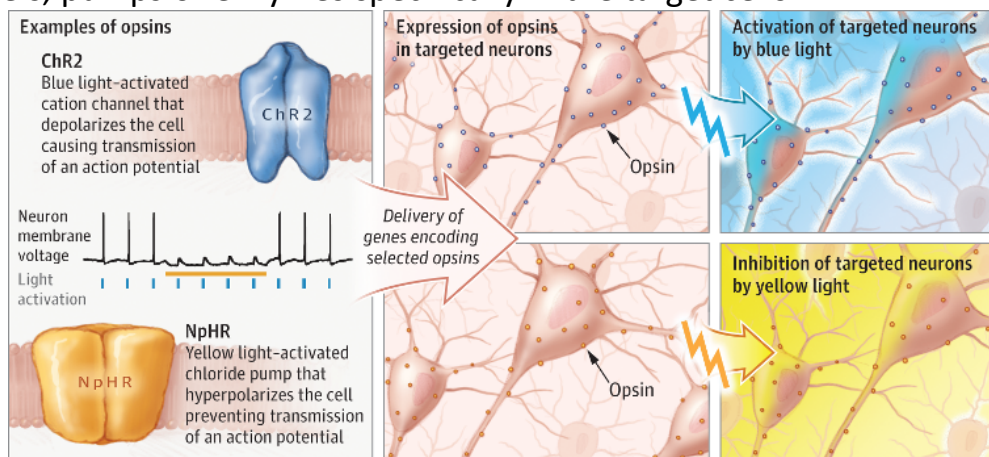




1

## What is optogenetics?

Optogenetics is a biological technique to control the activity of neurons or other cell types with light. This is achieved by expression of light-sensitive ion channels, pumps or enzymes specifically in the target cells .



2

## Different types of opsins

- Excitatory or inhibitory effects

- Induce excitation

channelrhodopsins (ChRs)

- induce hyperpolarization (inhibition)

halorhodopsin-type  $\text{Cl}^-$  pumps; bacteriorhodopsin-type proton pumps;  $\text{Cl}^-$ -conducting ChRs

