QUANTUM-BASED OBSERVATION OF DEVELOPING MOUSE EMBRYOS

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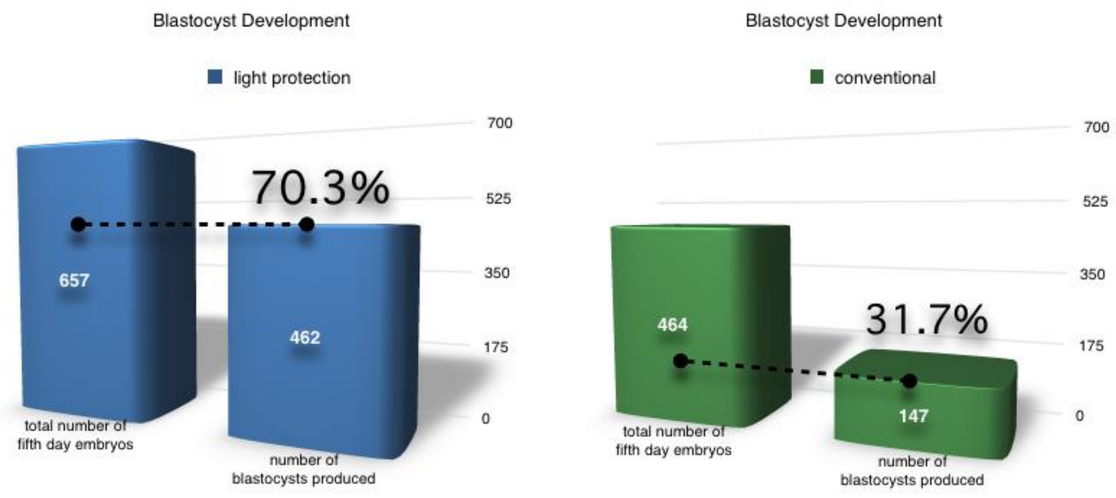
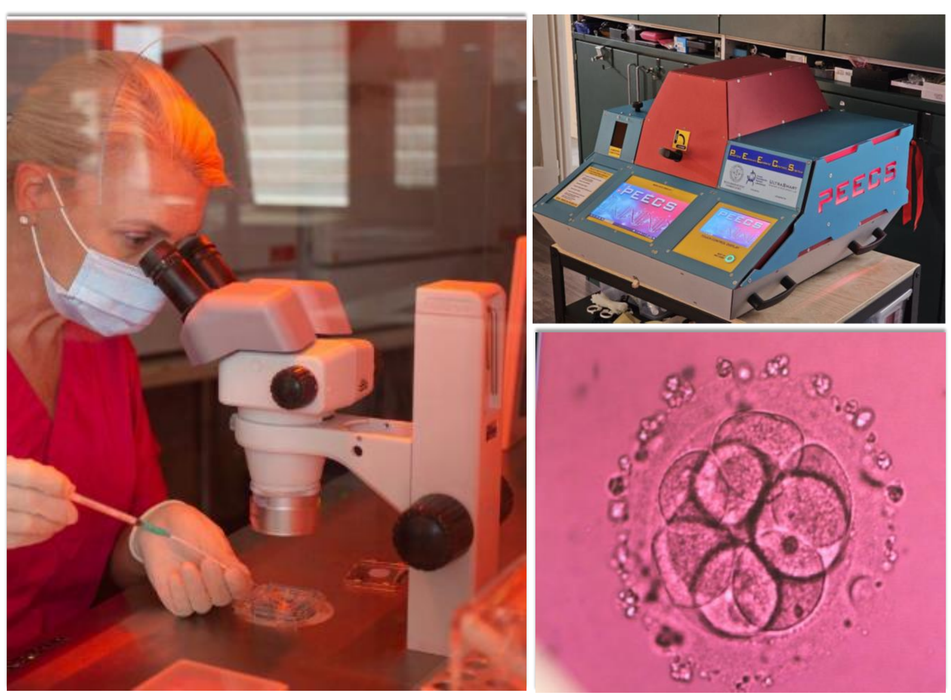
OBJECTIVE

More than ten million children have been born worldwide as a result of assisted reproductive technology, and approximately 2.5 million in vitro fertilization (IVF) cycles result in 500,000 children each year. The method used for embryo selection and implantation is a very important ethical and even more practical issue. Time-lapse imaging technology allows embryos to be continuously observed and monitored during their development, but this requires visible light, which can be harmful to the embryos. Living cells have spontaneous far-infrared radiation (FIR) and ultraweak photon emission (UPE), which arise from metabolic reactions associated with physiological conditions, and their detection can be used to make observations.



MATERIALS AND METHODS

The **PEECS Quantum Incubator®** is an extremely sensitive and indispensable device that allows the detection of photons and FIR radiation emitted by embryos while excluding harmful visible light. By applying the second law of thermodynamics, the low-entropy energy absorbed and used by embryos can be distinguished from the higher-entropy energy released and detected in their environment. To evaluate this, we developed a unique algorithm for calculating the ***entropy-weighted spectral fractal dimension***. In the first series of biological experiments, four-cell mouse embryos grown in an incubator were removed from the incubator and examined in laboratory air, light and temperature. As a control, only the oil with incubation medium and the empty vessel were measured, and then in the second period, we simply turned off all the filters of the measurement software to maximize the data and finally analyze them with our methods.

