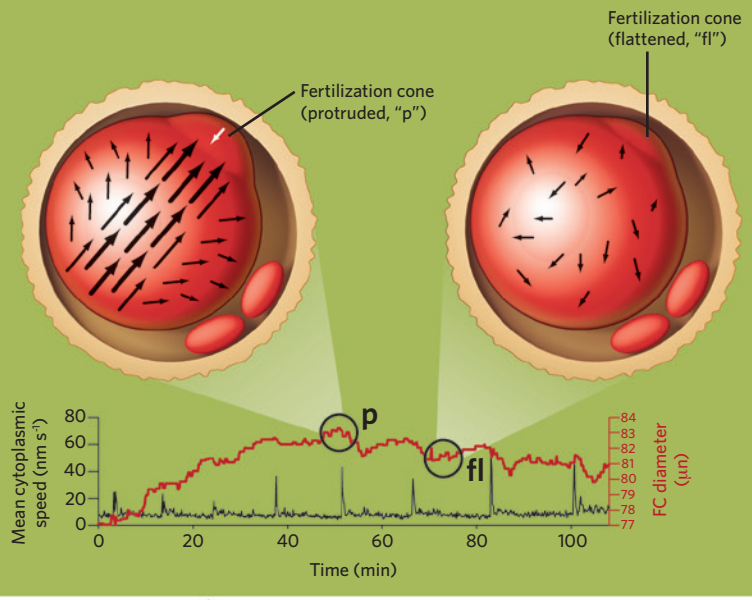
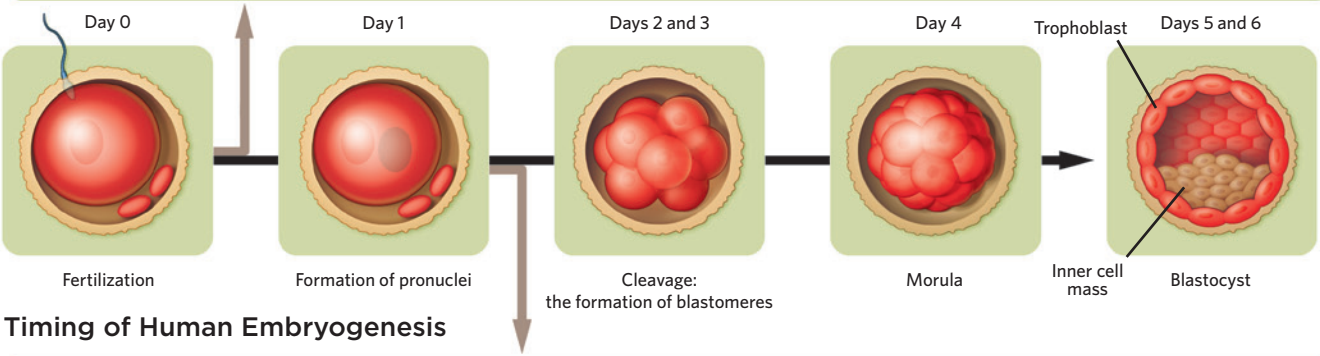
NEW METHODS FOR EMBRYO SELECTION

Traditionally, human eggs fertilized in vitro are selected for implantation based on visual assessments of embryonic fitness made at any of three developmental checkpoints: days 1, 2 or 3, and 5 (see below)—a process sometimes combined with genetic testing of cells harvested from the cleavage embryo or the blastocyst. However, these methods identify embryos that go on to have, at best, a 30 to 40 percent rate of successful implantation and pregnancy. New noninvasive imaging methods using quantitative image-analysis software could offer better success rates and return the embryo to the mother's uterus earlier than day 5, when implantation normally begins.



Timing Cytoplasmic Flow

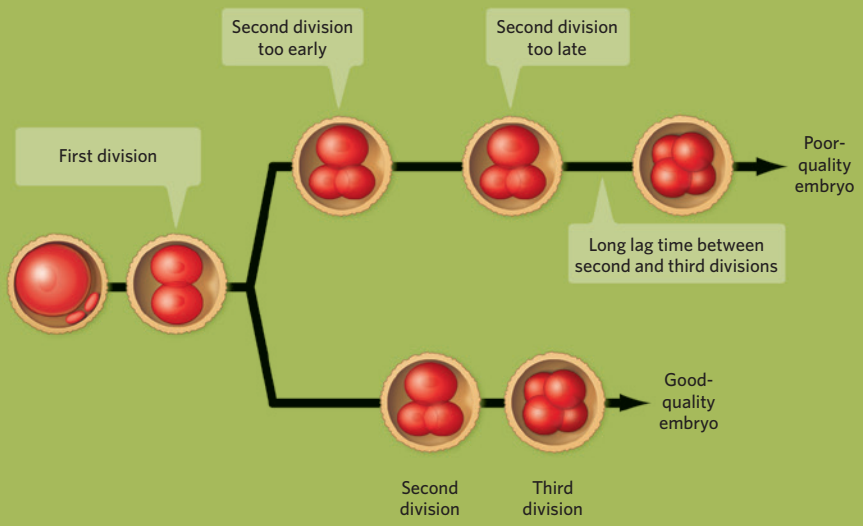
When a sperm fertilizes an egg—leaving only a protrusion, the fertilization cone, where the sperm entered—it initiates a rhythmic release of calcium ions from the endoplasmic reticulum into the cytoplasm. These bursts of calcium cause the embryo's actomyosin cytoskeleton to contract, making the cytoplasm swirl or flow within the cell. This pulsating movement of the cytoplasm can be captured and analyzed with software designed to quantify fluid dynamics. If the intervals between cytoplasmic pulsations are too short or too long, a mouse embryo has a lower chance of developing to term, whereas an average rhythm of flow is most predictive of successful pregnancy.



Timing of Human Embryogenesis

Timing Cleavage Stages

Measuring the timing of cell division at three points can distinguish between high- and low-quality embryos. The first thing researchers look at is how long it takes the zygote to pinch off into two cells. Poor-quality embryos start their second cell division—one that results in three cells—either much earlier or much later than good-quality embryos. Embryos that will ultimately be successful are also more likely to start their third division, which brings the total to four cells, shortly after or almost synchronously with the second.



© TAMI TOLPA