中国工程科技知识中心
China Knowledge Centre for Engineering Sciences and Technology

《整合医学战略研究（2035）》参考

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中国工程科技知识中心医药卫生专业分中心
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[动态信息]

1. **Wearable robot 'WalkON Suit' off to Cybathlon 2020**

【**EurekAlert**】Standing upright and walking alone are very simple but noble motions that separate humans from many other creatures. Wearable and prosthetic technologies have emerged to augment human function in locomotion and manipulation. However, advances in wearable robot technology have been especially momentous to Byoung-Wook Kim, a triplegic for 22 years following a devastating car accident.

链接： https://www.eurekalert.org/pub_releases/2019-06/tkai-wr062519.php

2. **Can magnetic stem cells improve cartilage repair?**

【 **EurekAlert** 】New Rochelle, NY, July 11, 2019-Cells equipped with superparamagnetic iron oxide nanoparticles (SPIOs) can be directed to a specific location by an external magnetic field, which is beneficial for tissue repair. Researchers have now taken the important step of evaluating the safety and efficacy of magnetically labeled mesenchymal stem cells (MSCs) for use in repairing cartilage defects. The study is published in Tissue Engineering, a peer-reviewed journal from Mary Ann Liebert, Inc., publishers. Click here to read the article for free on the Tissue Engineering website through August 11, 2019.

链接： https://www.eurekalert.org/pub_releases/2019-07/mali-cms071519.php

3. **SLAS Discovery announces its July feature article, '3D Cell-Based Assays for Drug Screens: Challenges in Imaging, Image Analysis, and High-Content Analysis'**

【**EurekAlert**】Oak Brook, IL - In July's SLAS Discovery feature article, "3D Cell-Based Assays for Drug Screens: Challenges in Imaging, Image Analysis, and High-Content Analysis," Tijmen H. Booij, Ph.D., Screening Specialist for NEXUS Personalized Health Technologies (Switzerland), discusses the switch from using 2D to 3D cell cultures in drug discovery to more accurately mimic human physiological conditions and improve the success rates of drugs in the early stages of preclinical drug discovery.

链接： https://www.eurekalert.org/pub_releases/2019-06/sfl-sda062419.php

4. **Team Model, Big Data Bring Precision Medicine to Primary Care**

【**medscape**】A pilot project tests a new model of primary care that incorporates collection and analysis of personal physiologic and genetic data into the electronic health record to inform personalized care plans with unique features of the whole patient.

链接： https://www.medscape.com/viewarticle/914841

5. **Will 3D Printing Revolutionize Orthopedic Implant Surgery?**

【 **medscape** 】From tailoring preprocedural planning in patients with heart failure to building layers of cardiac tissue to create a tiny 'heart', 3D printing (or additive manufacturing) has shown promise in various applications in cardiology. So, how is the technology currently being applied in orthopedics?

Medscape spoke with Timothy M. Wright, PhD, who works in the department of biomechanics at the Hospital for Special Surgery (HSS) in New York City, to learn more about how 3D printing may revolutionize the design of orthopedic devices and improve biomechanical performance in joint replacements

链接： https://www.medscape.com/viewarticle/914856

6. **Does Foam Rolling Help Sports Tissue Injuries?**

【 **medscape** 】Foam rolling has become increasingly popular in recent years. However, scientific evidence supporting its health benefits is still scarce, says Dr Christian Baumgart, a German expert on performance diagnostics and exercise science at the University of Wuppertal, Germany.

链接： https://www.medscape.com/viewarticle/915484

7. **3D technology might improve body appreciation for young women**

【**EurekAlert**】COLUMBIA, Mo. - 3D technology has transformed movies and medical imaging, and now it might be able to help young women better appreciate their bodies.

