3.3.1 科技研发和社会服务标志性成果

佐证材料目录

3.3.1.1 广东省科技进步二等奖（2 项）

广东省科技进步奖
证　书

为表彰2020年度广东省科技进步奖获得者，特颁发此证书。

项目名称：病媒生物及其携带细菌性病原体的分子鉴定关键技术研发

奖励等级：二等奖

获 奖 者：岳巧云

粤府证【2021】1732号
项目编号:J13-2-03-R01

广东省人民政府
2021年3月

广东省科技进步奖
证　书

为表彰2020年度广东省科技进步奖获得者，特颁发此证书。

项目名称：传统广式焙烤食品加工与安全控制关键技术及升级

奖励等级：二等奖

获 奖 者：李向丽

粤府证【2021】712号
项目编号:J03-2-08-R09

广东省人民政府
2021年3月

3.3.1.2 国际设计 IF 奖（4 项）

DESIGN AWARD 2021

DISCIPLINE PROFESSIONAL CONCEPT
CATEGORY 5.01 Product Concepts

Braille Medication Instruction

Medication instruction card for the blind

DESIGN
Zhongshan Torch Polytechnic
Jiayue Wang, Yanfei Gao, Jing Zhao,
Chuan-Xin Sheng, Haoran Pei
Zhongshan, China

CLIENT / MANUFACTURER
Zhongshan Torch Polytechnic
Zhongshan, China

346-PC-3140863

DESIGN AWARD 2021

DISCIPLINE PACKAGING
CATEGORY 2.01 Beverages

The Four Seasons

Wine packaging

DESIGN
Zhongshan Torch Polytechnic
Gao Yanfei, Song Jinan, Wang Jiayue,
Peng Zhifeng, Huang Yanhui
Zhongshan, China

CLIENT / MANUFACTURER
Hoicheung Packaging Design
& Service Co., Ltd.
Zhongshan, China

Jury

Marika Aakesson | Werner Aisslinger | Josephine Akvama Hoffmeyer | Marta Alonso Yebra | Silvana Angeletti | Keiji Ashizawa | Serdal Korkut Avci | Tomoko Azumi | Jan-Erik Baars | Ceren Bagatar | Stefan Behnisch | Michal Bonikowski | Philipp Bree | Dave Brown | Uwe Brückner | Maike Budde | Sean Carney | Eva Castro | Annie Chang | Chi-Yi Chang | Emil Chao | Shikuan Chen | Lee Chen | Albert Chen | Patrizio Clonfoli | Paul Cohen | Sonja Cornelißen | Isabelle Dahlborg Lidström | Michele De Lucchi | Christian Doering | Bern Donadeu | Manfred Dorn | Friederike Faller | Fritz Frenkler | Claudia Friedrich | Marisa Galván | Niklas Galler | Manuel Gattinger | Oliver Gerstheimer | Isabelle Goller | Senna Graulus | Gyeongguk Grey Choe | Matthis Hamann | Sascha Hanke | Gesa Hansen | Sam Hecht | Olivia Herms | Tom Hirt | Britta Hölscher | Daisuke Ishii | Neslihan Isik | Morten Bo Jensen | Henrik Jeppesen | Long Jiao | Ann Kalkschmidt | Karen Korellis Reuther | Henk Koscha | Michael Lanz | Kristina Lassus | Sukwoo Lee | Lidan Liu | Sam Livingstone | PPetra Lundblad | Kazushige Miyake | Nils Holger Moormann | Alexander Müller | Darragh Murphy | Achim Nagel | Stina Nillmaa Wickström | Changho Noh | Katrin Oeding | Lutzila Ortiz Miralles | Haruki Ota | Thomas Paulen | Andy Payne | Achim Pohl | Fátima Pombo | Claudia Pommer | Bruno Porto | Ana Relvão | Nina Rieke | Andreas Rotzler | Robert Sachon | Annett Schaper | Sonja Schiefer | Johanna Schoemaker | Myungsup Shin | Patrick Speck | Patricia Stark | Junggi Sung | Hiroaki Tanaka | Martin Topel | Kanaé Tsukamoto | Wolfgang Wagner | Manfred Wang | Jutta Werner | Irmy Wilms-Haferkamp | William (Jian) Wu

