

Subject: Thesis Defense - Kajal A. Patil, MS in Biology
Date: Wednesday, April 8, 2026 at 6:02:03 PM Eastern Daylight Time
From: SSB Faculty List on behalf of Diane St. Germain
To: SSB-FACULTY-LIST-L@LISTSERV.GMU.EDU

Thesis Defense Announcement
To: The George Mason University Community

Candidate: Kajal Patil

Program: M.S. in Biology

Date: April 23, 2026

Time: 4:00 PM Eastern Time (US and Canada)

Location: via Zoom

Join Zoom Meeting

[https://gmu.zoom.us/j/91845328245?
pwd=i0A1EQQFDGdXzVXOKAGFxopeikBNfq.1](https://gmu.zoom.us/j/91845328245?pwd=i0A1EQQFDGdXzVXOKAGFxopeikBNfq.1)

Meeting ID: 918 4532 8245

Passcode: 135749

One tap mobile

+13017158592,,91845328245#,,,,*135749# US (Washington DC)

+12678310333,,91845328245#,,,,*135749# US (Philadelphia)

Dial by your location

+1 301 715 8592 US (Washington DC)

+1 267 831 0333 US (Philadelphia)

Meeting ID: 918 4532 8245

Passcode: 135749

Find your local number: <https://gmu.zoom.us/u/aAV0jwEaV>

Committee Chair: Dr. Fatah Kashanchi

Committee Members: Dr. Heather Branscome, Dr. Ancha Baranova

Title: Presence of Viral mRNA and Protein in Extracellular Vesicles from HIV-1 Infected Cells

Abstract:

The Human Immunodeficiency Virus (HIV) is the etiological agent of acquired immunodeficiency syndrome (AIDS). As of 2024, approximately 40.8 million individuals worldwide are infected with HIV, with an estimated 1.3 million new infections each year. Combination antiretroviral therapy (cART) targets multiple stages of the HIV-1 replication cycle; however, complete viral eradication remains unattainable due to the establishment of persistent latent reservoirs early in infection. These latently infected cells contain transcriptionally silent but replication-competent full-length viral genomes, as well as short non-coding transcripts capable of reactivating viral production upon treatment interruption. HIV-1 establishes chronic infection by reverse-transcribing its RNA genome into DNA, which integrates into the host genome. The host transcriptional machinery then utilizes this proviral DNA template through tightly regulated transcription and alternative splicing to generate multiple HIV-1 mRNA species. Recent deep sequencing studies, including Oxford Nanopore Technologies (ONT) long-read cDNA sequencing, have identified 53 distinct HIV-1 transcript variants. These viral mRNAs play essential roles in viral replication and persistence. Extracellular vesicles (EVs) are small, membrane-bound particles that encapsulate lipids, proteins, and nucleic acids, facilitating intercellular communication, immune modulation, and the dissemination of pathogenic signals. Previous studies from our group demonstrated that HIV-infected cells release EVs containing viral components, including regulatory RNAs such as TAR and various viral proteins. In this thesis, we investigated the presence of viral mRNAs and proteins within EVs derived from HIV-1–infected cells. To achieve this, different EV populations were isolated using differential ultracentrifugation, followed by mRNA extraction with oligo d(T) magnetic beads for gene expression analysis and protein isolation for Western blotting. We observed that increasing concentrations of cART treatment resulted in upregulation of HIV-1 RNAs (vpr, env, nef, rev, and tat) within EVs, accompanied by elevated levels of viral proteins p24 and gp120 after 24 hours, as confirmed by Western blot analysis. Distinct EV fractions (2K, 10K, 100K, 167K-S, and 167K-L) contain both viral proteins (e.g., p24) and viral mRNAs. Additionally, EVs isolated from cerebrospinal fluid (CSF) and plasma samples of HIV-1–positive individuals also harbored viral nef and env mRNAs. Collectively, these findings indicate that despite cART treatment, HIV-infected cells continue to produce viral genes and proteins that are packaged into EVs, potentially facilitating the transfer of viral components to neighboring cells. This supports the hypothesis that EVs may contribute to viral persistence and play a critical role in HIV pathogenesis.

###