

Virology - Cell Biology - Disease and Vaccination

Imaging Based Strategies to Explore Pathogen Replication and Host Responses

- ➔ Molecular basics of virus replication, pathogenesis and host reactions
- ➔ Involved cellular mechanisms and ways to manipulate by external triggers (e.g. viruses)
- ➔ Development of novel vaccines and antiviral strategies

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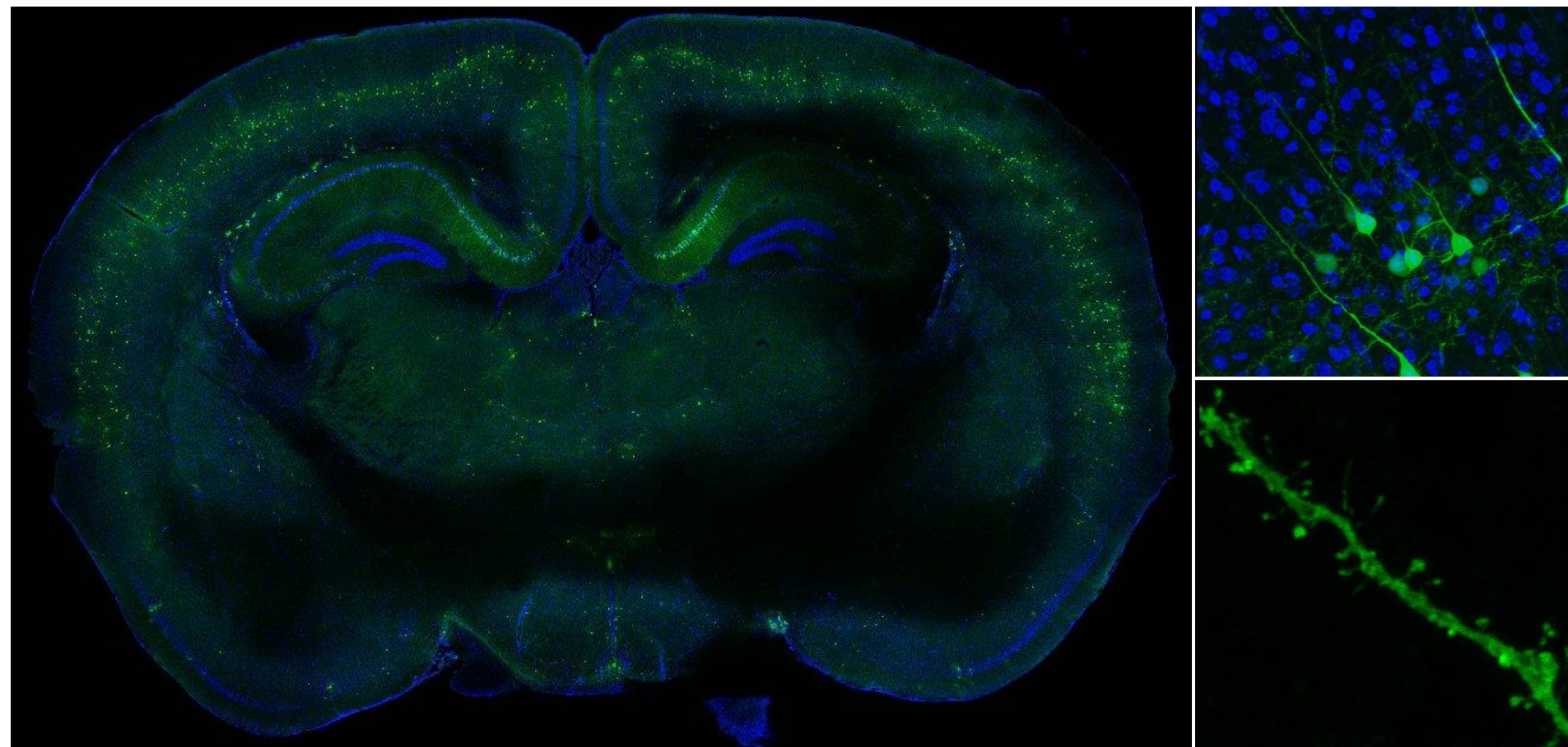
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In vivo Tropism of Reporter Genes Expressing Viruses - Confocal Imaging of Vibratome Tissue Slices -



