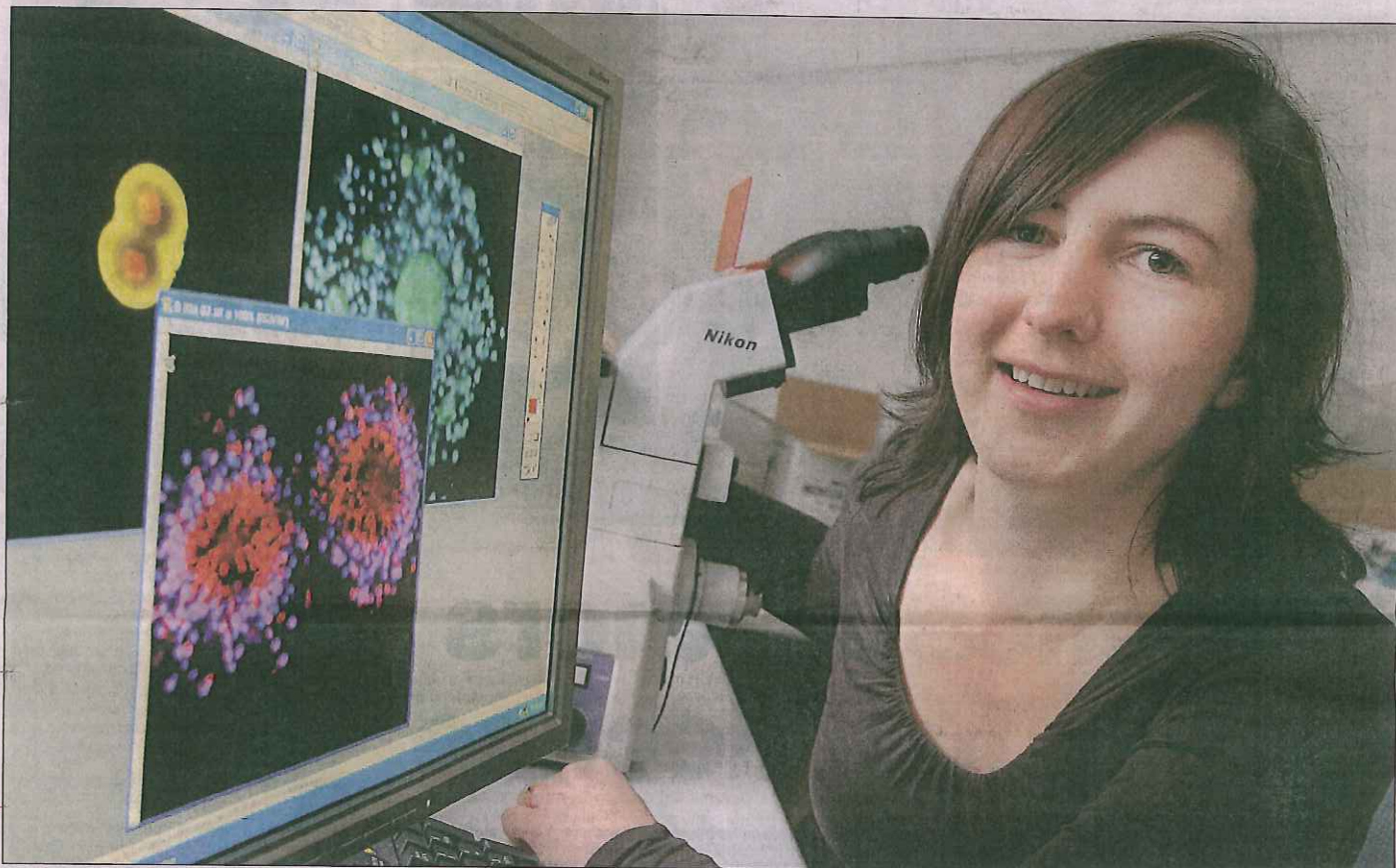


On the road to finding what an embryo wants



INSIGHTS: PhD student Sarah Wakefield, at the School of Paediatric and Reproductive Health, is researching IVF technology; and below, mouse embryos.

Picture below supplied by SARAH WAKEFIELD

SARAH KELLETT

THREE-YEAR-OLDS demand what they want. Babies cry for what they want. But how can a five-day-old embryo tell you what it wants?

PhD student Sarah Wakefield from the Robinson Institute at the University of Adelaide is on the case. She investigates how embryos extract energy from nutrients to control early development.

