**Microstates and Optogenetics**

The term ‘microstates’ was first used in human Electroencephalogram (EEG) studies where microstates are defined as the segmentations of the event-related potential (ERP) map series into successive periods of quasi-stable field configuration[3](#_ENREF_3), [7](#_ENREF_7), [8](#_ENREF_8). The EEG microstate is started by locating positive and negative centroids of gravity of the global field power map at a given time frame, and setting a spatial window around each centroid. At the next time frame, the spatial windows are attempted to accommodate the new positive and negative centroids respectively. If accommodation is possible, the map belongs to the current microstate and the following map is considered for inclusion. If it is not possible to accommodate the next centroids within the spatial windows, a microstate border is accepted and a new microstate is started[7](#_ENREF_7). Analysing the locations of positive and negative centroids and border probability, it was possible to characterise EEG spatiotemporal dynamics in event-related fashion.

Structure of microstates, or frames, can be modelled base on each individual neurons’ responses to the same stimulus. Template peaking times of neurons, etc [5](#_ENREF_5)

Different specialised areas of brain are integrated by phase synchronisation[10](#_ENREF_10). Oscillatory multiplexing: computational roles of oscillatory dynamics in high level processes, one prominent hypothesis is that a function of network oscillations is to control the flow of information through anatomical pathways, thus flexibly modulating effective connectivity[1](#_ENREF_1) among local networks.

Adeno-Associated Virus (AAV) Vector design encompasses two main aspects: cellular transduction and vector transport. Research has shown AAV1 and AAV5 to be more efficient in transducing neurons among the other nine naturally occurring AAV serotypes (AAV1 - AAV11)[9](#_ENREF_9). (Interneuron-transduction efficiency) Vectors can spread intracellularly and extracellularly through tissue. Intracellularly, axonal transport can occur in the retrograde[6](#_ENREF_6) or the anterograde direction, and such axonal transport can be used to trace and manipulate neural circuits in the central nervous system (CNS)[2](#_ENREF_2). Extracellularly, AAV9 has been found to be able to cross the blood-brain barrier (BBB) in neonatal and adult mice to mediate widespread CNS gene expression[4](#_ENREF_4). Intracranial administration of AAV. Discussion: the extent to which ChRd is expressed in the cortex.

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