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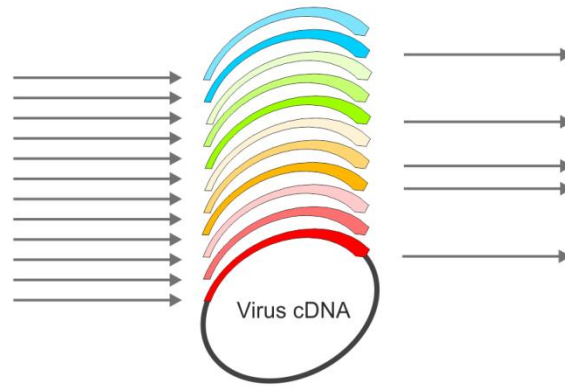
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Efficient Reverse Genetics: Genetically Modified Viruses

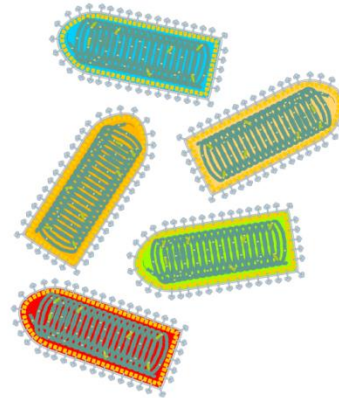
virus population



plasmid bank
with complete cDNA genomes



rescue of selected
viruses



experimental
virology

mutagenesis
gene insertions
deletions



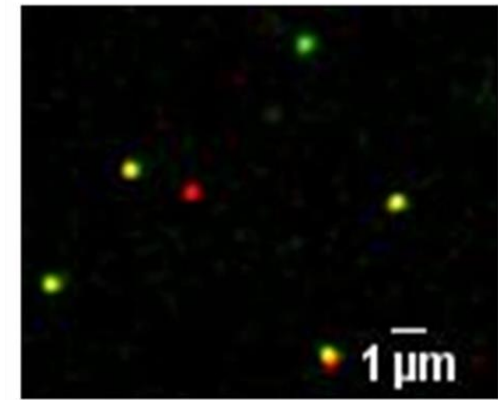
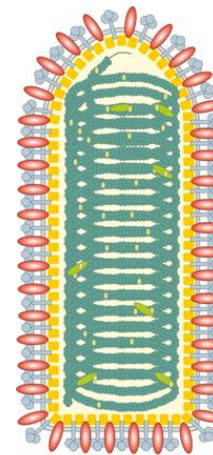
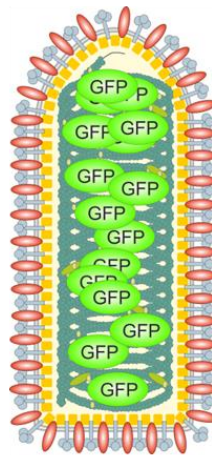
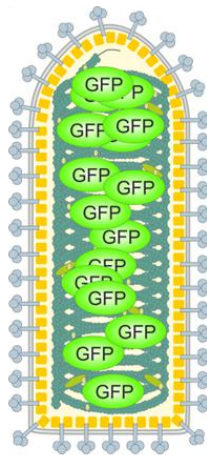
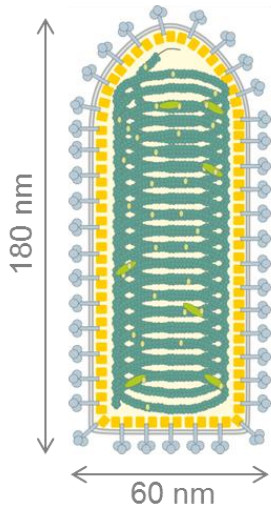
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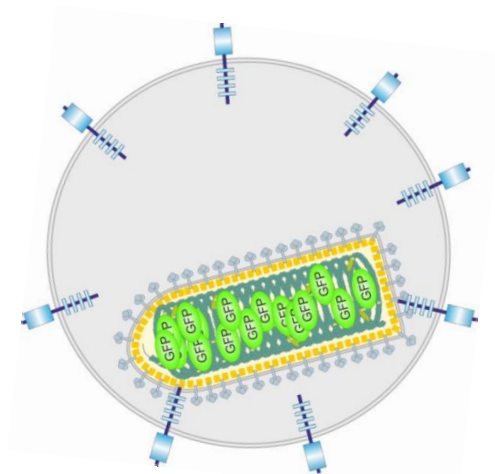
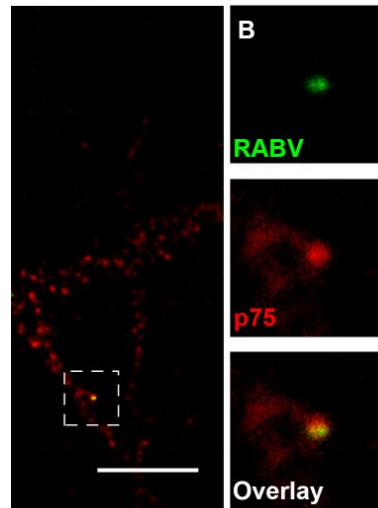
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Virus Design - Imaging of Individual Virus Particles