DESIGN AWARD 2021

DISCIPLINE PROFESSIONAL CONCEPT
CATEGORY 5.03 Packaging Concepts

Environmental energy-saving lamp packaging

Lamp packaging

DESIGN
Zhongshan Torch Polytechnic
Gao Yanfei, Li Fuyin, Qiu Yan, Chen Ting,
Huang Zengping, Lu Oyanli, He Sufen
Zhongshan, China

CLIENT / MANUFACTURER
Guangdong CAILE Intelligent
Packaging Technology Co., Ltd.
Zhongshan, China

Jury

Marika Aakesson | Werner Aisslinger | Josephine Alwana Hoffmeyer | Marta Alonso Yebra | Silvana Angeletti | Keiji Ashizawa | Serdal Korkut Avci | Tomoko Azumi | Jan-Erik Baars | Ceren Bagatar | Stefan Behnisch | Michal Bonikowski | Philipp Bree | Dave Brown | Uwe Brückner | Maike Budde | Sean Carney | Eva Castro | Annie Chang | Chi-Yi Chang | Emil Chao | Shikuan Chen | Lee Chen | Albert Chen | Patrizio Clonfoli | Paul Cohen | Sonja Cornelißen | Isabelle Dahlborg Lidström | Michele De Lucchi | Christian Doering | Bern Donadeu | Manfred Dorn | Friederike Faller | Fritz Frenkler | Claudia Friedrich | Marisa Galién | Niklas Galler | Manuel Gattinger | Oliver Gerstheimer | Isabelle Goller | Senna Grauius | Gyeongguk Grey Choe | Matthis Hamann | Sascha Hanke | Gesa Hansen | Sam Hecht | Olivia Herms | Tom Hirt | Britta Hölscher | Daisuke Ishii | Neslihan Isik | Morten Bo Jensen | Henrik Jeppesen | Long Jiao | Ann Kalkschmidt | Karen Korellis Reuther | Henk Kosche | Michael Lanz | Kristina Lassus | Sukwoo Lee | Lidan Liu | Sam Livingstone | Pfetra Lundblad | Kazushige Miyake | Nils Holger Moormann | Alexander Müller | Darragh Murphy | Achim Nagel | Stina Nillmaa Wickström | Changho Noh | Katrin Oeding | Lutzia Ortiz Miralles | Haruki Ota | Thomas Paulen | Andy Payne | Achim Pohl | Filtima Pombo | Claudia Pommer | Bruno Porto | Ana Relvão | Nina Rieke | Andreas Rotzler | Robert Sachon | Annett Schaper | Sonja Schiefer | Johanna Schoemaker | Myungsup Shin | Patrick Speck | Patricia Stark | Junggi Sung | Hiroaki Tanaka | Martin Topel | Kanaé Tsukamoto | Wolfgang Wagner | Manfred Wang | Jutta Werner | Irmy Wilms-Haferkamp | Willem (Jian) Wu

3.3.1.3 2021 年（第四届）广东高校科技成果转化路演大赛总决赛获奖（铜奖）

广东高校科技成果转化中心

关于公布2021年（第四届）广东高校科技成果转化路演大赛总决赛获奖名单的公示

各学校、参赛团队：

为深入落实创新驱动发展战略，激发广大师生创新创业活力，推动高校科技成果转化，加速创新成果和资源聚集，为高校科研团队提供服务平台，全面提升高校科技创新和服务社会能力，由广东省教育厅主办的2021年（第四届）广东高校科技成果转化路演大赛总决赛于2021年12月10-11日在佛山圆满落幕。

经大赛专家评委组评审，最终评出大赛总决赛高校主赛道特等奖1个、金奖1个、银奖2个、铜奖3个、优胜奖5个，职教赛道金奖1个、银奖2个、铜奖3个。高校优秀组织奖10个和优秀创新创业导师10名，最具商业价值奖、最佳创意奖各1个。经过网络评选，票选出最具人气奖1个。现将获奖名单公示如下。（详见附件）

公示期自2021年12月17日起至12月19日止，公示期内如有异议，可向广东高校科技成果转化中心反映，并提供书面说明材料，署（报）真实姓名、单位和联系方式，以便查证核实。

联系人：陈伟芳，联系电话：18988675113

电子邮箱：gurfcc@163.com

10	消化道电子光-声内窥镜	华南师范大学	杨思华	优胜奖
11	智能半导体气体传感器	香港科技大学	范智勇	优胜奖
12	微纳米纤维素关键制备、表征技术及其高值化应用	华南理工大学	曾劲松	优胜奖