链接： https://www.eurekalert.org/pub_releases/2019-06/uom-3tm062019.php

8. **New CRISPR Platform Expands RNA Editing Capabilities**

【**EurekAlert**】CRISPR-based tools have revolutionized our ability to target disease-linked genetic mutations. CRISPR technology comprises a growing family of tools that can manipulate genes and their expression, including by targeting DNA with the enzymes Cas9 and Cas12 and targeting RNA with the enzyme Cas13. This collection offers different strategies for tackling mutations.

链接：https://www.natureworldnews.com/articles/41752/20190713/new-crispr-platform-expands-rna-editing-capabilities.htm

9. **Ocutrx 推出首款可改善黄斑变性症的 AR 眼镜**

【**可穿戴设备网**】近日，Ocutrx Vision 公司宣布即将推出一款具有视力调整效果的 AR 眼镜：Oculenz ARwear。是不是很强大？那么，今天小编就给大家介绍关于这款 AR 眼镜的信息，希望大家会喜欢。在近期于希腊举行的爱琴海视网膜会议（Retina Conference）上，一家名为 Ocutrx Vision 的公司展示了一款具有视力调整效果的 AR 眼镜：Oculenz ARwear，据这家公司称是市面上唯一能帮助老年性黄斑变性患者恢复视力的解决方案。

链接： https://wearable.ofweek.com/2019-07/ART-8120-5006-30398743.html

10. **研发世界上最小的单导心电检测仪，和家健康致力于移动医疗系统家庭化**

【**猎云网**】和家健康自主研发的移动数字医疗系统涵盖了人体心血管系统的检测技术及“大数据+AI 健康数据分析”，可以辅助医生决策。企业以移动数字医疗为研发方向离不开两条主线，一条是线下入口的医疗级可穿戴设备，用于采集生理数据，另一条是线上的 APP 与大数据云平台、智能 AI 平台。和

家健康的研发团队从2018年至今，研发了多款可穿戴设备，致力于将传统医疗系统的中小型医疗仪器设备进行微型化设计。微型化、可穿戴化、低成本化的特点，可快速将医疗级仪器普及到家庭的日常生活中；大数据云平台处在测试阶段，人工智能分析平台在开发中。

链接： https://baijiahao.baidu.com/s?id=1636034104134092416&wfr=spider&for=pc

[文献速递]

1. **Advanced Soft Materials, Sensor Integrations, and Applications of Wearable Flexible Hybrid Electronics in Healthcare, Energy, and Environment.**

   作者：Lim HR

   文献来源：*Adv Mater.*

   摘要： Recent advances in soft materials and system integration technologies have provided a unique opportunity to design various types of wearable flexible hybrid electronics (WFHE) for advanced human healthcare and human-machine interfaces.The hybrid integration of soft and biocompatible materials with miniaturized wireless wearable systems is undoubtedly an attractive prospect in the sense that the successful device performance requires high degrees of mechanical flexibility, sensing capability, and user-friendly simplicity. Here, the most up-to-date materials, sensors, and system-packaging technologies to develop advanced WFHE are provided. Details of mechanical, electrical, physicochemical,and biocompatible properties are discussed with integrated sensor applications in healthcare, energy, and environment. In addition, limitations of the current materials are discussed, as well as key challenges and the future direction of WFHE. Collectively, an all-inclusive review of the newly developed WFHE along with a summary of imperative requirements of material properties, sensor capabilities, electronics performance, and skin integrations is provided.

   链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40333

2. **Application of mobile health, telemedicine and artificial intelligence to echocardiography.**

作者：Seetharam K

文献来源：*Echo Res Pract.*

摘要：The intersection of global broadband technology and miniaturized high capability computing devices has led to a revolution in the delivery of healthcare and the birth of telemedicine and mobile health (mHealth). Rapid advances in handheld imaging devices with other mHealth devices such as smartphone apps and wearable devices, are making great strides in the field of cardiovascular imaging like never before. Although these technologies offer a bright promise in cardiovascular imaging, it is far from straightforward. The massive data influx from telemedicine and mHealth including cardiovascular imaging supersedes the existing capabilities of current healthcare system and statistical software. Artificial intelligence with machine learning is the one and only way to navigate through this complex maze of the data influx through various approaches. Deep learning techniques are further expanding their role by image recognition and automated measurements. Artificial intelligence provides limitless opportunity to rigorously analyze data. As we move forward, the futures of mHealth, telemedicine and artificial intelligence are increasingly becoming intertwined to give rise to precision medicine.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40334

