque formation, and in biomedical devices including catheters

Cosmetic applications such as use in conditioners and shampoos

Friction reducers in synovial joints where osteoarthritis-related problems arise

Advantages

Rapid and simple liposome preparation procedure

Strong decrease of friction coefficient at physiological pressures

Material robustness and stability

Technology's Essence

Our phosphatidylcholine liposomes spontaneously adsorb and self-assemble onto a solid surface in aqueous solution to form a robust boundary layer which provides extremely efficient lubrication at the interfaces. The lubrication occurs under pressures of up to 100 atmospheres or more. These characteristics are preserved up to the gel-to-liquid-crystalline phase transition temperature (Tm= 53ºC for the HSPC liposomes for example). The lipids head groups which are highly hydrated and exposed at the outer liposome surfaces provide these remarkable properties by virtue of the hydration lubrication mechanism.

NO.	Field	Technology Number
95	Medical Devices	1533
Principal Investigator:	**Department**	**Patent Status**
Prof. Noam Sobel	Neurobiology	Pending
Title	**Treatment of Sleep Disorders**	
Link	http://www.yedarnd.com/technologies/treatment-sleep-disorders-0	

Summary

A method to treat sleep apnea without causing arousal or wake.

Sleep apnea is a sleep disorder characterized by repetitive cessation or decreased amplitude of breathing lasting 10s or more, that may occur up to hundreds of times per night. The cessations of breath lead to oxyhemoglobin desaturation that often leads to awakening. The prevalence of the disorder is 4% and 2% in middle-aged men and women, respectively. Additionally, 7% of the population suffer from a mild sleep apnea. There has been limited success in treating apnea with pharmacological and surgical methods, and the standard treatment for apnea remains a device consisting of a pump and nasal mask that provide continuous positive airway pressure. The major disadvantage of this device is the relatively low compliance (12% of users abandon therapy after 1 night, and only 46% use this device on a regular daily basis). Thus, apnea remains an often untreated disorder. The present technology triggers an odor at the onset of sleep apnea, thus jump-starting the respiratory pattern without inducing arousal or wake.

Applications

Treatment of sleep apnea

Advantages

"Jump start" of respiration without inducing arousal or wake

More pleasant that current treatment

Technology's Essence

Odors have been long suggested as a possible treatment for sleep apnea. The novel finding in this technology is that odors modify respiration during sleep, where they decrease inhalation and increase exhalation volume for several breaths after odor onset. An odorant stimulus is provided such that it is not a puff of air but rather a block of odorant embedded within a constant airflow. Therefore, this method may serve as a platform to treat sleep apnea.

NO.	Field	Technology Number
96	Medical Devices	1540
Principal Investigator:	**Department**	**Patent Status**
Prof.Elisha Moses	Physics of Complex Systems	Granted US 9067052
Title	**Rotating Field Transcranial Magnetic Stimulation**	
Link	http://yedarnd.com/technologies/rotating-field-transcranial-magnetic-stimulation-rftms-1	

Summary

A novel TMS method that eliminates the restrictions of angular positioning, exciting more neurons per area of stimuli, in further areas of the brain.

Current TMS methods and TMS methods under development, suffer shortcomings of a highly specific directional electric field, which demands a precisely targeted application. Current methods are extremely sensitive to the movements of the patient or the device. Once a position is established the patient must remain still for the treatment. Furthermore, stable and reproducible positioning is costly and time-consuming.

Researchers at the Weizmann Institute developed a method to induce a rotating magnetic field in TMS applications, yielding optimal targeting of brain regions where correct orientation cannot be determined (e.g. via motor feedback). This innovative method can also stimulate brain regions with no preferred axonal orientation, and open new applications in diagnostics and research in neuronal cultures and rats, previously unresponsive to conventional TMS

Applications

Accurate, cost-effective, enhanced rfTMS devices for treatment of depression, migraines and other mental disorders. A novel model system in rats and neuronal cultures for development of diagnostics and therapeutics.

Advantages

Exciting more neurons in the same area of stimulation. Accessing areas in the brain that are currently unresponsive to conventional TMS. No positional restrictions. Requires less voltage

Technology's Essence

The theory behind this technology involves the understanding that neural response is direction dependent. Neurons whose axons are parallel to the magnetic field will be most significantly stimulated. Additionally, factors of magnetic field, rise time and neural cooperatively play a role. All these are addressed by a rotating magnetic field creating anisotropy of angles that match the neurons□ orientation and the excitation of dendrites by applying pulses of the order of 1ms. This solution offers greater control over the TMS system.

NO.	Field	Technology Number
97	Medical Devices	1408
Principal Investigator:	**Department**	**Patent Status**
Prof. Hadassa Degani	Biological Regulation	N/A
Title	**Assessing Drug Delivery and Resistance to Therapy of Tumor by MRI**	
Link	http://yedarnd.com/technologies/assessing-drug-delivery-and-resistance-therapy-tumor-mri-1	

Summary

A non invasive method for determining the interstitial fluid pressure (IFP) in tumors. The majority of cancer diseases are managed with a variety of systemic therapeutic agents. These agents are usually administered through the blood circulation, enter the tumor vasculature, extravasate out into the tissue across the microvascular wall and move through the interstitial compartment into the cells overcoming the cells membrane barrier. However, these therapeutic agents may not reach the target cells because of high pressure gradients that do not allow entrance of the drug to the tumor. This inhibition of delivery of drugs is a form of a physical drug resistance and can drastically impair treatment of tumors. This invention present an MRI imaging method for non-invasively monitoring an actual system pressure, assessing drug delivery and resistance to therapy of a tumor or organ, control pressure in a tumor or organ and mapping delivery capacity by imaging actual interstitial fluid pressure and concentration or distribution of a tracer.