二、职教赛道总决赛获奖名单

序号	项目名称	学校/单位	负责人	奖项
1	基于纯国产区块链操作系统的智慧实验平台	佛山职业技术学院	李建辉	金奖
2	精密电子高性能锡膏	深圳职业技术学院	赵宁	银奖
3	水性无氟防油剂	广东轻工职业技术学院	向华	银奖
4	植物源生物保鲜保活液在水产品运输存放中的研究及产业化应用	中山火炬职业技术学院	李晓璐	铜奖
5	改良型一次性病毒采样管	广州卫生职业技术学院	詹雁竣	铜奖
6	新型电力系统安全防护的装备支撑项目	佛山职业技术学院	丁犇	铜奖

三、高校优秀组织奖获奖名单

序号	获奖单位
1	深圳大学
2	中山大学

3.3.1.4 2021 年度中山市退役军人全员适应性培训

HT2021043

委托承办 2021 年度中山市退役军人全员适应性培训协议书

甲方：中山市退役军人事务局（以下简称“甲方”）

乙方：中山火炬职业技术学院（以下简称“乙方”）

双方经友好协商，甲方委托乙方承办 2021 年度中山市退役军人全员适应性培训班，双方同意在非学历教育培训合作中遵守国家法律法规和甲、乙双方非学历教育培训的相关管理规定。为保障双方的合法权益，甲乙双方签订本协议：

一、培训对象

2021 年中山市退役军人，约 500 人。

二、培训时间

第一期为 2021 年 10 月 13-26 日，共 80 课时；第二期在 2021 年 12 月份，具体时间待定，共 80 课时。

三、培训内容

1. 对 2021 年退役军人全员进行适应性培训。

培训内容：退役军人就业创业政策与常用法律法规、求职应聘技能与商务礼仪指导、职业精神与职业发展能力、粤港澳大湾区及广东经济形势、就业创业能力提升、退役军人有效沟通与团队合作能力、就业创业能力提升现场教学、思想政治教育等。

2. 开展“送政策进军营”活动。全员适应性培训期间，到军营开展两场军人退役后就业创业相关优惠政策宣讲和指导等。

四、培训方式

遵照“方便学员学习、讲究培训效果”的原则，利用先进的

方等第三方索取或接受合同约定外的明扣、暗扣、好处费、现金、有价证券、购物卡、实物、礼品、请吃、旅游等形式的不当得利。如经发现并核实，经依法报送行政或司法机关处理。本条款所称："其他相关人员"是指甲乙双方经办人以外的与合同有直接或间接利益关系的人员，包括但不限于合同经办人的亲友，或其他关系人等。乙方承诺：在履行合同过程中如违反上述反商业贿赂行为约定，甲方有权单方面解除本合同，且不予支付本合同未付金额。乙方不参与可能与合同规定的与甲方利益相冲突的任何活动。

十一、其他

1. 合同执行过程中发生的任何争议，如双方不能通过友好协商解决，任何一方均有权向甲方住所地有管辖权的人民法院提起诉讼。

2. 因不可抗力因素导致违约，不需支付违约金，但双方可以协商本协议的继续履行。

3. 本协议一式 4 份，甲方执 2 份，乙方执 2 份，协议自甲乙双方签订之日起生效。

4. 本协议未尽事宜，双方协商解决，补充协议具有与本协议同等法律效力。

甲方：中山市退役军人事务局　　乙方：中山火炬职业技术学院

（盖章）　　（盖章）

甲方代表：　　乙方代表：

日期　　日期

3.3.1.5 2021 年中山市火炬开发区社区教育

火炬开发区 2021 年度社区教育工作

材料汇编

中山火炬职业技术学院

2021 年 12 月 28 日

目　录

HT2021673

中山市火炬开发区2021年社区教育培训协议书

甲方：中山火炬高技术产业开发区教育事务指导中心

（以下简称“甲方”）

乙方：中山火炬职业技术学院（以下简称“乙方”）

根据《教育部等九部门关于进一步推进社区教育发展的意见》《广东省教育厅关于大力发展社区教育推进学习型社会建设的意见》等文件要求，打造共建共治共享的现代化社区治理格局，甲方委托乙方作为社区教育培训方，在全区开展社区教育培训工作，经甲乙双方友好协商达成本合同，约定事项如下：