"An embryo begins as a single cell when a sperm enters an egg."

"That one cell has to divide into two, those two cells keep dividing," said Ms Wakefield.

At five days, a human embryo has about a hundred cells. Some of those cells will become the foetus, while others will become the placenta.

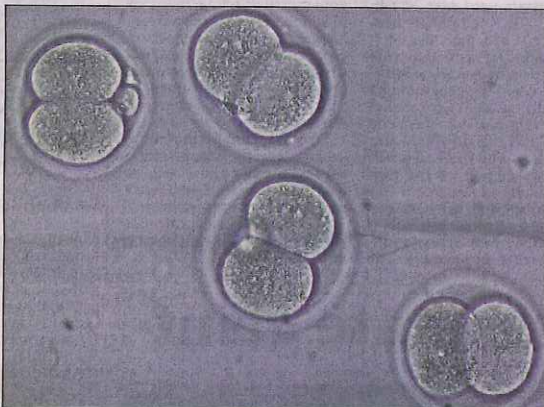
It's a time of dramatic, awe-inspiring change.

Metabolism, how cells get energy from nutrients, "also changes a lot in those first five days," said Ms Wakefield.

Her supervisor Dr Michelle Lane is the scientific director of fertility clinic Repromed, which works closely with the Robinson Institute.

Dr Lane is very interested in the project.

"The metabolism of the embryo is not like a normal cell," she said. "It's quite different, which is one of the reasons we know so little about it. While most other cells use glucose, the early embryo can't, and doesn't. So it uses pyruvate."



During those first five days the embryo stops needing small molecule pyruvate and prefers the sugar glucose.

If conceived naturally, an early embryo moves through the fallopian tube to the uterus. As it moves, the nutrients around it change, supplying the embryo with what it needs most.

However embryos conceived through IVF develop outside the body in solution for those five days. Years ago, Dr Lane's own PhD project helped change the solution used during IVF to provide for changing needs.

"The more understanding we have on how the embryo grows," Dr Lane said, "the better we can approximate or mimic those conditions in vitro." It could result in more successful IVF treatments.

In her research, Ms Wakefield looks at the mitochondria, powerhouse of the cell. "We're looking at how metabolic function or mitochondrial function can regulate the development of the embryo," she said. Changing the activity of the mitochondria provides insight into how it works.

Slowing metabolism over the first

five days slows the embryo's growth. However other research has shown increasing metabolism also slows growth. Ms Wakefield describes it as "a balance."

While studying for her PhD, Ms Wakefield also works at the Repromed clinic in Dulwich.

She is involved in almost all aspects of the IVF procedure, from egg collection in theatre to embryo transfer five days later.

"It gives you a really good perspective on what you're doing to help people," she said.

Her research could improve IVF procedures. People who conceive naturally could also benefit.

Those first five days affect the future in ways we don't completely understand. It may influence a baby's health during pregnancy, and beyond birth into adulthood.

Most mothers know nutrition during pregnancy is important, but most women are unaware they are pregnant at the five-day mark.

Dr Lane believes "lifestyle choices around conception are important."

It's also true for the months before in creating a healthy egg.

Preconception health is not limited to women. Health in men may influence sperm quality, and affect health in the next generation.

"It's really quite early on, we just got our first paper accepted for publication from one of my other students," said Dr Lane. "There's a role of oxidative stress and DNA damage in the sperm."

FACTS ABOUT IVF

STUDY PATHWAYS

At the University of Adelaide, Flinders University or UniSA study one of these degrees:

- Bachelor of Health Science
- Bachelor of Science
- Bachelor of Medical Science.

Honours projects are on offer at the Robinson Institute, Research Centre for Reproductive Health.

IVF PROCEDURE

- In vitro fertilisation is one option for couples having trouble with fertility.
- Medicine is used to stimulate ovaries, which produce mature eggs contained in follicles.
- Follicular fluid containing eggs is collected in surgery under light sedation.
- Eggs are placed with a sperm sample in a special solution designed to improve fertilisation.
- If fertilisation does not occur, another procedure can inject sperm directly into the egg. This is called intra cytoplasmic sperm insemination (ICSI).
- The embryos grow in culture for five days.
- Scientists choose the embryo most likely to create a successful pregnancy.
- The decision is based on how the embryo looks and a new metabolism test.
- Other medicine to increase progesterone levels is needed to prepare the body.
- The embryo is placed into the uterus. A blood test is used to confirm the pregnancy.