**RABV = Rabies Virus
(STED)**

**p75 = Receptor
(conventional LSM)**



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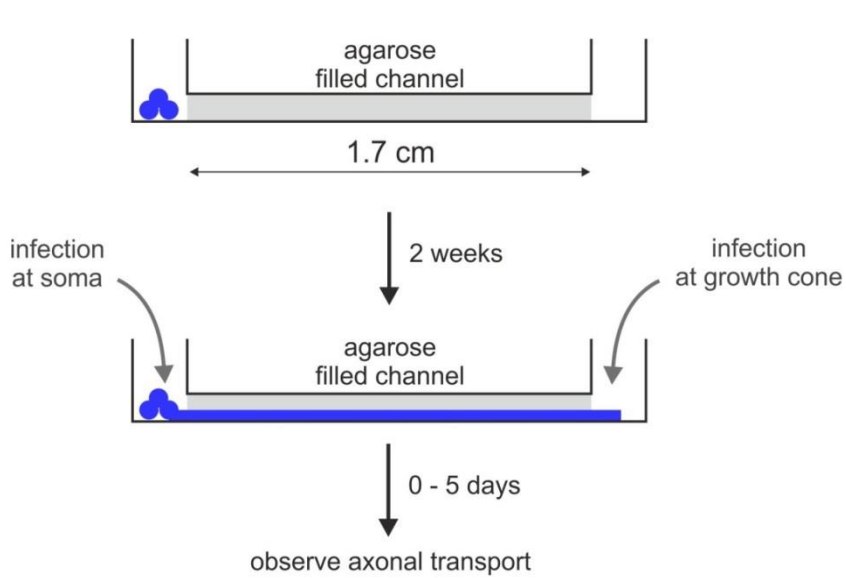
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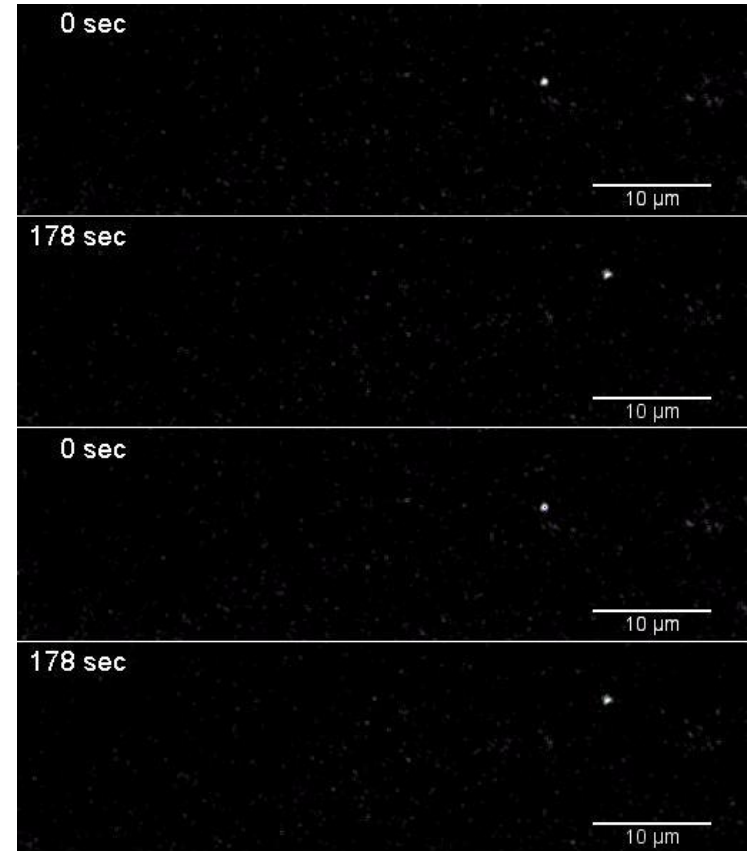
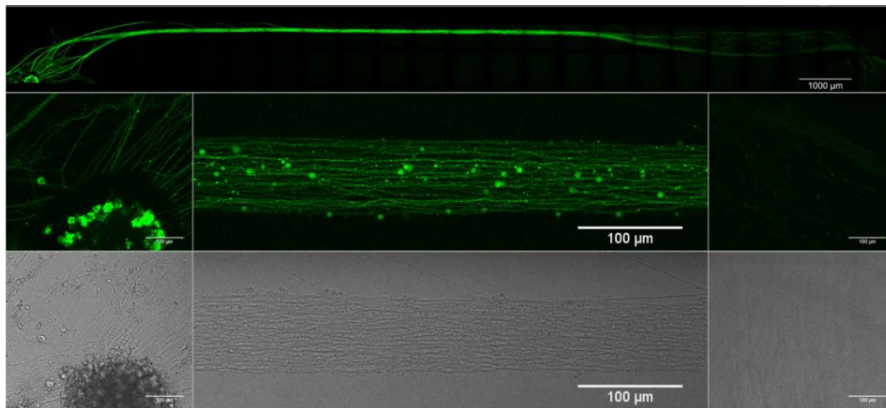
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Live Imaging of Virus Particles in Relevant Host Cells