- Kinetic variance

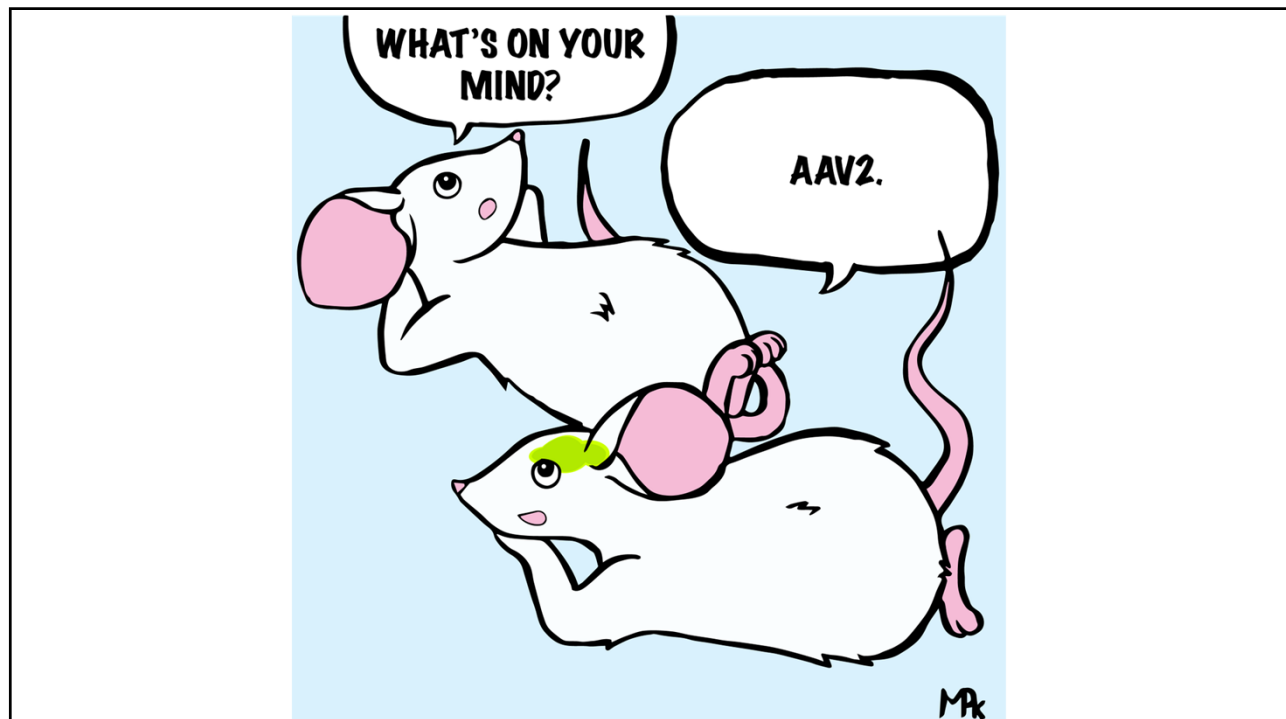
- faster-deactivating ChR variants

ChETA, ChIEF, Chronos

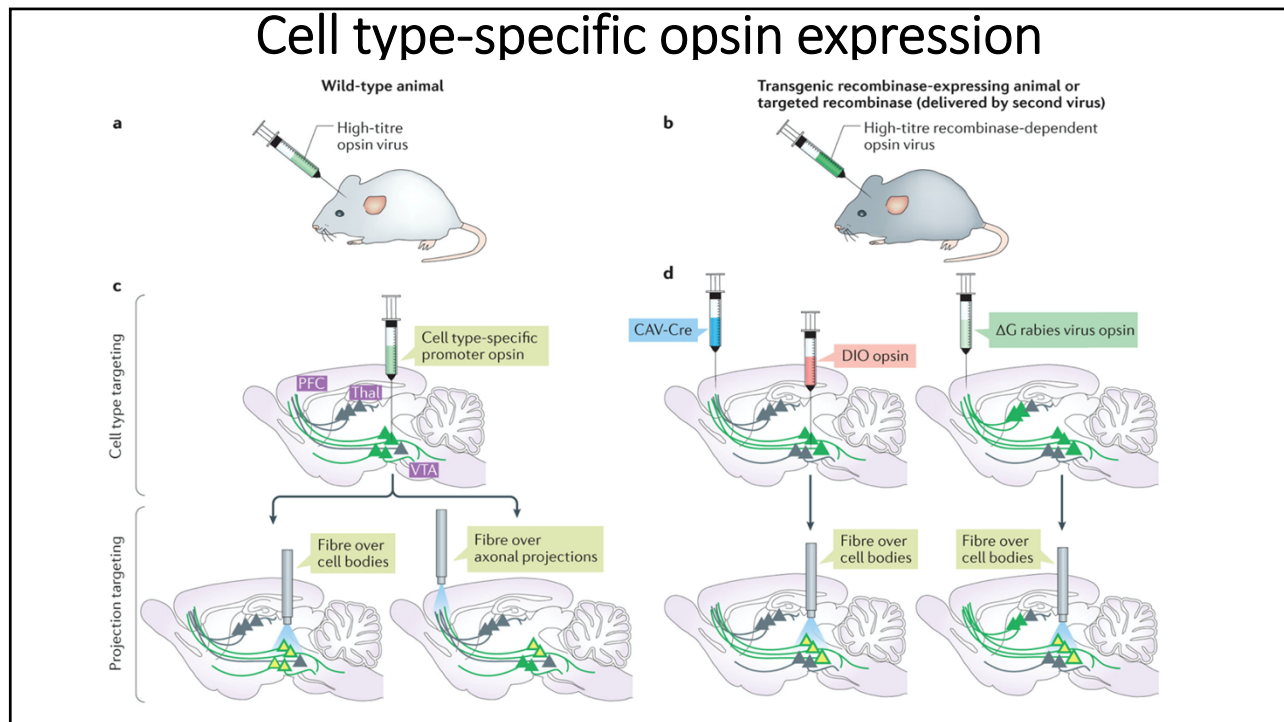
- step-function opsins

excitatory stabilized step-function opsin (SSFO); the step-waveform inhibitory ChR

3



4



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## The hardware for optogenetic experiments

- Small fiber-optic probe
- Lightweight fiber-optic patch cord
- Laser diode or LED light source
- Fast camera or photomultiplier

**PlexBright 4 Channel Optogenetic Controller**  
Delivers software generated control signals to LED Modules

**PlexBright Dual LED Commutator**  
Mounts above moving animal to provide a rotating pass-through for two LED control signals

