# Description of Techniques and Explanation of Concepts

Optogenetic Stimulation Induced Attack

○ "We next tested whether functional manipulations of VMHvl would affect mating or fighting[1]. Although VMHvl overlaps the rat HAA, extensive attempts to elicit attack by conventional electrical stimulation of this region in mice were unsuccessful. As an alternative, therefore, we expressed channelrhodopsin-2 (ChR2) in VMHvl neurons unilaterally[1], using stereotactic co-injection of adeno-associated viral vectors (AAV2)[2] expressing Cre recombinase and a Cre-dependent form of ChR2 fused with enhanced yellow fluorescent protein (ChR2−EYFP) and selectively illuminated cells[2] in this region using an implanted fibreoptic cable (Fig. 4a)[3].
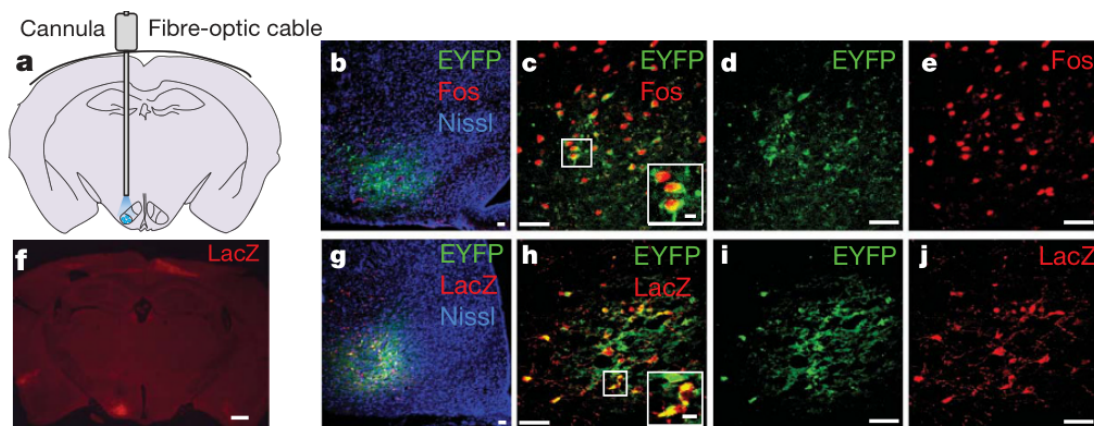
- Hypothesis in question[1]: this section deals with figure 4 in the paper, where the authors are testing whether functional manipulations of VMHvl are affect behavior, but had an issue of selectively activating the area.

- ChR2[2]: use of channelrhodopsin (light gated ion channels), specifically channelrhodopsin-2, allowed the researcher to select particular neurons[2] to analyze cell responses in VMHv1 directly.

- Co-injection of AAV2[3]: AAV2 infects neurons preferentially, allowing only neurons whose cell bodies are local to the injection site express the CHR2. Co-injection ensures that cells observed are exactly the neurons in question, which blue region under *a* in the above image.

○ Selectively illuminated cells[2] using an implanted fibreoptic cable[3]: "results showed that *c-fos* could be strongly induced in VMHvl on the infected, but not the contralateral control side after repeated blue light stimulation in awake animals."

- The actual analysis of how the authors determined this result is something I'm struggling to understand. I get the idea of injecting and selectively controlling regions that respond to the optogenetic light, allowing for functional testing of behavior, but I don't *b*−*e* and *g*−*h*.

- *f*: does use LacZ to identify infected cell bodies, which I assume is to verify effectiveness of AAV2.