一、培训对象

中山市火炬开发区各社区居民。

二、培训时间和地点

具体时间、地点与选课单位协商。

三、培训形式

坚持理论联系实际，以问题为导向，利用线上+线下教学平台，送教上门，综合运用专题讲授、案例教学、情景模拟、互动研讨、沙龙、体验教学、访谈教学以及现场教学等教学方法，体现组织需求、家庭需求、职业需求和兴趣需求，充分发挥教与学两个方面的积极性，做到教学相长、学学相长。

四、甲方权利和义务

（一）甲方提出培训需求，审核乙方提交的培训方案；

（二）甲方负责协调召开火炬开发区社区教育工作会议，研

（四）本协议未尽事宜，双方协商解决，补充协议具有与本协议同等法律效力。

甲　　方：中山火炬高技术产业开发区教育事务指导中心
甲方代表：
签字日期：2021年12月10日

乙　　方：中山火炬职业技术学院
乙方代表：刘岩
签字日期：2021年12月10日

3.3.1.6 行业标准-包装用多层共挤阻隔膜

ICS 55.040
CCS A 82

BB

中华人民共和国包装行业标准

BB/T 0041—2021
代替 BB/T 0041—2007

包装用多层共挤阻隔膜

Multi-layer co-extrusion barrier film for packaging

2021-12-22 发布　　2022-04-01 实施

中华人民共和国工业和信息化部　发布

3.3.1.7 ZnO QD covalently coated, GSH/pH dual-responsive drug delivery system for chemotherapeutic/ionic synergistic therapy （SCI）

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ZnO QD covalently coated, GSH/pH dual-responsive drug delivery system for chemotherapeutic/ionic synergistic therapy

Bo Fu [a], Can Tao [b], Nian Chen [a], Jie-Rou Lin [b], Ping Zhao [b,*]

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ARTICLE INFO

Keywords:
Drug delivery
ZnO QD
Dual-responsive
Cytotoxicity
Chemotherapeutic/ionic

ABSTRACT

Chemotherapeutical agents have been frequently reported to have adverse side effects which reduce their application in clinic. Herein, we reported a mesoporous silica nanoparticles (MSNs)-based drug delivery system (DDS) capped with zinc oxide quantum dots (ZnO QD) which has glutathione (GSH)/pH dual-responsive controlled release in the cancer cells. The drug loaded DDS have higher cellular inhibition than the free drug because of the synergistic effect of payload DNM and the Zn^{2+} dissolved from ZnO QD. The anti-cancer mechanism research indicates that the designed drug loaded DDS can cause mitochondrial damage, arrest the cell cycle and induce the cell apoptosis and autophagy. The combination of excellent biocompatibility, selective release performance, synergistic cellular cytotoxicity, endowed the DDS with the potential of utilization in cancer treatment.

1. Introduction

Chemotherapeutic agents always suffer from their drawbacks such as poor selectively, solubility, stability and quick clearance from body [1–3]. To address these issues, numerous nanoparticle-based materials such as various polymer, liposome, protein and inorganic/organic hybrid materials have been developed as advanced drug delivery systems (DDS) [4–6]. Quantum dots (QDs) are promising candidates in nanomedical fields due to the distinct photochemical properties such sharper spectra, photostability and high quantum yield. Quantum dots like CdS and CdTe nanoparticles have been widely investigated in DDS because of their high quantum yields [7,8]. However, many reports have proved that these QDs are toxic to animals [9]. It is desired to design and explore the advanced DDS based on other safe and efficient QDs.

In recent years, inexpensive and low-toxic ZnO QDs have caught researchers' eyes in biomedical applications. ZnO QDs are benign and weakly toxic, making them ideal for biological applications. It is reported that ZnO QDs are easy to prepare, low-cost, and display a response to acid. Nel and co-workers found that ZnO QDs exhibited significant cytotoxic effects after dissolution in the low pH value in the microenvironment of cancer cells and preferentially killed them [10]. Considering these excellent properties above of ZnO QDs, pH-sensitive ZnO QDs drug delivery system was supposed to display much better therapeutic efficacy. In our previous work, ZnO QDs were employed as gatekeepers to block the nanopores of mesoporous silica nanoparticles (MSNs) through simple physical adsorption. The combination of drugs and ZnO QDs in the systems achieved a synergistic antitumor activity [11]. However, ZnO QDs easily aggregated and the strong adsorption ability of MSNs hindered the complete release of the drug. Moreover, the drug release process only relied on the pH sensitivity of ZnO QDs, which was not adequate and limited the wide application of the cells.

