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Optogenetic animal models for depression and other psychiatric conditions

Researchers in Prof. Karl Deisseroth's laboratory have developed specific, inducible animal models for depression that use targeted optogenetic strategies to precisely dissect the neuronal circuits underlying the condition. This technique can be used to induce individual behavioral symptoms (e.g. hopelessness, psychomotor retardation, avolition, anhedonia, and dysphoria/psychic pain) to evaluate the effects of therapeutic candidates. These animal models have applications for basic research and drug development.

Stage of Research
The inventors have performed mechanistic studies and identified several different neuronal circuits that can be targeted in rodents to induce specific depression-like symptoms.

Applications

- **Drug and medical device development:**
  - identification of new treatment strategies and targets for psychiatric diseases (for pharmaceutical agents or devices that provide direct simulation/inhibition)
  - generation of drug screening platforms (animals, slices, and other screening paradigms) to find drugs that specifically resolve symptoms of depression
- **Research** - inducing depression symptoms for basic studies of psychiatric conditions in animal models

Advantages

- **Unique tool** - currently, no similar animal models of depression or depressive symptoms exist
- **Specific** - targets well-defined neural circuits
- **Simple induction** - optogenetic control of circuits is much easier to induce depressive symptoms than current laborious methods

Publications

- patent application PCT/US2013/030893: Non-human animal models of depression and methods of use thereof

Patents

- Published Application: WO2013142196
- Published Application: 20150040249

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