3. **A Composite Hydrogel with High Mechanical Strength, Fluorescence, and Degradable Behavior for Bone Tissue Engineering**

作者：Yanqin Wang

文献来源：*Polymers*

摘要：In this work, to obtain a novel composite hydrogel with high mechanical strength, fluorescence and degradable behavior for bone tissue engineering, we prepare a nanofiller and double-network (DN) structure co-enhanced carbon dots/hydroxyapatite/poly (vinyl alcohol) (CDs/HA/PVA) DN hydrogel. The composite hydrogels are fabricated by a combination of two fabrication techniques including chemical copolymerization and freezing–thawing cycles, and further characterized by FTIR, XRD, etc. Additional investigations focus on the mechanical properties of the hydrogel with varying mass ratios of CDs to PVA, HA to PVA and different numbers of freezing/thawing cycles. The results

show that the as-prepared CDs3.0/HA0.6/PVA DN9 hydrogel has optimized compression properties (Compression strength = 3.462 MPa, Young's modulus = 4.5 kPa). This is mainly caused by the synergism effect of the nanofiller and chemical and physical co-crosslinking. The water content and swelling ratio of the CDs/HA/PVA SN and DN gels are also systematically investigated to reveal the relationship of their microstructural features and mechanical behavior. In addition, in vitro degradation tests of the CDs/HA/PVA DN hydrogel show that the DN hydrogels have a prominent degradable behavior. So, they have potential to be used as high-strength, self-tracing bone substitutes in the biomedical engineering field.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40336

4. **Hierarchical Hydrogel Composite Interfaces with Robust Mechanical Properties for Biomedical Applications.**

作者：Zhu Y

文献来源：*Adv Mater.*

摘要：Cells sense and respond to a wide range of external signals, including chemical signals, topography, and interface mechanics, via interactions with the extracellular matrix (ECM), triggering the regulation of behavior and function. The ECM can be considered a hierarchical multiphase porous matrix with various components. Highly porous hydrogel-based biomaterials can mimic the critical ECM properties, to provide mechanical support for tissues and to regulate cellular behaviors, such as adhesion, proliferation, and differentiation. Herein, based on micro/nanoscale-topography-coupled mechanical action, recent advances in the fabrication and application of hydrogel composites with tunable mechanical properties and topography in biomedicine are summarized. In particular, recent findings showing that hydrogels with specifically designed structures not only influence a range of cellular processes and fit the needs of engineered tissues but also have pharmacological effects are emphasized.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40335

5. **Controlling the Self-Assembly of Biomolecules into Functional Nanomaterials through Internal Interactions and External Stimulations: A**

Review.

作者：Wang L

文献来源：*Nanomaterials (Basel).*

摘要：Biomolecular self-assembly provides a facile way to synthesize functional nanomaterials. Due to the unique structure and functions of biomolecules, the created biological nanomaterials via biomolecular self-assembly have a wide range of applications, from materials science to biomedical engineering, tissue engineering, nanotechnology, and analytical science. In this review, we present recent advances in the synthesis of biological nanomaterials by controlling the biomolecular self-assembly from adjusting internal interactions and external stimulations. The self-assembly mechanisms of biomolecules (DNA, protein, peptide, virus, enzyme, metabolites, lipid, cholesterol, and others) related to various internal interactions, including hydrogen bonds, electrostatic interactions, hydrophobic interactions, π¯π stacking, DNA base pairing, and ligand¯receptor binding, are discussed by analyzing some recent studies. In addition, some strategies for promoting biomolecular self-assembly via external stimulations, such as adjusting the solution conditions (pH, temperature, ionic strength), adding organics, nanoparticles, or enzymes, and applying external light stimulation to the self-assembly systems, are demonstrated. We hope that this overview will be helpful for readers to understand the self-assembly mechanisms and strategies of biomolecules and to design and develop new biological nanostructures or nanomaterials for desired applications.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40337