**PlexBright Compact LED Modules**  
Generate super-intensity fiber-coupled light in a compact form factor

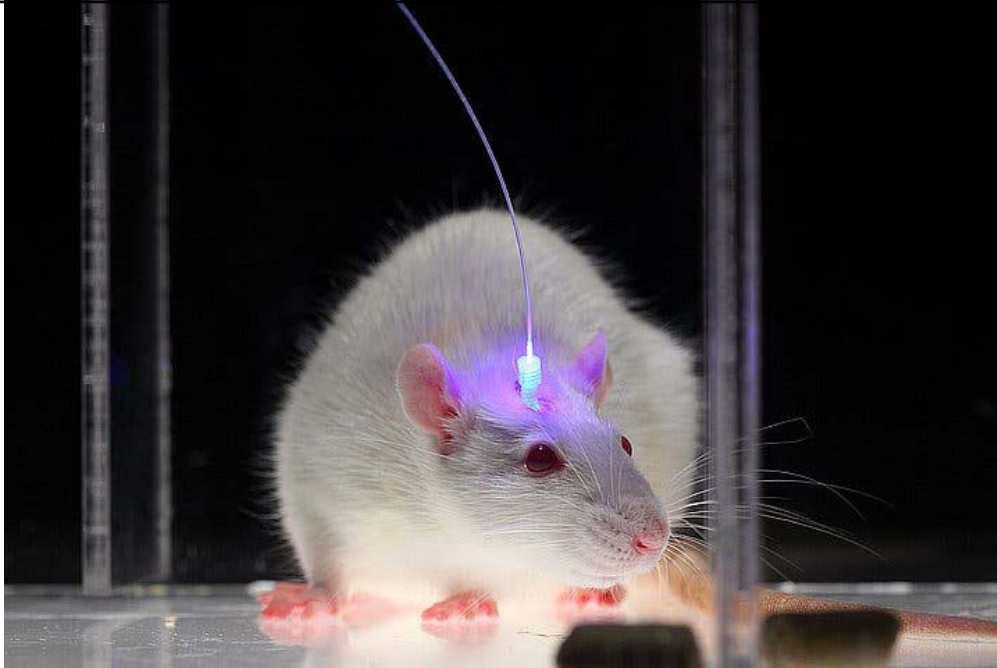
**PlexBright LC or FC Ferrule Tip Optical Patch Cables with Armored Jacket**  
Connect to Compact LED modules via an LC connector to transmit light to Fiber Stub Implants or optrodes

**PlexBright Fiber Stub Implants**  
Implanted in cranium to enable light delivery in chronic experiments

**LC or FC Ferrule Tip Optical Patch Cables attach to LC or FC Fiber Stub Implants with a mating sleeve**

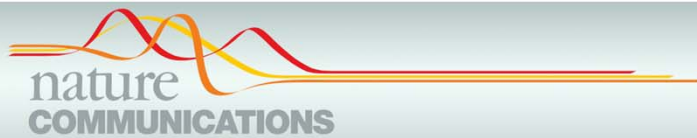
**(LED Modules and heatsink rotor base spin freely with animal to prevent cable tangling.)**

6



[Excellent video for optogenetics](#)

