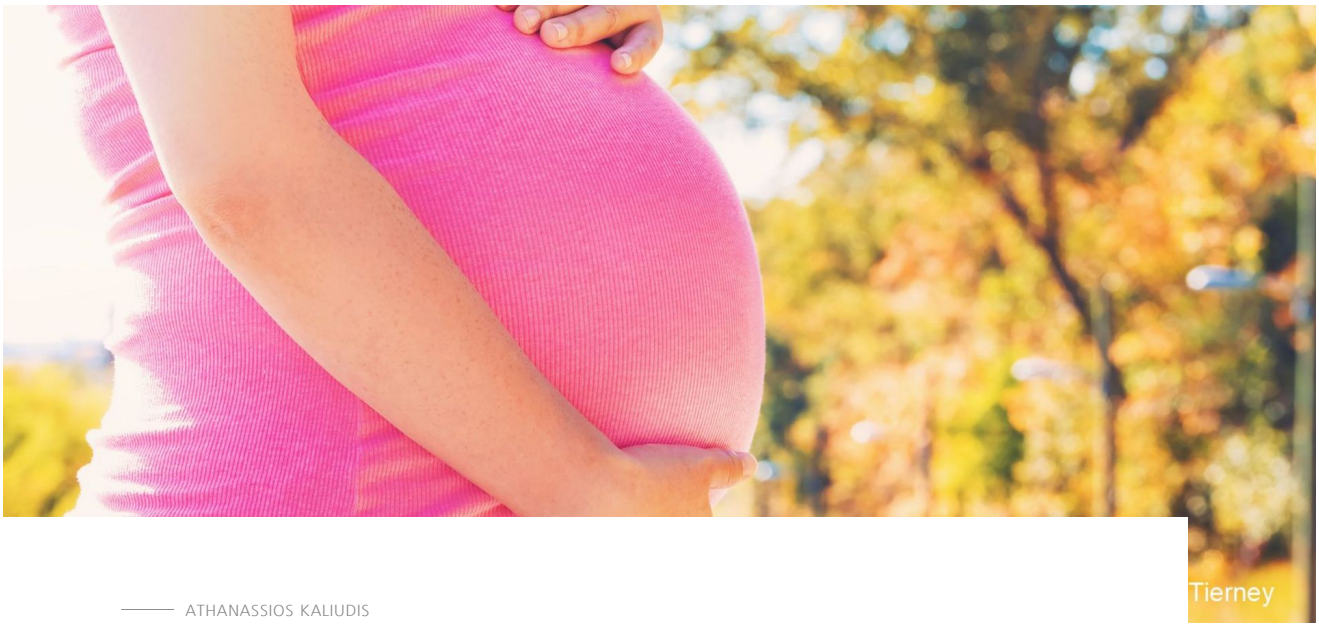

ATHANASSIOS KALIUDIS

Godly: How the Laser Creates Life

For some couples, artificial insemination is the only way to have children of their own. Researchers are constantly improving the methods used in reproductive technology—and lasers are providing assistance in key areas.

Sperm must display a certain amount of agility for artificial insemination to work. DNA-strand breaks in sperm cells have a negative effect on factors such as sperm motility, representing a possible cause of miscarriages. For many years, doctors assessed quality by examining sperm through a microscope—a relatively imprecise method.

Lasers give greater certainty to the process. Two highly focused beams act as "optical tweezers" that are used to hold the spermatozoa firmly in place. The way in which the laser light is reflected provides important information on the sperms' motility (See Fig. 1 in the Gallery), enabling doctors to identify the best candidates. The optical tweezers also provide support in the actual process of insemination, transporting the spermatozoa to the egg.

Further assistance is provided by a UV laser beam, which drills a tiny hole in the egg to help the spermatozoa get inside (See Fig. 2 in the Gallery). The ability to influence the process with such precision makes this a highly reliable method of insemination—and the non-contact nature of the technology eliminates any possibility of contamination.

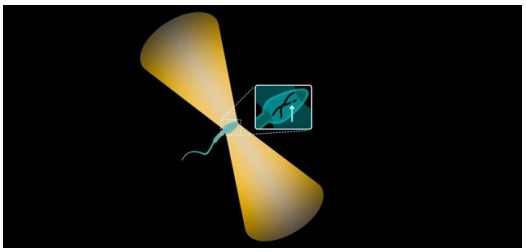

Fig. 1: The way in which the laser light is reflected provides important information on the sperms' motility.

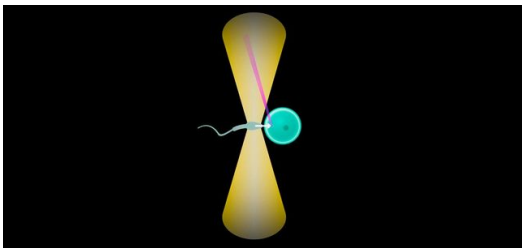

Fig. 2: A UV laser beam drills a tiny hole in the egg to help the spermatozoa get inside.

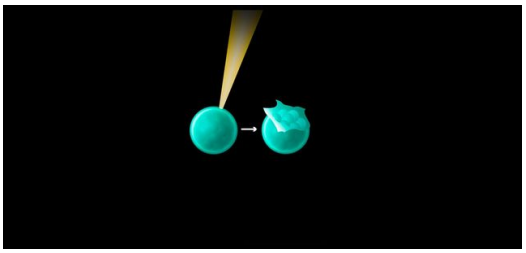

Fig. 3: A method known as “assisted hatching” can help the embryo penetrate the zona pellucida. This is performed using an infrared laser, which perforates the membrane.

Pregnancy begins once the egg has been implanted in the uterus. For this to take place, the embryo must “hatch” from the egg, something that sometimes fails to occur because the egg membrane (zona pellucida) is too tough. A method known as “assisted hatching” can help the embryo penetrate the zona pellucida. This is performed using an infrared laser, which perforates the membrane (See Fig. 3 in the Gallery). Mother Nature is left to take care of the rest.

And that's how optical tweezers work:

When a photon collides with a particle, the force of the impact causes two things to happen: the photon changes course, and the object struck is set in motion. If the light is powerful enough, it can push the object away with significant force. This effect can be harnessed by using two beams to hold or move the object in the same way you would use a pair of tweezers.



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