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Portable Nanostructured Photonic Crystal Device for HIV-1 Viral Load

Project Number
5R01AI120683-04

Contact PI/Project Leader
DEMIRCI, UTKAN Other PIs

Awardee Organization
STANFORD UNIVERSITY

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Description

Abstract Text

DESCRIPTION (provided by applicant: The HIV/AIDS **pandemic** has had a devastating global impact causing more than 30 million HIV-1 infections and over 25 million deaths worldwide. In addition, it is estimated that annually over 450,000 infants are infected through mother-to-child transmission (MTCT). Although antiretroviral therapy (ART) is effective to save lives and reduce MTCT, the coverage of ART in treatment-eligible patients in developing countries is only approximately 67% due to the lack of simple, inexpensive and rapid near-patient treatment monitoring tools. To address the unmet need, we propose to develop an HIV-1 viral load monitoring microfluidic platform technology development of a sensitive photonic crystal sensing technology. This technology detects and quantifies the binding of biotargets (e.g., HIV-1 virus particles) to an optical sensing surface due to the change of bulk index of refraction. The resulted shift in the peak wavelength value correlates with the concentration of biotargets in a biological sample. This technology- driven proposal addresses a significant global clinical need and aims to deliver a portable photonic crystal device that can (i) selectively capture HIV-1 from whole blood, (ii) be sensitive within the clinical cut-off (with ±10% error range), inexpensive (<$1), rapid (within 30 minutes), and (iii) handle fingerprick whole blood (up to 100 µL) to aid i HIV patient care and treatment in resource-constrained settings. The delivery of this photonic crystal-based HIV-1 viral load monitoring microchips can significantly facilitate the expansion of ART in developing countries, achieving universal access to ART to control the AIDS **pandemic**.

Public Health Relevance Statement

PUBLIC HEALTH RELEVANCE: Despite tremendous efforts made to control the HIV/AIDS pandemic, the lack of simple, inexpensive and rapid HIV-1 viral load monitoring tools significantly prevent universal access to antiretroviral therapy (ART) in developing countries. We aim to develop nanostructured photonic crystal devices to measure HIV-1 viral load from unprocessed whole blood samples to guide ART in resource-limited settings without requiring conventional, central laboratory-based HIV-1 RNA nucleic acid amplification technologies. This sensitive nanotechnology enabled microchip can facilitate the global expansion of ART, especially in developing countries, to save lives and reduce transmission.

NIH Spending Category

Bioengineering Biotechnology HIV/AIDS Infectious Diseases Nanotechnology

Project Terms

AIDS/HIV problem Acquired Immunodeficiency Syndrome Address Antigens Binding Biological Biological Assay Biological Markers Biosensing Techniques Biosensor Blood specimen CD4 Lymphocyte Count CD4 Positive T Lymphocytes Care Technology Points Cells Cessation of life Clinical Communicable Diseases Complex Country Crystallization Detection Developed Countries Developing Countries Development Devices Diagnosis Diagnostic Disease Progression Drug resistance Drug usage Ensure Evaluation Failure Frequencies HIV HIV Antibodies HIV-1 Healthcare Hepatitis Image Immobilization Individual Infection Influenza Knowledge Label Laboratories Lead Liquid substance

Read More

Details

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UNITED STATES (US)

Other Information

FOA
PA-13-302

Study Section
Special Emphasis Panel[ZRG1-AARR-M(81)S]

Fiscal Year
2019

Award Notice Date
10-June-2019

Administering Institutes or Centers
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES

DUNS Number
009214214

CFDA Code
855

Project Start Date
18-July-2016

Project End Date
30-June-2021

Budget Start Date
01-July-2019

Budget End Date
30-June-2021

Project Funding Information for 2019

Total Funding
$375,674

Direct Costs
$297,374

Indirect Costs
$78,300

Year	Funding IC	FY Total Cost by IC
2019	NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	$375,674

NIH Categorical Spending

Click here for more information on NIH Categorical Spending

Funding IC	FY Total Cost by IC	NIH Spending Category
NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES	$375,674	Bioengineering; Biotechnology; HIV/AIDS; Infectious Diseases; Nanotechnology;

Sub Projects

No Sub Projects information available for 5R01AI120683-04

Publications

No Publications available for 5R01AI120683-04

Patents

No Patents information available for 5R01AI120683-04

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 5R01AI120683-04

Clinical Studies

No Clinical Studies information available for 5R01AI120683-04

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History

No Historical information available for 5R01AI120683-04

Similar Projects

No Similar Projects information available for 5R01AI120683-04

Thank you for your feedback!