7



ARTICLE



<https://doi.org/10.1038/s41467-020-20093-4>

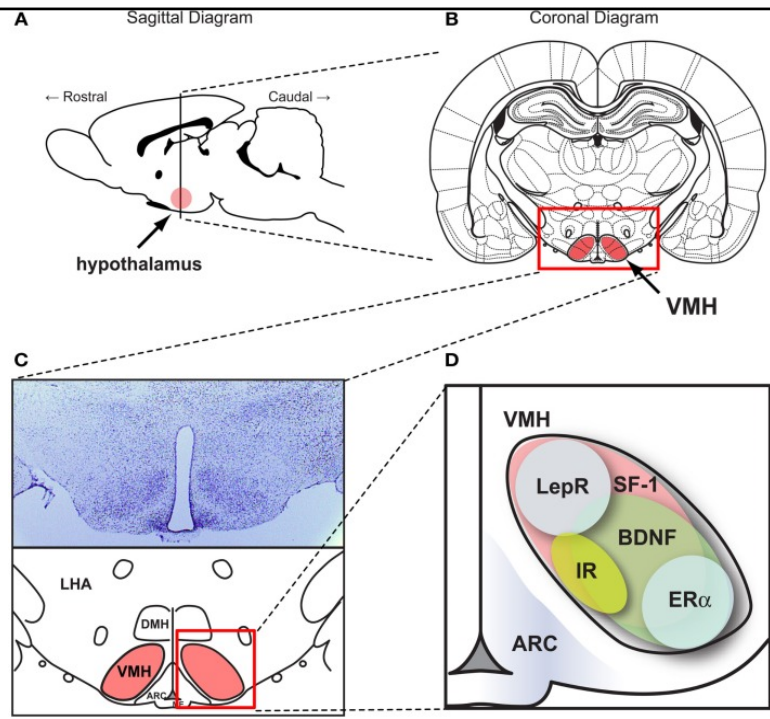
OPEN

An excitatory ventromedial hypothalamus to paraventricular thalamus circuit that suppresses food intake

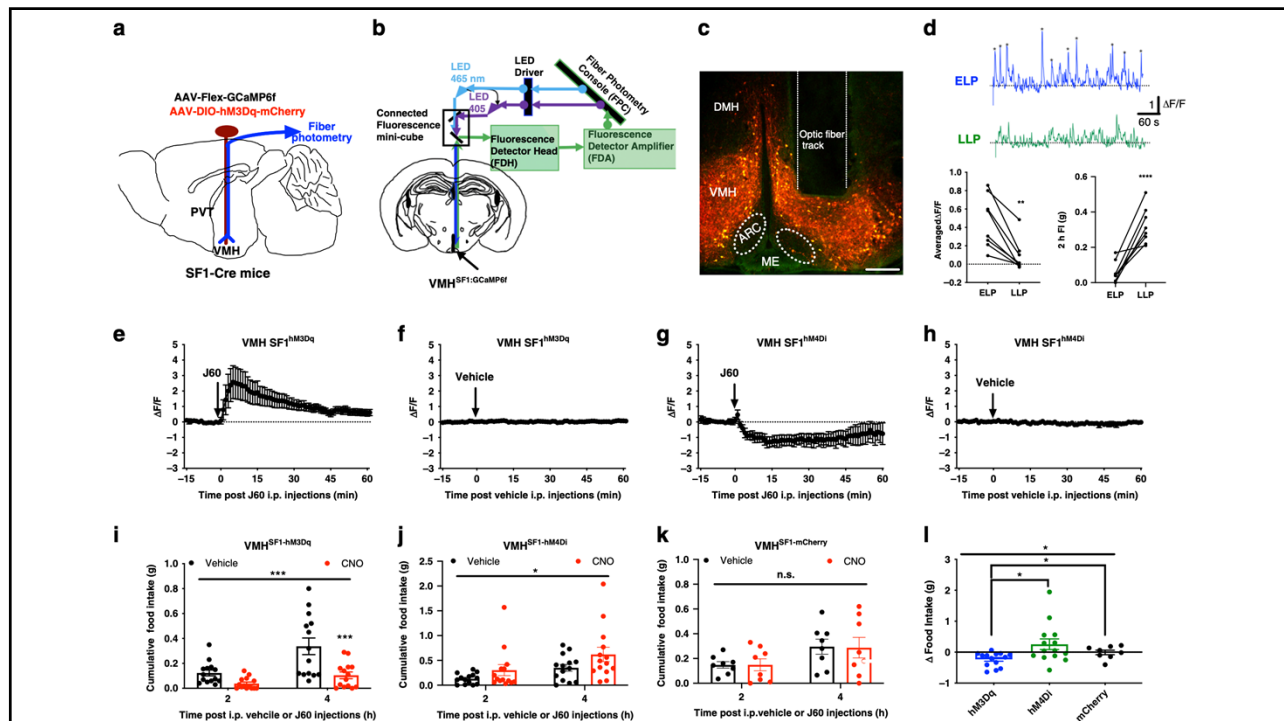
8

## Background

- hypothalamic arcuate nucleus (ARC) plays crucial roles in the control of feeding.
- the ventromedial hypothalamus (VMH) serves as a satiety center in the central nervous system (CNS).
- SF1 neurons are primarily distributed in the center VMH.

