Johns Hopkins Engineering

Methods in Neurobiology

Choosing the Appropriate Model in Research

JOHNS HOPKINS
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of ENGINEERING

How to select an appropriate research model

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Level of investigation

↓

Choose the most convenient,
cost-effective,
high gain model

Peng, Y., Clark, K.J., Campbell, J.M., Panetta, M.R., Guo, Y., & Ekker, S.C. (2014). Making designer mutants in model organisms. *Development 141*, 4042 - 4054.

How to select an appropriate research model: Example 1

Nature
Volume 392, Issue 6676, 9 April 1998, Pages 605-608

Mutations in the parkin gene cause autosomal recessive juvenile parkinsonism

Kitada, T., Asakawa, S., Hattori, N., Matsumine, H., Yamamura, Y., Minoshima, S., Yokochi, M., Mizuno, Y., Shimizu, N.

- Cell model carrying the mutant gene: most easy to make but with limitations
- IPSCs model: more difficult and sometimes no access to human samples
- Animal model: high risk/high gain. More difficult, expensive but more comprehensive

How to select an appropriate research model: Example 2

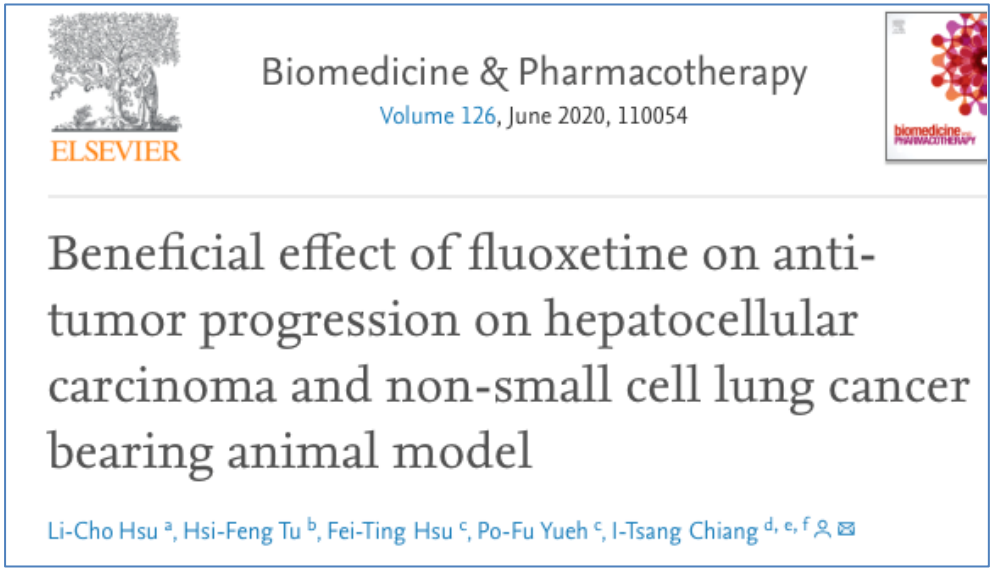
Cell Rep. 2020 Mar 17;30(11):3682-3690.e6. doi: 10.1016/j.celrep.2020.02.099.

Changes in Gut Microbiota by Chronic Stress Impair the Efficacy of Fluoxetine.

Siopi E[1], Chevalier G[2], Katsimpardi L[3], Saha S[3], Bigot M[3], Moigneu C[3], Eberl G[2], Lledo PM[4].

- Animal model because we need microbiota-host interaction. Mouse because more similar to humans, easier to manipulate, cost effective.
- Gut on a chip. Technique not widely available.

How to select an appropriate research model: Example 3



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Biomedicine & Pharmacotherapy

Volume 126, June 2020, 110054

Beneficial effect of fluoxetine on anti-tumor progression on hepatocellular carcinoma and non-small cell lung cancer bearing animal model

Li-Cho Hsu [a], Hsi-Feng Tu [b], Fei-Ting Hsu [c], Po-Fu Yueh [c], I-Tsang Chiang [d, e, f]

- Cell line of liver carcinoma;
- Nude mice/SCID mice (xenograft model);
- Spheroids from patients.
- 3D cultures
- Multiorgan on a chip