6. **Degradability of chitosan micro/nanoparticles for pulmonary drug delivery.**

作者：Islam N

文献来源：*Heliyon.*

摘要：Chitosan, a natural carbohydrate polymer, has long been investigated for drug delivery and medical applications due to its biodegradability,

biocompatibility and low toxicity. The micro/nanoparticulate forms of chitosan are reported to enhance the efficiency of drug delivery with better physicochemical properties including improved solubility and bioavailability. This polymer is known to be biodegradable and biocompatible; however, crosslinked chitosan particles may not be biodegradable. Crosslinkers (e.g., tripolyphosphate and glutaraldehyde) are needed for efficient micro/nanoparticle formation, but it is not clear whether the resultant particles are biodegradable or able to release the encapsulated drug fully. To date, no studies have conclusively demonstrated the complete biodegradation or elimination of chitosan nanoparticles in vivo. Herein we review the synthesis and degradation mechanisms of chitosan micro/nanoparticles frequently used in drug delivery especially in pulmonary drug delivery to understand whether these nanoparticles are biodegradable.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40339

7. **3D Bioprinted Nanocellulose-Based Hydrogels for Tissue Engineering Applications: A Brief Review**

作者：Sandya S. Athukoralalage

文献来源：*Polymer*

摘 要 ： Nanocellulosic materials, such as cellulose nanocrystals, cellulose nanofibers, and bacterial nanocellulose, that display high surface area, mechanical strength, biodegradability, and tunable surface chemistry have attracted great attention over the last decade for biomedical applications. Simultaneously, 3D printing is revolutionizing the field of biomedical engineering, which enables the fast and on-demand printing of customizable scaffolds, tissues, and organs. Nanocellulosic materials hold tremendous potential for 3D bioprinting due to their printability, their shear thinning behavior, their ability to live cell support and owing to their excellent biocompatibility. The amalgamation of nanocellulose-based feedstocks and 3D bioprinting is therefore of critical interest for the development of advanced functional 3D hydrogels. In this context, this review briefly discusses the most recent key developments and challenges in 3D bioprinting nanocellulose-based hydrogel constructs that have been successfully tested for mammalian cell viability and used in tissue

engineering applications.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40340

8. **Production of 3D printed polylactide scaffolds with surface grafted hydrogel coatings.**

作者：Kowalczyk P

文献来源：*Colloids Surf B Biointerfaces.*

摘要：The aim of this work was to elaborate the 3D printed polylactide (PLA) polymeric scaffolds and, subsequently, study the possibility of coating thereof with a biomedical polyvinylpyrrolidone (PVP) hydrogel through the previously patented protocol. Such materials have a potential to be applied in biomedical engineering, e.g. for tissue regeneration. PVP layer according to the present paper could constitute a useful biocompatible supporting layer for drug delivering implant surfaces of any shape. Polylactide (PLA) both in forms of flat foils and 3D-printed scaffolds was used to be coated with PVP layer with the Fenton-type reaction that enables the polymeric scaffold grafting with hydrogel in two easy steps. The study revealed that PVP was successfully grafted to PLA substrates. Most optimal parameters for PVP grafting process were selected. The PLA-PVP materials were found to be hydrophilic and non-toxic which is promising considering their biomedical application. The method comprising well-tested PLA scaffolds printing and then grafting them with PVP layer has a promising potential to be brought in to the industrial production due to its simplicity.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40338