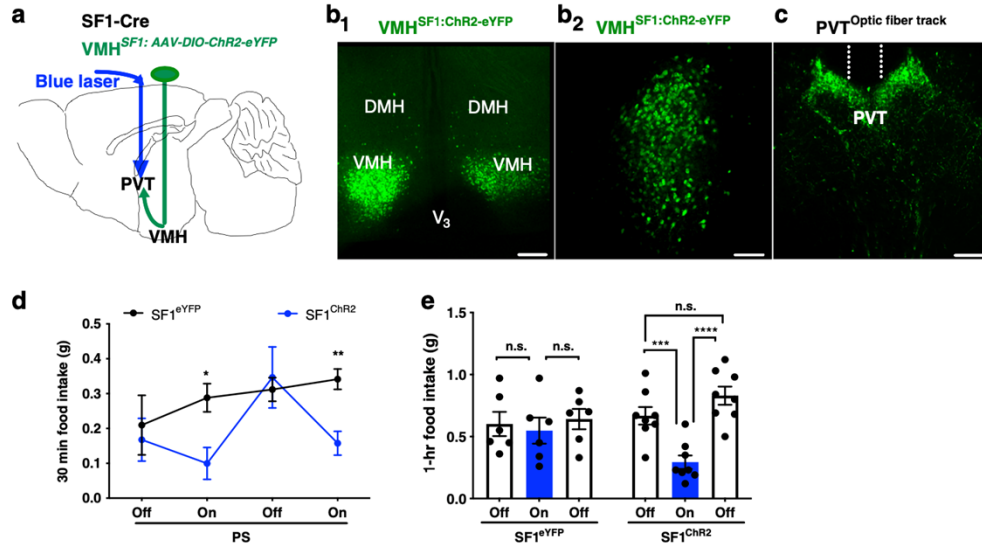


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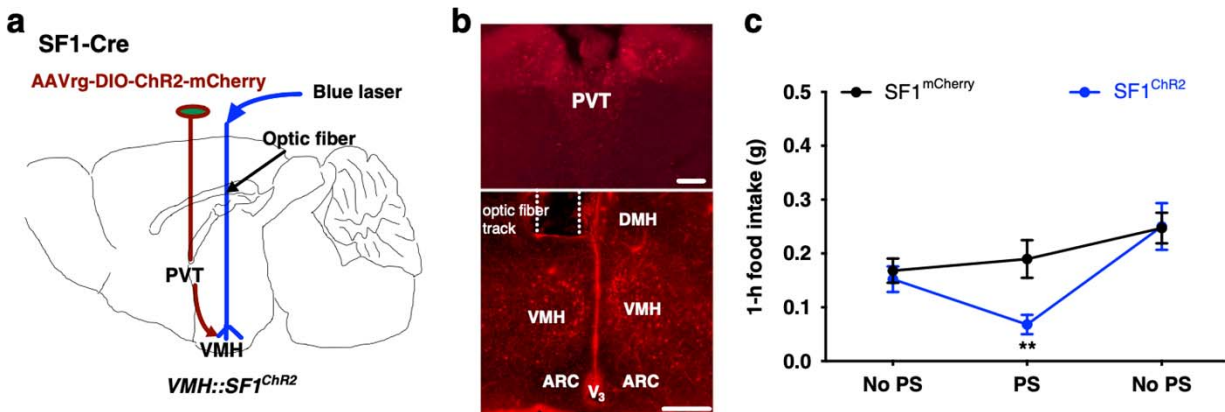
10