- Axonal Virus Transport in Primary Neurons -



← retrograd



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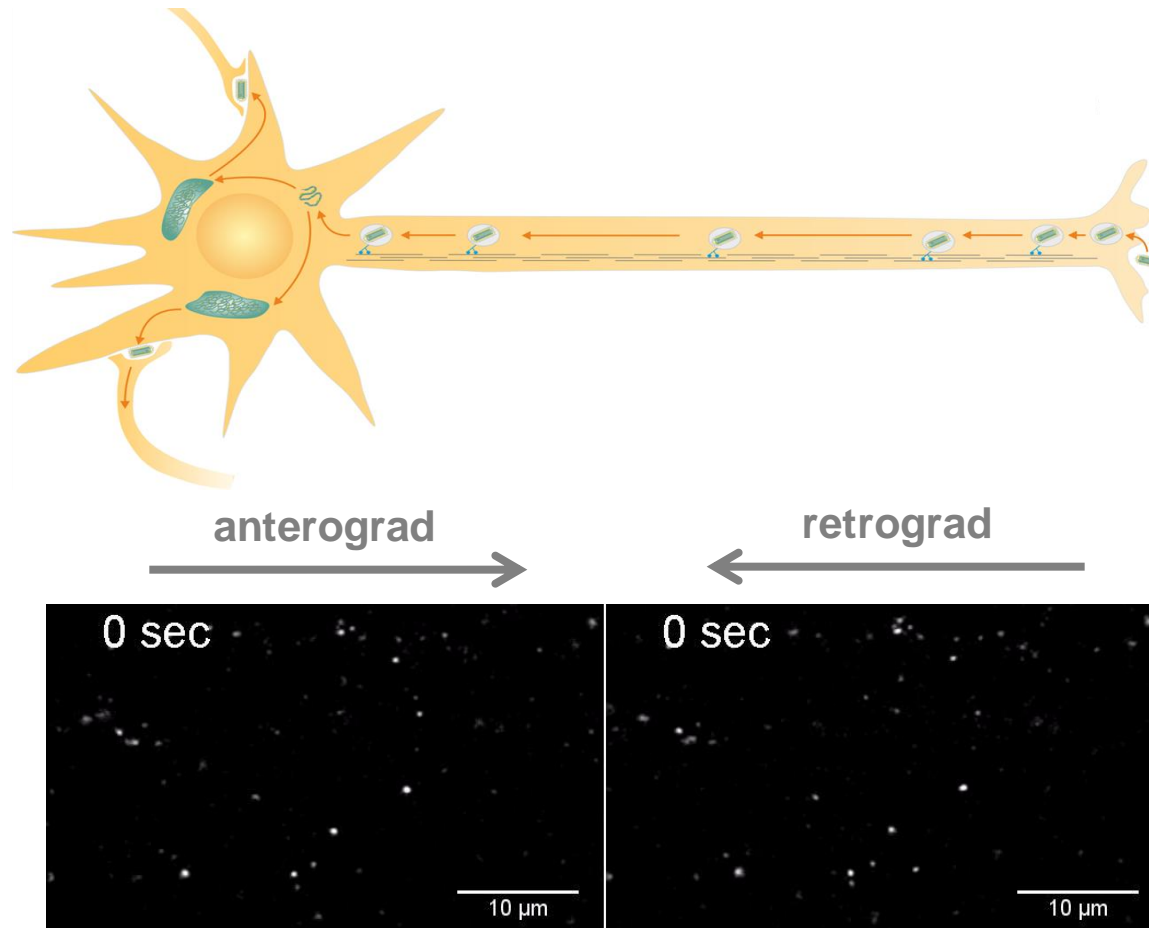
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Live Imaging of Virus Particles in Relevant Host Cells