Applications

Monitor temporal changes in interstitial fluid pressure. Assessing a tumor's susceptibility and resistance to drugs.

Advantages

An imaging method that can measure pressure not just in a limited loci of a tumor. A non-invasive method which does not damage the investigated tissue and which does not elevating the interstitial fluid pressure of the investigated tissue. Can be used for internal organs and tumors.

Technology's Essence

In order to map interstitial fluid pressure and barriers to drug delivery, a contrast agent is administered by a slow infusion into the blood circulation of a mammal while monitoring by MRI the concomitant changes in signal enhancement. When the concentration of the contrast agent in the blood circulation reaches a steady state, the monitoring by MRI produces output images indicative of changes in contrast agent concentration in the system that are processed according to a novel algorithm to obtain data regarding transfer constants and values of pressure gradients, and to obtain data regarding the differences in space between the distribution of the tracer due to the presence of pressure gradients. Essentially, the interstitial fluid pressure (IFP) can be determined and monitored in an ongoing basis, so that the effective transcapillary transfer through the interstitium from adjacent regions is known, while giving an indication of delivery of or resistance to delivery of a drug to a tumor or organ.

NO.	Field	Technology Number
98	Medical Devices	1604
Principal Investigator:	**Department**	**Patent Status**
Prof. Michal Neeman	Biological Regulation	Pending
Title	**Mouse IgE and Anti-Mouse IgE Monoclonal Antibodies**	
Link	http://www.yedarnd.com/technologies/mouse-ige-and-anti-mouse-ige-monoclonal-antibodies	

Summary

Novel reporter gene for magnetic resonance imaging applications.The ability to image the duration and location of gene expression in vivo and noninvasively is imperative for the future of biology and clinical medicine. Magnetic Resonance Imaging (MRI) is a widely used noninvasive clinical diagnostic tool that offers views into deep tissues at exquisite spatial resolution. Recently, MRI has emerged as a valuable tool for monitoring the expression of genes by utilizing metal-complexed MRI agents to display transgene activity in vivo. However, administration of metal complexes into tissues and cells is challenging. Intra-cellular metalloproteins such as Ferritin have been utilized as endogenous MRI contrast agents, but offer relatively low sensitivity. The present technology provides a novel Ferritin-based transgene with enhanced MRI contrast.

Applications

Non-invasive imaging of gene expression in transgenic mice models.
Monitoring target gene expression in pre-clinical studies.
Long-term cell labeling and tracking.
Visualization of cellular- and gene-based therapeutics.

Advantages

Does not require delivery of exogenous substrate.
Enhanced MRI contrast over current Ferritin-based reporters.
Conversion to magnetite is achieved in physiological conditions and not by synthetic modification or by extreme heating.

Technology's Essence

Ferritin, the main Iron storage intracellular protein, contains a paramagnetic ferryhydrate core, and thus was proposed as an endogenous MRI reporter gene. However, Ferritin provides relatively low sensitivity. One way to increase sensitivity of Ferritin is to convert the non-crystalline ferrihydrate in its core into crystal magnetite as has been done chemically, to form magneto-ferritin. The current method enhances the magnetic properties of Ferritin by engineering a Ferritin protein fused to a bacteria-derived peptide. This novel recombinant fusion protein facilitates conversion of ferrihydrate into crystal magnetite and by this induces MRI contrast. The new construct can serve for monitoring delivery and differentiation of cells in vivo in cellular based therapy.

NO.	Field	Technology Number
99	Medical Devices	1151
Principal Investigator:	**Department**	**Patent Status**
Prof. Lucio Frydman	Chimeical Physics	Granted US 6873153; 7271588; 7944206
Title	**Acquisition of Multidimensional NMR Spectra in a Single Scan**	
Link	http://yedarnd.com/technologies/acquisition-multidimensional-nmr-spectra-single-scan	

Summary

A method to significantly shorten acquisition times of high-quality MRI images.
Multidimensional nuclear magnetic resonance (NMR) is used nowadays in many applications (e.g., discovery of new pharmaceutical drugs, characterization of new catalysts, and investigation of the structure and dynamics of proteins). One drawback of this technique is that, by contrast to one-dimensional spectroscpic methods, multidimensional NMR requires relatively long measurement times associated with hundreds or thousands of scans. This places certain kinds of rapidly-changing systems in Chemistry outside the scope of the technique. Long acquisition times also make this technique ill-suited for in vivo analyses and for clinical measurements in combination with magnetic resonance imaging (MRI). The current technology allows for the acquisition of multidimentional NMR scans using a single continuous scan, thereby shortening the time needed to acquire high-quality MRI images.

Applications

In vivo diagnostics, High-throughput proteomics/metabonomics, NMR of unstable chemical systems, Metabolic dynamics, High-resolution NMR in tabletop systems, xtensions to non-MR spectroscopies

Advantages

Can shorten the acquisition time of any multidimensional spectroscopy experiment by orders of magnitude
Compatible with the majority of multidimensional pulse sequences
Can be implemented using conventional NMR and MRI hardware

Technology's Essence

The outlined approach, called ultrafast multidimensional NMR, significantly expedites the analysis of the electromagnetic sounds produced, making it possible to acquire complete multidimensional NMR spectra within a fraction of a second. This technology slices up□ the molecular sample into numerous thin layers and then simultaneously performs all the measurements required on every one of these slices. The protocol then integrates these measurements according to their precise location, generating an image that amounts to a full multidimensional spectrum from the entire sample.