Ai134(TITL-ChR2H134R-EYFP)-D mice (also called Ai134D or Ai134(TITL-ChR2-YFP)-D) are a Cre/Tet-dependent, optogenetic line - created by targeted insertion at the Igs7 locus (TIGRE; an intergenic region on mouse chromosome 9 that allows reporter expression to be tightly regulated). Following Cre-mediated removal of the STOP cassette, they may be used to generate Tet-Off/Tet-On mutant animals with conditional (inducible/reversible) expression of an improved channelrhodopsin2/EYFP fusion protein (ChR2(H134R)-EYFP). Subsequent illumination of ChR2(H134R)-expressing (EYFP fluorescent) cells with blue light leads to reversible photostimulation of action potential firing/neural activity in these cells.

Donating Investigator
Hongkui Zeng, Allen Institute for Brain Science
Ai134(TITL-ChR2H134R-EYFP)-D mice (also called Ai134D or Ai134(TITL-ChR2-YFP)-D) are a Cre/Tet-dependent, optogenetic line, created by targeted insertion at the Igs7 locus (TIGRE; an intergenic region on mouse chromosome 9 that allows reporter expression to be tightly regulated). Ai134D mice harbor the TIGRE-Ins-TRE-LSL-ChR2(H134R)/EYFP conditional allele, designed with a modified Tet response element (TRE or tetO) and loxP-flanked STOP cassette upstream of the ChR2(H134R)/EYFP fusion protein (see detailed description below). When bred with other mice expressing Cre recombinase and tetracycline-controlled transactivator protein (tTA) or reverse tetracycline-controlled transactivator protein (rtTA), ChR2(H134R) expression in cells/tissues where the expression patterns of the individual promoters driving Cre and tTA/rtTA overlap can be regulated with tetracycline or its analog doxycycline (dox). Following induction of ChR2(H134R) expression (EYFP fluorescence), illuminating neurons with blue light (~450-490 nm) leads to rapid and reversible photostimulation of robust action potential firing activity in these cells.

Specifically, the donating investigator reports Ai134D mice have no reported levels of EYFP fluorescence in absence of Cre and tTA. When bred with tTA-driver and Cre-driver lines to create triple transgenic animals (ChR2(H134R)/EYFP+/Cre+/tTA+), cells expressing both tTA and Cre exhibit robust/bright fluorescence. Light-induced expression of the activation opsin occurs at levels sufficient to effectively depolarize/activate cortical neurons. ChR2(H134R)/EYFP expression/function in tissues other than brain has not yet been evaluated (January 2018). For example, combining Ai134 with the moderately-expressing tTA-driver line ROSA26-ZtTA (see Stock No. 012266) and the cortical layer 4 Cre driver line Scnn1a-Tg3-Cre (Stock No. 009613) generates triple transgenic Scnn1a-Tg3-Cre;ROSA26-ZtTA;Ai134 animals. Those mice show good ChR2(H134R) expression and measurable photo-responses. The same may be expected for Ai134D. Additionally, the donating investigator advises against using very strong tTA drivers (e.g., Camk2a-tTA) in these triple transgenics - suggesting that the resulting high ChR2(H134R) expression levels lead to fluorescent aggregates in cells and/or aberrant morphology of labeled cells.

Ai134D heterozygotes are viable and fertile with no reported gross physical or behavioral abnormalities. To date (January 2018), it has not been attempted to make this strain homozygous.

The bacterial opsins are retinal-binding proteins that combine a light-sensitive domain with an ion channel or pump - providing light-dependent ion transport, membrane potential alteration, and sensory functions to bacteria. The ChR2(H134R)-EYFP fusion protein is composed of a Chlamydomonas reinhardtii-derived channelrhodopsin-2 that harbors a gain-of-function H134R substitution fused in-frame with an enhanced yellow fluorescent protein. The ChR2(H134R) is designed to cause larger stationary photocurrents compared to ChR2. This ChR2(H134R) functions as a blue light-driven cation channel that depolarizes the cell and causes action potentials. As such, illuminating ChR2(H134R)-expressing cells with blue light (450-490 nm) leads to rapid and reversible photostimulation of action potential firing activity in these cells.
Breeding Considerations

When maintaining a live colony, heterozygous mice may be bred together, to wildtype mice from the colony or to C57BL/6J inbred mice (Stock No. 000664). To date (January 2018), it has not been attempted to make this strain homozygous.

Additional Breeding and Husbandry Support

Mating System
Heterozygote x Wild-type
Wild-type x Heterozygote
Citation
When using the Ai134(TITL-ChR2H134R-EYFP)-D, Ai134D, Ai134(TITL-ChR2-YFP)-D mouse strain in a publication, please cite the originating article(s) and include JAX stock #031334 in your Materials and Methods section.

Animal Health Reports
Facility Barrier Level Descriptions

Production of mice from cryopreserved embryos or sperm occurs in a maximum barrier room, G200

Pricing & Availability

Cryo Recovery
Typically mice are recovered in 10-14 weeks. Contact Customer Service to place an order or for more information.

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Related Products and Services

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<td>$2595.00</td>
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Payment Terms and Conditions

Terms are granted by individual review and stated on the customer invoice(s) and account statement. These transactions are payable in U.S. currency within the granted terms. Payment for services, products, shipping containers, and shipping costs that are rendered are expected within the payment terms indicated on the invoice or stated by contract. Invoices and account balances in arrears of stated terms may result in The Jackson Laboratory pursuing collection activities including but not limited to outside agencies and court filings.

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The Jackson Laboratory has rigorous genetic quality control and mutant gene genotyping programs to ensure the genetic background of JAX® Mice strains as well as the genotypes of strains with identified molecular mutations. JAX® Mice strains are only made available to researchers after meeting our standards. However, the phenotype of each strain may not be fully characterized and/or captured in the strain data sheets. Therefore, we cannot guarantee a strain’s phenotype will meet all expectations. To ensure that JAX® Mice will meet the needs of individual research projects or when requesting a strain that is new to your research, we suggest ordering and performing tests on a small number of mice to determine suitability for your particular project. We do not guarantee breeding performance and therefore suggest that investigators order more than one breeding pair to avoid delays in their research.
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