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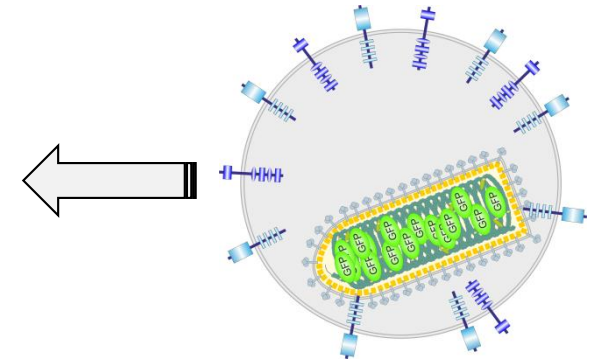
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Retrograder Axonaler Transport: Kotransport mit p75NTR, TrkA und Rezeptor

Binding to p75NTR not only mediates **Internalisation**
and retrograde transport but:

→ **accelerates the retrograde transport machinerie**



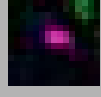
RABV



RABV + p75NTR



RABV + p75NTR + Trk



p75NTR + Trk



p75NTR (low affinity nerve growth factor receptor)

TrkA (Tropomyosin receptor kinase A)



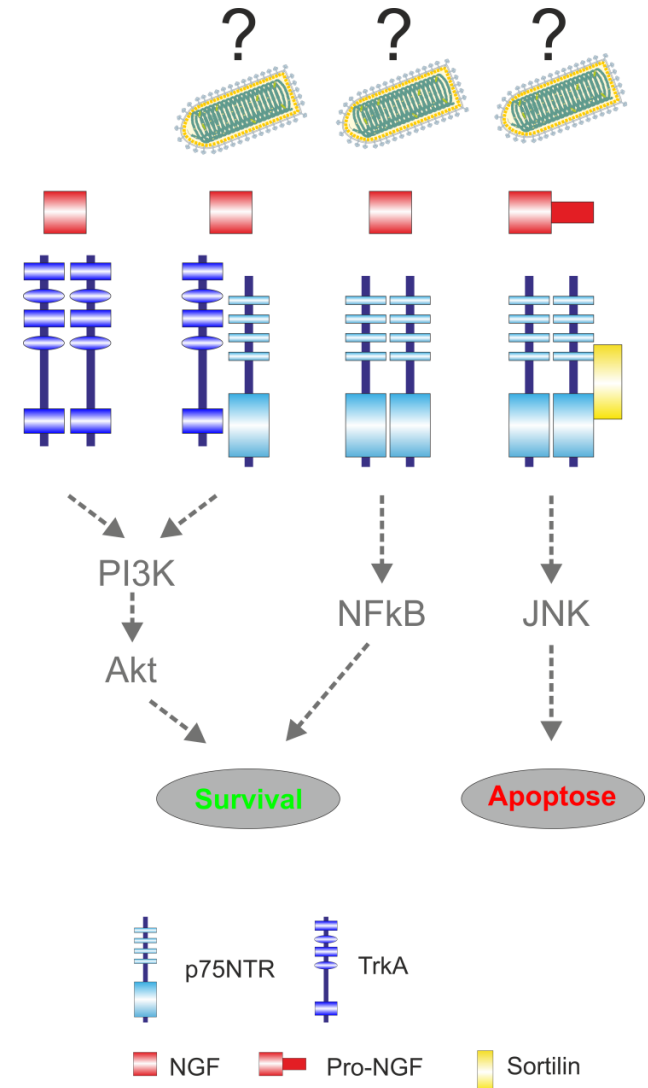
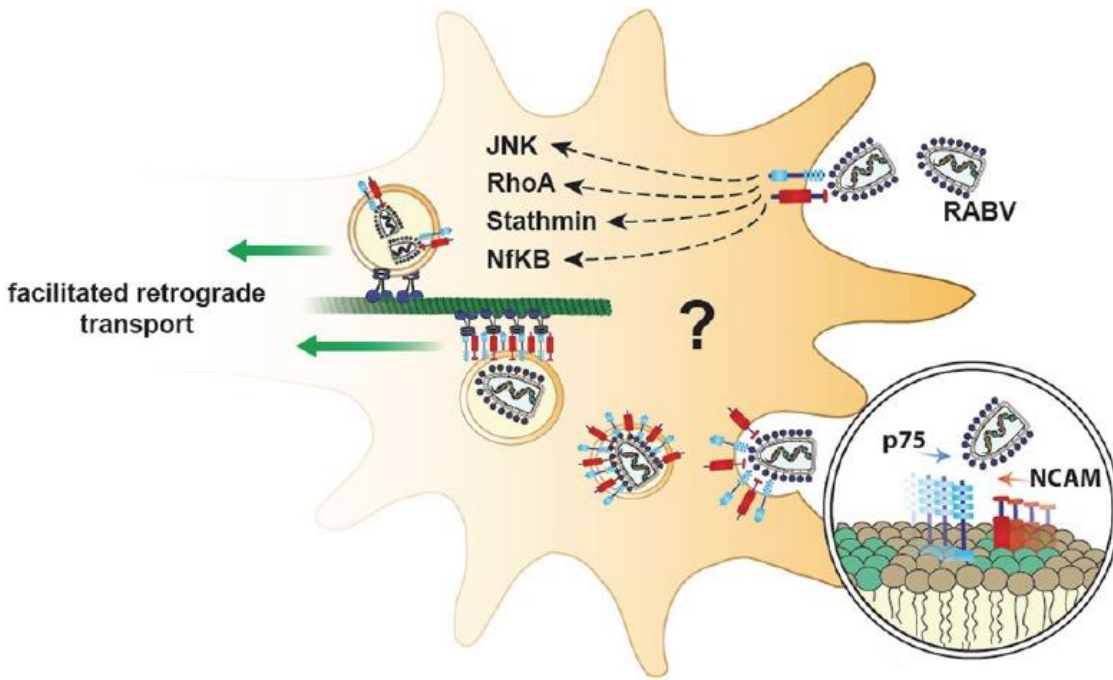
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From Virus Imaging to Cell Signaling - Host Cell Modulation by The Virus -



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Virology - Cell Biology - Disease and Vaccination

- **Live Confocal Imaging** of fluorescent structures at BSL2 and BSL3 levels
 - Experience in **genetic modification of viruses** (labeled Viruses, mutants etc.)
 - Animal facilities: cells/tissues from **relevant (natural) hosts** (e.g. carnivores)
 - **Combination of imaging with biochemical** characterization of molecular virus - host interaction
-
- **More microscopes:** 2-Photon Laser Scan (tissue slices)
Superresolution imaging (subcellular location of viruses)
TIRF (Total Internal Fluorescencen Reflection)
Correlative Microscopy (Electron + Fluorescence Microscopy)
 - **Mass spec techniques** for complex downstream host reactions to viral triggers
 - **Experience in pathogen - host interactions** and relevant signaling cascades (parallels to bacterial systems?)



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