

neoMimix: Natural Sperm Selection. Advancing Sperm Selection for use in Assisted Human Reproduction through Microfluidics

Overview

A novel, patented, 'fit and forget' energy harvesting solution that converts ambient vibrations into electrical power. The new technology eliminates the need for batteries and is tailored to power low-energy sensors for Internet of Things (IoT) applications.

Vibrational energy harvesters are typically based on linear oscillators, which can have a narrow frequency bandwidth. This impacts their ability to harvest energy as their resonant frequency must be close to the main frequency of ambient vibrations. Different methods have been suggested to overcome the problem of narrow bandwidth harvesters, however, the main challenges consist of increasing the output power and broadening the bandwidth at the same time.

Technology

neoMimix - simple, safe, natural selection of sperm with intact DNA for couples seeking successful pregnancy.

One in six couples requires fertility treatment.

There are two ways to fertilise eggs in vitro

1. Traditional in vitro fertilisation (IVF), whereby, sperm are placed on top of the eggs, and they fertilise themselves.
OR
2. Intra cytoplasmic sperm injection (ICSI), whereby the embryologist selects a sperm and injects it into the egg. Of the ~700,000 assisted reproduction cycles annually in Europe, 62% of these are ICSI. In the USA this is 70%.

For ICSI, the embryologist must select the sperm used to fertilise the egg, which leads to a baby. They do this by first centrifuging the sperm through a density gradient followed by the selection of motile and morphologically normal sperm.

If the selected sperm has fragmented DNA, the risk of miscarriage increases two-fold. The embryologist cannot determine if the selected sperm has fragmented DNA as the method for determining this destroys the sperm.

There is increasing evidence that sperm quality is linked to post-natal and adult health. The University of Limerick has developed an innovative microfluidics-based sperm sorting platform: neoMimix.

Benefits

Benefits for Couples

Compared to the current sperm selection technology (density gradient) neoMimix selects human sperm with:

1. Lower DNA fragmentation (-7.6 fold)
2. Higher motility (+1.4 fold)
3. Better morphology (+2.9 fold)
4. Higher fertilisation rates (+8%) and implantation rates (+12%) - Mouse model

Benefits to Embryologists

1. Quicker sperm preparation (30 vs >60 min)
2. Simpler sperm preparation (3 vs ~10 steps)

Benefits to Fertility Clinics

Competitive commercial business. The use of new cutting-edge technologies attracts business.

Our process selects sperm that are i) motile (mostly progressively motile) ii) have a higher percentage of morphologically normal sperm and iii) have a significantly lower percentage of DNA fragmentation in the selected sperm compared to the industry norm of the density gradient. The embryologist is thus presented with a population of superior-quality sperm for use in ICSI, IVF, or IUI.

Our solution selects sperm which when used in assisted reproduction gives significantly improved fertilisation, implantation, and foetal development rates compared to the current industry norm.

Applications

neoMimix is a Class IIb medical device with a single-use, disposal component. A clinical validation study was conducted for Q1 2020 in conjunction with leading Irish fertility clinics that are part of larger European networks. The EU and US total addressable market is approx. €150 million. A robust business plan has been developed. This technology increases embryo development rates.

The simple, fast, fully traceable enhanced process enables embryologists to optimize the potential for a successful pregnancy for couples.

Commercial Opportunity

The University of Limerick is seeking partners to exploit the commercial potential of these technologies by entering into licensing agreements.

Target Market for Innovation: Assisted Human Reproduction Clinics

Development partner

Commercial partner

Licensing

University spin-out

Seeking investment

Patent Filings:

Patent Title: Sample Separating Method

Type: PCT

Country: EPO

Status: Filed

Priority Date: 24 June 2020

Application number: PCT/EP2021/067160

Link:

<https://worldwide.espacenet.com/patent/search/family/071143601/publication/WO2021260011A1?q=PCT%2FEP2021%2F067160>



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Figures

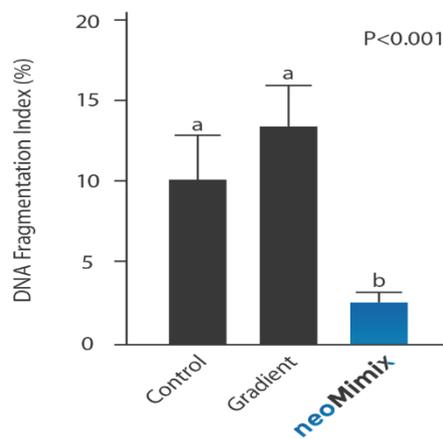


Figure 1: Percent of sperm with fragmented DNA. Unselected sperm (Control) vs sperm selected using a density gradient vs neoMimix.