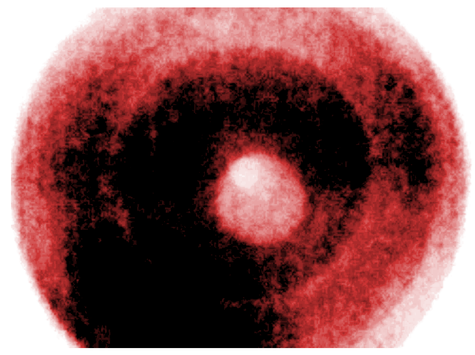


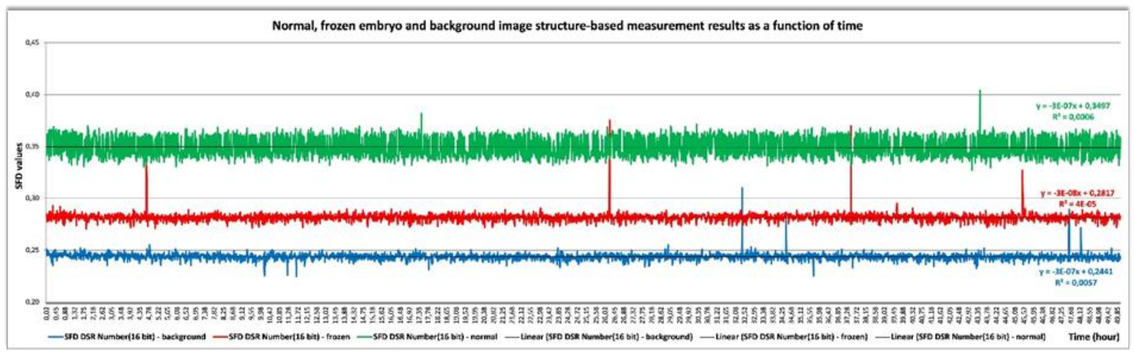
RESULTS

The degenerated two-cell stage embryo showed a decreased photon emission compared to that of its cleaving, counterpart. The four-cell embryos cultured in an incubator were removed from the incubator and examined in laboratory air, light, and temperature. The decreased photon emission showed the increasingly deteriorating living conditions, during which the embryos degenerated and then died. In the second series of experiments, the photon emission of freshly conceived embryos was significantly higher than that of previously frozen and then thawed embryos.

CONCLUSION

It has been detected UPE and FIR in mouse embryos, which can be the basis for an embryo monitoring system that explores developmental, physiological, and energetic processes under ideal dark incubation conditions without external physical or chemical stimulation.





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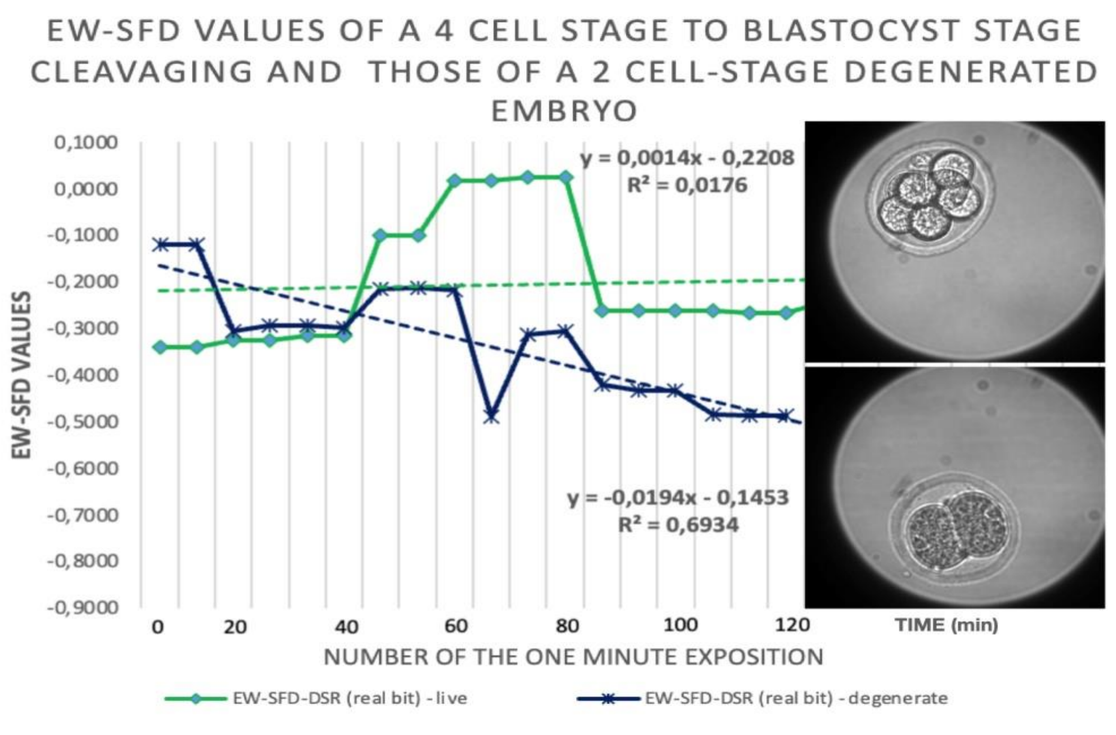

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