In fact, besides the distinct pH values between the normal and cancerous cells, glutathione (GSH) is present in the intracellular matrix of cancer cells at levels two to three orders of magnitude higher than that found in extracellular environments [12–14]. Thus, pH and redox stimuli responses can both used in the design of DDSs because of their significant differences in concentrations between tumour and normal tissues [15–17]. However, as far as we know, pH and redox dual responsive DDSs based on MMSN have been rarely reported.

Herein, a novel strategy was proposed to construct the pH/GSH dual-responsive DDS based on MMSN with ZnO QDs as gatekeeper. Daunomycin was selected as model anticancer drug to load on the designed DDS. As shown in Fig. 1A, the ZnO QD-capped MMSN nanospheres (DNM@MMSN-SS-ZnO) were effortlessly synthesized by the covalent attachment of carboxyl zinc oxide (ZnO–COOH) to the amide groups on the outer surface of sulfhydryl magnetic silica nanoparticles (MMSN-SS).

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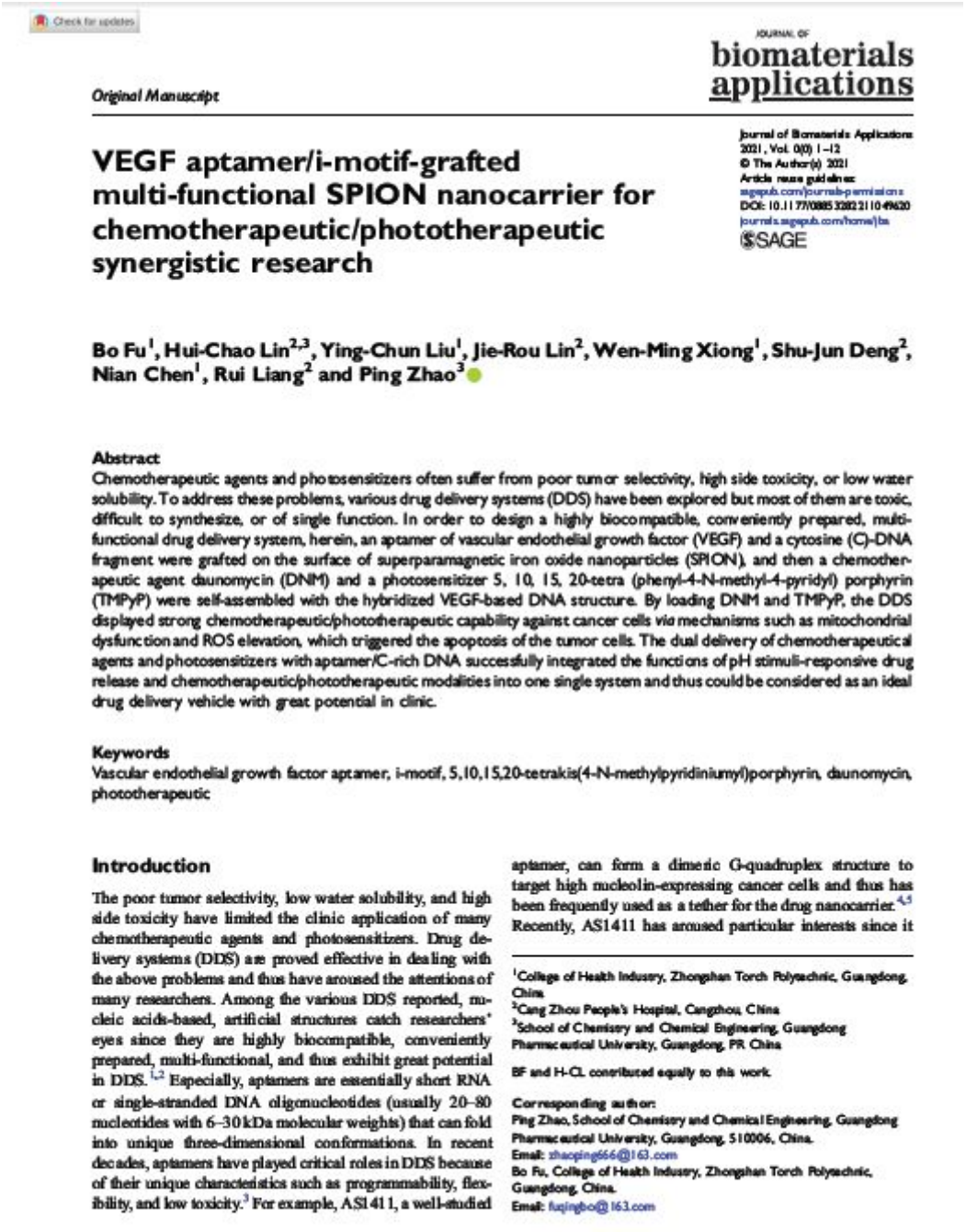
Available online 20 October 2021

