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# Novel adjuvant to boost humoral and cellular immune responses against influenza

Project Number 5R01Al139473-02

Contact PI/Project Leader CHEN, XINYUAN

Awardee Organization
UNIVERSITY OF RHODE
ISLAND



#### **Abstract Text**

Project Summary/Abstract Influenza is a highly contagious viral infectious diseases and causes 250,000-500,000 deaths and 3-5 million severe illnesses each year worldwide. Cellular immunity is crucial to eliminate virus-infected cells and promote recovery. Cellular immunity against conserved antigens can also confer protection against drifted influenza viruses. Current influenza vaccines mainly induce neutralizing antibodies against highly variable surface antigens and poorly induces cellular immunity. Adjuvants are promising to enhance influenza vaccine-induced humoral and cellular immune responses. Yet, current adjuvants approved to boost influenza vaccination mainly enhance humoral immune responses with little effects on cellular immunity. This project develops a physical radiofrequency (RF)-based adjuvant (RFA) with potent humoral and cellular adjuvant effects to boost influenza vaccination with minimal local, systemic or long-term side effects. Our preliminary studies identified potent humoral and cellular adjuvants effects of non-invasive RF treatment on several vaccine antigens, such as model antigen ovalbumin, recombinant hemagglutinin, and pandemic 2009 influenza H1N1 vaccine. The humoral RFA effects are comparable and cellular RFA effects are superior to the most potent adjuvant used in influenza vaccines. We hypothesize the novel RFA will significantly boost influenza vaccine-induced humoral and cellular immune responses, resulting in increased protection against vaccine and non-vaccine viral strains. Three specific aims are proposed: To optimize RFA effects and delineate adjuvantation mechanisms (specific aim 1); To explore RFA to boost seasonal and pre-pandemic influenza vaccination (specific aim 2); To develop RFA-based universal T cell vaccine (specific aim 3). Safety and potency of RFA will be first explored in murine models and then validated in miniature pigs. The success of this project will allow us to submit Investigational Device Exemption applications to explore RFA to boost influenza vaccination in clinics. Our ultimate goal is to develop a handheld RF device for convenient and cost-effective adjuvantation of influenza vaccination.

#### **Public Health Relevance Statement**

Project Narrative Safe and potent adjuvants are highly demanded to boost influenza vaccination. This project develops a physical radiofrequency-based adjuvants to boost both humoral and cellular immune responses against influenza.

#### **NIH Spending Category**

Biodefense Biotechnology Emerging Infectious Diseases Immunization

Infectious Diseases Influenza Pneumonia & Influenza Prevention

**Project Terms** 

Vaccine Related

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> **Animal Model** Adjuvant **Antibody titer measurement Antigen-Presenting Cells**

**Antigens Body Weight decreased** CD8-Positive T-Lymphocytes Cells **Communicable Diseases Cellular Immunity Cessation of life** Clinic

**Cosmetics Cross Presentation Cytotoxic T-Lymphocytes Dendritic Cells** 

**Esthetics Devices Electromagnetic Energy Development** Family suidae

**Fluzone** Genes Goals H1N1 vaccine Hemagglutination Hemagglutinin

Influenza Human Immune response **Immunity Immunize** 

Influenza vaccination Influenza A Virus, H1N1 Subtype Investigation Lung

**Read More** 

**Details** 

**Contact PI/ Project Other Pls Program Official** 

Leader Not Applicable Name

Name **CHEN, XINYUAN** 

Contact

jennifer.gordon2@nih.gov Title **ASSISTANT PROFESSOR** 

**GORDON, JENNIFER L** 

2018

01-May-

**Budget Start** 

Thank you for your feedback!

Contact xchen14@uri.edu

**Organization** 

State Code Department Type Name

**UNIVERSITY OF RHODE PHARMACOLOGY ISLAND** 

**Congressional District Organization Type** City **SCHOOLS OF PHARMACY** 02

**KINGSTON** 

Country

**Other Information** 

**UNITED STATES (US)** 

FOA Administering Institutes or **Project Start** 15-May-PA-16-160 Centers

Date **NATIONAL INSTITUTE OF** Study Section **ALLERGY AND INFECTIOUS Project End** Vaccines Against Microbial

30-April-**DISEASES** Diseases Study Section[VMD] Date 2023

**DUNS Number CFDA Code** 144017188 855 **Award Notice** 

2019 Date Fiscal Year Date 30-April-Budget End 2019 04-April-2019

2020 Date

**Project Funding Information for 2019** 

**Total Funding Direct Costs Indirect Costs** \$410,303 \$302,195 \$108,108

**Funding IC** Year

2019 NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES \$410,303

**NIH Categorical Spending** Click here for more information on NIH Categorical Spending

NIH Spending **Funding IC** 

https://reporter.nih.gov/search/z6xP2rlZHU6fFR7WbemCkg/project-details/9697768

NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES \$410,303 Biodefense; Biotechnology; **Emerging** Infectious Diseases; Immunization; Infectious Diseases; Influenza;

Pneumonia & Influenza; Prevention; Vaccine Related;

## 品 Sub Projects

No Sub Projects information available for 5R01Al139473-02

#### **Publications Export Publication Similar** Journal (Link to PubMed abstract) **Authors** Year **Publica Adjuvantation of Influenza Vaccines to Induce Cross-Protective Immunity.** Li, Zhuofan; Vaccines 2021 Jan 21; 9 (2) 2021 M G **G** Zhao, Yiwen; Li, Yibo; Chen, Xinyuan Vaccine delivery alerts innate immune systems for more immunogenic vaccination. JCI insight 2021 04 08; 6 (7) Li, Zhuofan; Cao, 2021 M G <u></u> G Yan; Li, Yibo; Zhao, Yiwen; Chen, Xinyuan

Improving immunogenicity and safety of flagellin as vaccine of	carrier by high-density display
on virus-like particle surface.	

Biomaterials 2020 08; 249 120030 Zhao, Yiwen; Li, 2020 M G <u></u> G **iCite** 1.31 Zhuofan; Zhu, Xiaoyue; Cao, Yan; Chen,

#### Laser facilitates week-long sustained transdermal drug delivery at high doses.

Xinyuan

Journal of controlled release: Kakar, Prateek; 2020 M G <u></u> G **iCite** 1.07 official journal of the Controlled Li, Zhuofan; Li, Release Society 2020 03 10; 319 Yibo; Cao, Yan; 428-437 Chen, Xinyuan

#### Augmentation of vaccine-induced humoral and cellular immunity by a physical radiofrequency adjuvant.

Nature communications 2018 09 2018 Cao, Yan; Zhu, M G <u></u> G **iCite** 0.93 Xiaoyue; <u>12; 9 (1) 3695</u> Hossen, Md Nazir; Kakar, Prateek; Zhao, Yiwen; Chen, Xinyuan



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No Patents information available for 5R01Al139473-02

#### Outcomes

The Project Outcomes shown here are displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed are those of the PI and do not necessarily reflect the views of the National Institutes of Health. NIH has not endorsed the content below.

No Outcomes available for 5R01Al139473-02

### **†** Clinical Studies

No Clinical Studies information available for 5R01Al139473-02

## News and More

#### **Related News Releases**

No news release information available for 5R01Al139473-02

# History

No Historical information available for 5R01Al139473-02

# **Similar Projects**

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