Virus Technology Unit

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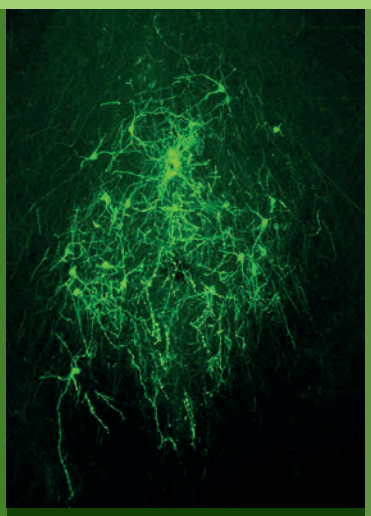

The molecular biology revolution of past decades enabled the introduction of genes from evolutionarily distant species into mammalian cells and as such the interrogation of biological phenomena at unprecedented specificity in living animals. The central components of gene transfer into target cells are recombinant viruses deprived of the machinery for normal viral operation rendering them incapable of replication in the host cell. The resulting viral particles carry the transgenes to be introduced into targets. By viral gene transfer modifications can be cell type, brain area and developmental time-specifically targeted. The dawn of optogenetics and the spread of high throughput approaches in various areas of neuroscience research e.g. connectomics, recording of neuronal activity by high density electrodes or by advanced imaging techniques resulted in the dramatic expansion of the viral gene transfer technique. Viruses have been incorporated into the methodological repertoire and now are routinely used by large number of labs around the world as basic and indispensable research tools.

Viral gene transfer was gradually implemented in the IEM during the mid-2000s. The growing demand especially after the implementation of optogenetic manipulation motivated the allocation of a dedicated virus injection facility. Currently, two virus labs operate in the Institute capable of satisfying the demands of all current and future groups aiming to deploy viral gene transfer by providing biosafety level 2 (BSL-2) conditions. The Institute's groups utilize viral gene transfer for a multitude of purposes such as introducing microbial opsin genes for the manipulation or various neuron types in optogenetic experiments, suppressing or overactivating genes or labeling neurons for determining their connectivity. The injected viral agents belong to adeno-associated viruses or lentiviruses.

The virus injection facilities were planned in order to accommodate enough space for all phases of the viral gene transfer procedure from the preparation of animals, through the injection process to the post-injection storage of the animals in ideal conditions during the incubation period and decontamination. Hence, the facilities have dressing rooms, injection labs with multiple injection setups, deep freezers and laminar boxes, animal rooms and decontamination rooms. The facilities' ventilation systems feed particle-filtered, cooled and humidified air to provide stable temperature and humidity level and remove contaminated air through high-efficiency particulate arrestance (HEPA) and small molecule adsorbing filters. Pressure gradients generated and maintained by ventilation prevent the outflow of contaminated air toward common areas outside the facilities. The injection setups are optimized for the targeted delivery of small amounts of virus solution. Injected animals are stored in animal rooms capable of holding up to 300 mice and 100 rats with programmable lighting under regular surveillance by an animal technician. Currently, more than 20 users representing more than 10 groups carry out viral gene transfer experiments. The virus injection facilities are supervised by the Institute's Biosafety Committee.