3.3.1.8 VEGF aptamer/i-motif-grafted multi-functional SPION nanocarrier for chemotherapeutic/phototherapeutic synergistic research（SCI）



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SAGE

VEGF aptamer/i-motif-grafted multi-functional SPION nanocarrier for chemotherapeutic/phototherapeutic synergistic research

Bo Fu[1], Hui-Chao Lin[2,3], Ying-Chun Liu[1], Jie-Rou Lin[2], Wen-Ming Xiong[1], Shu-Jun Deng[2], Nian Chen[1], Rui Liang[2] and Ping Zhao[3]

Abstract

Chemotherapeutic agents and photosensitizers often suffer from poor tumor selectivity, high side toxicity, or low water solubility. To address these problems, various drug delivery systems (DDS) have been explored but most of them are toxic, difficult to synthesize, or of single function. In order to design a highly biocompatible, conveniently prepared, multi-functional drug delivery system, herein, an aptamer of vascular endothelial growth factor (VEGF) and a cytosine (C)-DNA fragment were grafted on the surface of superparamagnetic iron oxide nanoparticles (SPION), and then a chemotherapeutic agent daunomycin (DNM) and a photosensitizer 5, 10, 15, 20-tetra (phenyl-4-N-methyl-4-pyridyl) porphyrin (TMPyP) were self-assembled with the hybridized VEGF-based DNA structure. By loading DNM and TMPyP, the DDS displayed strong chemotherapeutic/phototherapeutic capability against cancer cells *via* mechanisms such as mitochondrial dysfunction and ROS elevation, which triggered the apoptosis of the tumor cells. The dual delivery of chemotherapeutical agents and photosensitizers with aptamer/C-rich DNA successfully integrated the functions of pH stimuli-responsive drug release and chemotherapeutic/phototherapeutic modalities into one single system and thus could be considered as an ideal drug delivery vehicle with great potential in clinic.

Keywords

Vascular endothelial growth factor aptamer, i-motif, 5,10,15,20-tetrakis(4-N-methylpyridiniumyl)porphyrin, daunomycin, phototherapeutic

Introduction

The poor tumor selectivity, low water solubility, and high side toxicity have limited the clinic application of many chemotherapeutic agents and photosensitizers. Drug delivery systems (DDS) are proved effective in dealing with the above problems and thus have aroused the attentions of many researchers. Among the various DDS reported, nucleic acids-based, artificial structures catch researchers' eyes since they are highly biocompatible, conveniently prepared, multi-functional, and thus exhibit great potential in DDS.[1,2] Especially, aptamers are essentially short RNA or single-stranded DNA oligonucleotides (usually 20–80 nucleotides with 6–30 kDa molecular weights) that can fold into unique three-dimensional conformations. In recent decades, aptamers have played critical roles in DDS because of their unique characteristics such as programmability, flexibility, and low toxicity.[3] For example, AS1411, a well-studied aptamer, can form a dimeric G-quadruplex structure to target high nucleolin-expressing cancer cells and thus has been frequently used as a tether for the drug nanocarrier.[4,5] Recently, AS1411 has aroused particular interests since it

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3.3.1.9 VEGF aptamer/i-motif-based drug co-delivery system for combined chemotherapy and photodynamic therapy（SCI）

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VEGF aptamer/i-motif-based drug co-delivery system for combined chemotherapy and photodynamic therapy