Photostimulation of VMH SF1 projections to the PVT inhibits food intake

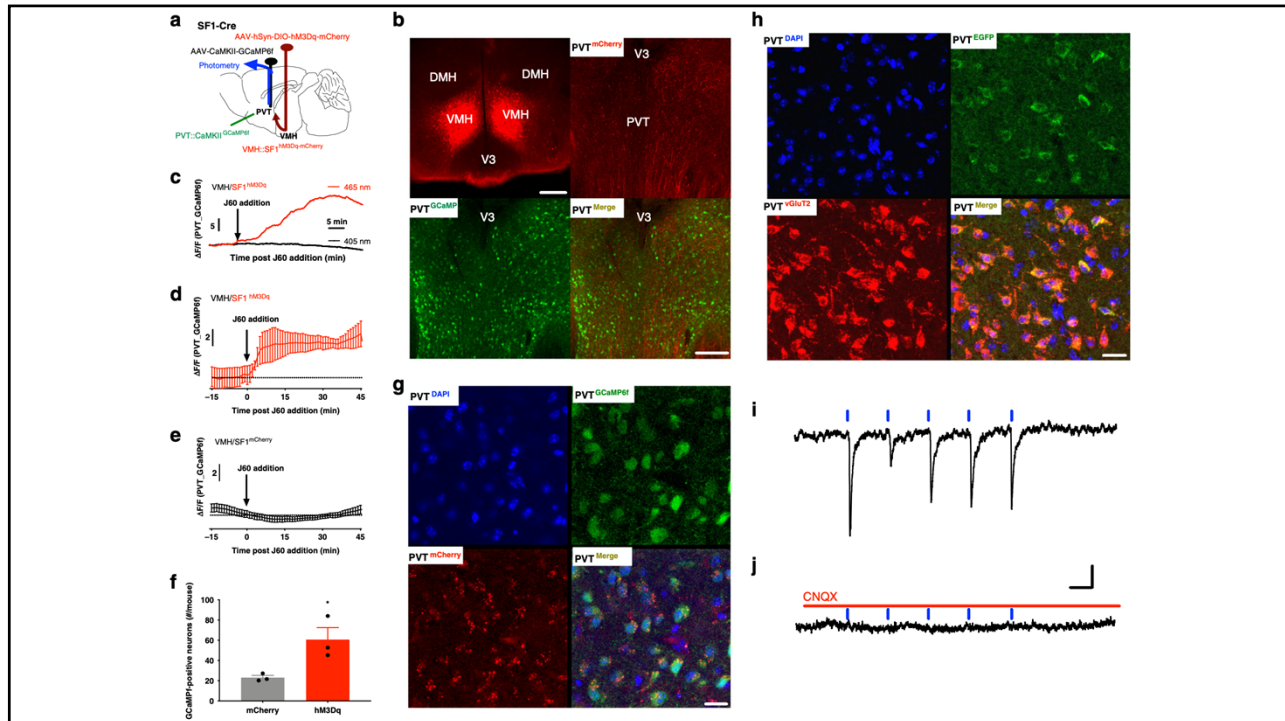


11

Photostimulation of PVT-projecting SF1 neurons inhibits food intake

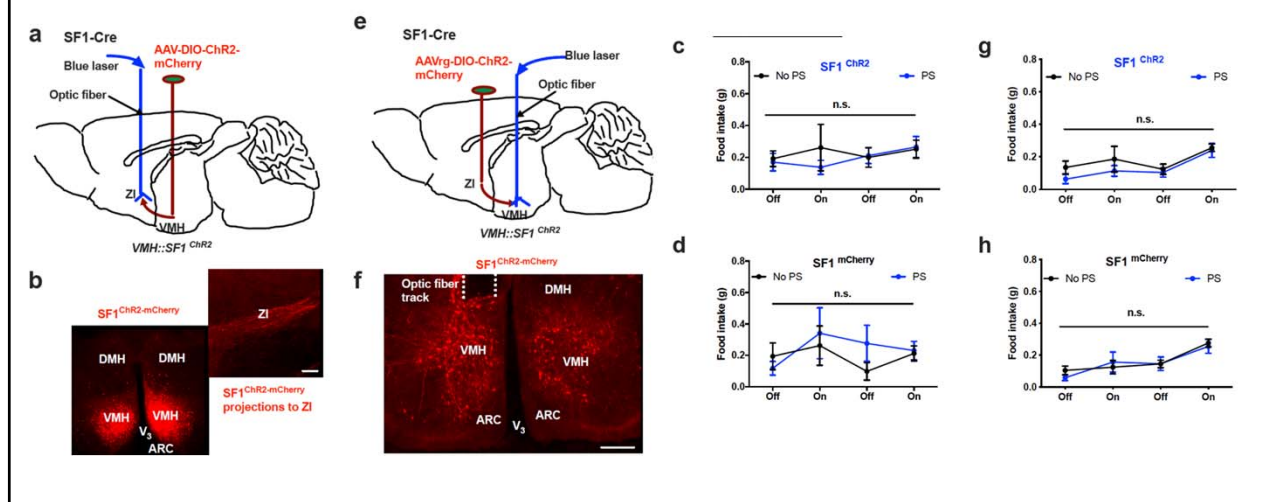


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## VMH SF1 neural projections to zona incerta (ZI) do not affect food intake



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