9. **Stretch in Focus: 2D Inplane Cell Stretch Systems for Studies of Cardiac Mechano-Signaling.**

作者：Friedrich O

文献来源：*Front Bioeng Biotechnol.*

摘要： Mechanobiology is a rapidly growing interdisciplinary research field, involving biophysics, molecular and cell biology, biomedical engineering, and medicine. Rapid progress has been possible due to emerging devices and tools engineered for studies of the effect of mechanical forces, such as stretch or shear

force, impacting on biological cells and tissues. In response to such mechanical stimuli, cells possess various mechanosensors among which mechanosensitive ion channels are molecular transducers designed to convert mechanical stimuli into electrical and/or biochemical intracellular signals on millisecond time scales. To study their role in cellular signaling pathways, devices have been engineered that enable application of different strain protocols to cells allowing for determination of the stress-strain relationship or other, preferably optical, readouts. Frequently, these devices are mounted on fluorescence microscopes, allowing simultaneous investigation of cellular mechanotransduction processes combined with live-cell imaging. Mechanical stress in organs/tissues can be complex and multiaxial, e.g., in hollow organs, like lung alveoli, bladder, or the heart. Therefore, biomedical engineers have, in recent years, developed devices based on elastomeric membranes for application of biaxial or multiaxial stretch to 2D substrate-adhered or even 3D-embedded cells. Here, we review application of stretch technologies to cellular mechanotransduction with a focus on cardiovascular systems. We also present new results obtained by our IsoStretcher device to examine mechanosensitivity of adult ventricular cardiomyocytes. We show that sudden isotropic stretch of cardiomyocytes can already trigger arrhythmic Ca2+ transients on the single cell level.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40341

10. **Dual-Gel 4D Printing of Bioinspired Tubes.**

作者：Liu J

文献来源：*ACS Appl Mater Interfaces.*

摘要：The distribution of periodic patterns of materials with radial or bilateral symmetry is a universal natural design principle. Among the many biological forms, tubular shapes are a common motif in many organisms, and they are also important for bioimplants and soft robots. However, the simple design principle of strategic placement of 3D printed segments of swelling and nonswelling materials to achieve widely different functionalities is yet to be demonstrated. Here, we report the design, fabrication, and characterization of segmented 3D printed gel tubes composed of an active thermally responsive swelling gel (poly N-isopropylacrylamide) and a passive thermally nonresponsive gel

(polyacrylamide). Using finite element simulations and experiments, we report a variety of shape changes including uniaxial elongation, radial expansion, bending, and gripping based on two gels. Actualization and characterization of thermally induced shape changes are of key importance to robotics and biomedical engineering. Our studies present rational approaches to engineer complex parameters with a high level of customization and tunability for additive manufacturing of dynamic gel structures.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=40342

[研究报告]

1. **Additive Manufacturing Applications on Flexible Actuators for Active Orthoses and Medical Devices.**

发布源：*University of L'Aquila, Italy.*

发布时间：2019 年

摘 要： This paper describes the results of research projects developed at the University of L'Aquila by the research group of the authors in the field of biomedical engineering, which have seen an important use of additive manufacturing technologies in the prototyping step and, in some cases, also for the realization of preindustrialization prototypes. For these projects, commercial 3D printers and technologies such as fused deposition modelling (FDM) were used; the most commonly used polymers in these technologies are acrylonitrile butadiene styrene (ABS) and polylactic acid (PLA). The research projects concern the development of innovative actuators, such as pneumatic muscles and soft pneumatic actuators (SPAs), the development of active orthoses, such as a lower limb orthosis and, finally, the development of a variable-stiffness grasper to be used in natural orifice transluminal endoscopic surgery (NOTES). The main aspects of these research projects are described in the paper, highlighting the technologies used such as the finite element analysis and additive manufacturing.

链接： http://pan.ckcest.cn/rcservice//doc?doc_id=41758

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