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ABSTRACT

Background: Nucleic acids used as drug delivery systems (DDS) have gained attention because of their biosafety and effortless synthesis. G-quadruplex (G4) structured aptamer such as AS1411 was frequently employed to deliver photosensitizers or chemotherapeutic agents while other aptamers were seldomly reported in this field.
Methods: Herein, a chemical anticancer drug daunomycin (DNM), and a photosensitizer 5, 10, 15, 20-tetra (phenyl-4-N-methyl-4-pyridyl) porphyrin (TMPyP) were physically assembled with a novel DNA structure composed of an aptamer of vascular endothelial growth factor (VEGF) and a cytosine (C)-rich DNA fragment (gc-34). Spectral and molecular mimicking methods were employed to research the drug loading/releasing process. The in vitro cytotoxicity was studied by MTT, ROS, cell cycle, and cell apoptotic assays and the in vivo anticancer efficiency was evaluated by the inhibitive effect on the cancerous growth of MCF-7 tumor-bearing nude mice.
Results: The G4-structured VEGF aptamer delivered TMPyP successfully for the first time. The designed DDS displayed sensitive VEGF/pH controlled drug release. The co-delivery of DNM and TMPyP exhibited high ROS production, significant cell cycle arresting and evident cell apoptosis, and displayed superior cytotoxicity against tumor cells compared with individual agents in vitro. In vivo studies showed that the dual-drug loaded system can greatly inhibit tumor growth with chemotherapeutic/photodynamic synergistic effects.
Conclusion: The co-delivery of DNM and TMPyP with aptamer/C-rich DNA successfully integrates the functions of VEGF/pH stimuli-responsive drug release and chemotherapeutic/phototherapeutic modalities into one single system, and may have great potential in cancer treatment.

1. Introduction

Many chemotherapeutic agents and photosensitizers suffer from poor tumor selectivity, low water solubility or high side toxicity in the clinic application. To address these issues, drug delivery systems (DDS) have aroused the attentions of many researchers since they are proved effective in dealing with the above problems and thus. Among the reported DDS, nucleic acids have caught researchers' eyes because of their unique characteristics such as programmability, flexibility, and low toxicity [1, 2]. The highly programmable and predictable Watson-Crick base pairing endows the nucleic acids with excellent conformational polymorphism [3, 4]. In particular, aptamer, a kind of short single-stranded RNA/DNA oligonucleotide with defined three-dimensional conformations, can bind with molecular targets with high affinity. By effortlessly integrating with other nucleic acid, apamers can specifically recognize and load the therapeutic drugs through the receptors over-expressed on the tumor cells. For example, AS1411, a well-studied aptamer with dimeric G-quadruplex structure, can target the high expressing nucleolin in cancer cells and has been frequently used as a tether to capture the G4-ligand, such as 5,10,15,20-tetrakis (4-N-methylpyridiniumyl)porphyrin (TMPyP) [5]. TMPyP is a broadly used photodynamic therapy (PDT) reagent with poor selectivity in the blood and low accumulation in the tumor cells [6, 7]. Tan et al. have summarized the application of AS1411 in delivering TMPyP and

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CONSTRUCTION, EXPRESSION AND BIOLOGICAL ACTIVITIES OF TAT-SOD1 FUSION PROTEIN

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ABSTRACT

Copper/zinc superoxide dismutase (SOD1) has strong antioxidant activity against the reactive oxygen species (ROS). But exogenous SOD1 cannot enter cells because of its low biomembrane permeability. Cell-penetrating peptides (CPPs) can rapidly cross plasma membranes. TAT derived from the HIV-1 virus is a CPP with strong biomembrane permeability. This study aimed to construct a fusion protein TAT-SOD and investigate its antioxidant activity and the membrane penetration efficiency.

1. INTRODUCTION

Cell mentalism generates reactive oxygen species (ROS), e.g., $O_2^{\bullet-}$ and OH. These radicals are mainly from the mitochondrial electron transport chain and flavoprotein. ROS plays an important role in maintaining cell homeostasis. ROS also participates in redox reactions and generates metabolic signals. However, too much ROS can play an important role in aging, cardiovascular diseases, inflammation and cancer as signal molecules.[1,2] The human body's antioxidant system includes antioxidant enzymes and small molecular antioxidants. The most important type of antioxidant enzymes is superoxide dismutase (SOD).

In mammalian cells, SOD can be divided into three types according to the location of the cell. SOD1 gene is located on chromosome 21 with a molecular weight 32KD. SOD1 mainly exists in the cytoplasm. SOD2 gene is located on chromosome 6 with a molecular weight 96KD, which is almost completely located in the mitochondrial matrix. SOD3 gene is located on chromosome 4 with a molecular weight of 135KD which is secreted into the extracellular