



# InSilicoTrials InSilicoENDO

## **Infertility Virtual Patients**

Infertility is a disease that is estimated to affect from 8 to 12% of reproductive-aged couples in developing and developed countries [1]. Infertility is caused by female health problems in about 50% of the cases, 40% of which are due to endocrinological disorders.

Assisted reproduction techniques have increased the chances of successful reproduction. However, investigation and treatment of infertility represent a high cost for the individual and the society.

Model-based approaches for the efficacy assessment of pharmacological treatments allow to decrease the time and costs of experiments and enable to personalize treatments to design the optimal therapy for each patient before administration.

The product Infertility Virtual Patients allows to simulate a digital twin or a population of virtual female subjects and apply infertility treatment options [2].

### **What is Infertility Virtual Patients**

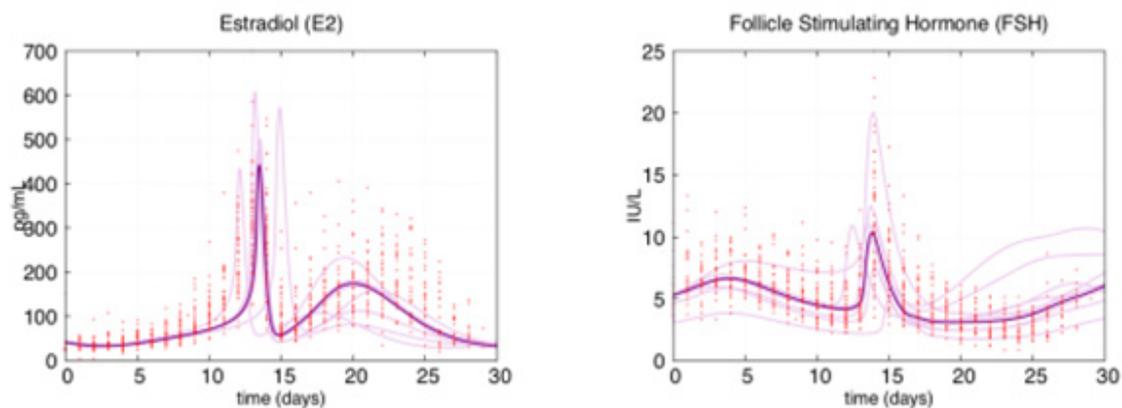
The Infertility Virtual Patients tool allows to evaluate an infertility treatment effect on women. Two workflows are possible:

- (i) Make individual predictions to support clinicians in decision making
- (ii) Investigate treatment effects in patient subpopulations to support the design of future clinical trials.

The tool simulates the downregulation effect of an assisted reproduction protocol.

The tool is based on a mathematical model of the female menstrual cycle that includes the physiological compartments hypothalamus, pituitary gland, and ovaries, connected by the bloodstream.

Within these compartments, through pharmacokinetic/pharmacodynamic relationships the model predicts the follicle-stimulating hormone (FSH) and luteinizing hormone (LH) suppression induced by gonadotropin releasing hormone (GnRH) agonists or antagonists throughout the menstrual cycle [3].



**Figure 1.** Simulation results and experimental data for a virtual population of untreated women.

## Advantages

- Quick and cost-effective assessment of pharmacological treatment used for assisted reproduction
- Reduce in vivo experiments
- Personalize treatment for each patient before administration

## How it works

Two workflows are available:

- (i) **Digital twin.** The user specifies patient characteristics, selects treatment options, and run the simulation. The results consist of individual-level predictions to support clinicians in decision making.
- (ii) **Clinical trial simulation.** The user specifies population characteristics, inclusion criteria, selects treatment options, and runs the simulation. The results consist of simulated treatment effects in patient subpopulations to support the design of future clinical trials

## Why working with InSilicoTrials

### TECHNOLOGY-ENABLED SERVICES

Ask us for support on technology integration, in silico trials planning, execution and reporting, in line with regulatory requirements

### VIRTUAL PATIENTS

Design and accelerate your clinical trials with the virtual patient populations you need

### ON DEMAND & CUSTOM

Ask us for the models and simulations you need, or ask us to evaluate where modeling and simulation can support you

### SaaS

Buy tokens and use the online products of your choice among those available on the platform

## In silico methods can innovate drug research and development

Today, the very long and expensive development and the complex registration processes for new drugs are becoming financially unsustainable.

Regulatory agencies have been encouraging the use of in silico methods in drug research and development for years [2] because the use of these methods can significantly reduce costs and greatly accelerate the go-to-market of new medicines, allowing companies to exploit patents for a longer period. Solvers, IT infrastructure and computational specialists require a continuous investment from companies.

To help solve these challenges, InSilicoTrials Technologies has developed a game-changing-solution. Our experts:

- Select computational models from excellence research centers around the world
- Integrate them in our cloud-based platform
- Make them available through user-friendly online products

This solution enables companies to leverage cutting-edge in silico methods at low costs without specific computational expertise, IT infrastructure and solvers investments requirements. On our cloud-based platform, users can select the online computational product of their choice in pay-per-use or ask us to build the digital product they need.

References:

- [1] World Health Organization Programme of Maternal and Child Health and Family Planning, "Infertility : a tabulation of available data on prevalence of primary and secondary infertility," Art. no. WHO/MCH/91.9. Unpublished, 1991, Accessed: May 17, 2022. [Online]. Available: <https://apps.who.int/iris/handle/10665/59769>
- [2] T. Mancini et al., "Computing Personalised Treatments through In Silico Clinical Trials. A Case Study on Down-regulation in Assisted Reproduction.," *EasyChair, EasyChair Preprints*, Aug. 2018. doi: 10.29007/g864.
- [3] S. Röblitz et al., "A mathematical model of the human menstrual cycle for the administration of GnRH analogues," *J. Theor. Biol.*, vol. 321, pp. 8–27, Mar. 2013, doi: 10.1016/j.jtbi.2012.11.020.
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