*Journal of Health Disparities Research and Practice*

*Volume* 12, *Issue* 4 2018 *Article* 24

2019 STEP-UP SPECIAL ISSUE

# Exosomes: A Novel Zika Virus Vaccine Candidate

Carlos Furukawa* Pakieli Kaufusi, B.A., M.Sc., Ph.D.†

*

†University of Hawai'i

# Exosomes: A Novel Zika Virus Vaccine Candidate*

Carlos Furukawa and Pakieli Kaufusi, B.A., M.Sc., Ph.D.

## Abstract

With the recent emergence of Zika virus (ZIKV) diseases, increasing global concern has driven the demand for a vaccine. One promising vaccine platform has presented itself in the form of exosomes: a subgroup of extracellular vesicles released by many human cell types that facilitate intercellular communication. The objective of this study is to engineer exosomes that incorporate ZIKV structural proteins into its phospholipid bilayer. Previous studies indicate that CD9 and CD63 proteins are highly enriched in exosomal membranes. From this, it was hypothesized that attaching ZIKV genes to CD9 or CD63 to produce a gene fusion may enable exosomes to act as antigen-presenting vesicles. These engineered exosomes may potentially stimulate T-cells to mount a strong immune response. The cDNA of the CD9, CD63, and the highly immunogenic ZIKV genes (envelope, precursor membrane, and NS1) were generated using RT-PCR. These products were used as a template for regular PCR, and cloned into pcDNA3.1/V5 vector. The chimeric gene fusion was assembled using the Gibson assembly kit, and transfected into human embryonic kidney epithelial (HEK293T) cells for expression. The exosomes were purified from the supernatant and subjected to immunoblotting and immunofluorescence assays to confirm the presence of ZIKV proteins.

The results of this study are pending at the time of this abstract submission. A future study will be conducted using an *in vitro* activation assay to determine if the engineered exosomes induce T-cell activation. The potential candidates will be used in an animal study for immunity against ZIKV infection.

**KEYWORDS:** Zika Virus; Vaccines; Exosomes; Antigen-presenting vesicles

---

*The STEP-UP HS program is supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institute of Health, Grant number: R25DK78386-12.

**Journal of Health Disparities Research and Practice**
**Volume 12, STEP-UP Special Issue, Summer 2019, pp. 38**

School of Public Health
University of Nevada, Las Vegas

# Exosomes: A Novel Zika Virus Vaccine Candidate

Carlos Furukawa
Pakieli Kaufusi, B.A., M.Sc., Ph.D., University of Hawai'i
**Coordinating Center:** University of Hawai'i at Manoa

**ABSTRACT**

With the recent emergence of Zika virus (ZIKV) diseases, increasing global concern has driven the demand for a vaccine. One promising vaccine platform has presented itself in the form of exosomes: a subgroup of extracellular vesicles released by many human cell types that facilitate intercellular communication. The objective of this study is to engineer exosomes that incorporate ZIKV structural proteins into its phospholipid bilayer. Previous studies indicate that CD9 and CD63 proteins are highly enriched in exosomal membranes. From this, it was hypothesized that attaching ZIKV genes to CD9 or CD63 to produce a gene fusion may enable exosomes to act as antigen-presenting vesicles. These engineered exosomes may potentially stimulate T-cells to mount a strong immune response. The cDNA of the CD9, CD63, and the highly immunogenic ZIKV genes (envelope, precursor membrane, and NS1) were generated using RT-PCR. These products were used as a template for regular PCR, and cloned into pcDNA3.1/V5 vector. The chimeric gene fusion was assembled using the Gibson assembly kit, and transfected into human embryonic kidney epithelial (HEK293T) cells for expression. The exosomes were purified from the supernatant and subjected to immunoblotting and immunofluorescence assays to confirm the presence of ZIKV proteins.

The results of this study are pending at the time of this abstract submission. A future study will be conducted using an *in vitro* activation assay to determine if the engineered exosomes induce T-cell activation. The potential candidates will be used in an animal study for immunity against ZIKV infection.

**Keywords:** Zika Virus, Vaccines, Exosomes, Antigen-presenting vesicles

**ACKNOWLEDGEMENTS**

The STEP-UP HS program is supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institute of Health, Grant number: R25DK78386-12.