

# More IVF babies born after egg collection in summer rather than in autumn, study finds

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The time of year when eggs are collected from women's ovaries during fertility treatment makes a difference to live birth rates, according to new research published today in the journal *Human Reproduction*.

Researchers in Australia have found that transferring frozen then thawed embryos to women's wombs from eggs collected in the summer resulted

in a 30% higher likelihood of babies born alive, than if the eggs had been retrieved in the autumn.

Dr. Sebastian Leathersich, an obstetrician, gynecologist and Fellow in Reproductive Endocrinology and Infertility at Fertility Specialists of Western Australia, City Fertility Centre, and the King Edward Memorial Hospital in Perth, Australia, who led the study, said, "Over the duration of our study, the average live birth rate following frozen embryo transfer in Australia was 27 births per 100 people. In our study, the overall live birth rate following frozen embryo transfer was 28 births per 100 people."

"If eggs were collected in autumn, it was 26 births per 100 people, but if they were collected in summer there were 31 births per 100 people. This improvement in [birth rates](#) was seen regardless of when the embryos were finally transferred to the women's wombs. The live birth rates when eggs were collected in spring or winter lay between these two figures, and the differences were not statistically significant."

The researchers also found a 28% increase in the chances of a live birth among women who had eggs collected during days that had the most sunshine compared to days with the least sunshine.

Until now, there have been conflicting findings on the effects of the seasons on pregnancies and live birth rates following egg collection and embryo freezing. Dr. Leathersich explained, "It's long been known that there is [seasonal variation](#) in natural birth rates around the world, but many factors could contribute to this including environmental, behavioral and sociological factors."

"Most studies looking at IVF success rates have looked at fresh embryo transfers, where the embryo is put back within a week of the egg being collected. This makes it impossible to separate the potential impacts of

environmental factors, such as season and hours of sunshine, on egg development and on embryo implantation and early pregnancy development."

"These days, many embryos are 'frozen' and then transferred at a later date. We realized this gave us an opportunity to explore the impact of environment on egg development and on early pregnancy separately by analyzing the conditions at the time of egg collection independently from the conditions at the time of embryo transfer."

Dr. Leathersich and his colleagues analyzed outcomes from all frozen embryo transfers carried out at a single clinic in Perth over a period of eight years, from January 2013 to December 2021. During this time there were 3,659 frozen embryo transfers with embryos generated from 2,155 IVF cycles in 1835 patients. Information on outcomes was missing for two frozen embryo transfers and so these were excluded, leaving 3,657 for analysis.

The researchers looked at birth outcomes according to season, temperatures, and the actual number of hours of bright sunshine (as opposed to calculating hours from sunrise to sunset). They obtained the data on weather from the Australian Bureau of Meteorology. They created three groups for duration of sunshine on days when eggs were collected: low sunshine days (0 to 7.6 hours of sunshine), medium sunshine days (7.7 to 10.6 hours) and high sunshine days (10.7 to 13.3 hours).

"When we looked specifically at the duration of sunshine around the time the eggs were collected, we saw a similar increase to that seen for egg collection during the summer," said Dr. Leathersich.

"The live birth rate following a frozen embryo transfer from an egg that was collected on a day with fewer hours of sunshine was 25.8%; this

increased to 30.4% when the embryo came from an egg that was collected on days with the most hours of sunshine. When we took into account the season and conditions on the day of the embryo transfer, this improvement was still seen."

The temperature on the day of egg collection did not affect the chances of a live birth. However, the chances of a live birth rate decreased by 18% when the [embryos](#) were transferred on the hottest days (average temperature of 14.5-27.8 °C) compared to the coolest days (0.1-9.8 °C), and there was a small increase in miscarriage rates, from 5.5% to 7.6%.

Dr. Leathersich said, "Our study suggests that the best conditions for live births appear to be associated with summer and increased sunshine hours on the day of egg retrieval."

"There are many factors that influence [fertility treatment](#) success, age being among the most important. However, this study adds further weight to the importance of environmental factors and their influence on egg quality and embryonic development. We effectively separated the conditions at the time of egg collection from the conditions at the time of transfer, demonstrating that environmental factors when the eggs are developing are as, if not more, important than environmental factors during implantation and early pregnancy."

"Optimizing factors such as avoiding smoking, alcohol and other toxins and maintaining healthy activity levels and weight should be paramount. However, clinicians and patients could also consider external factors such as environmental conditions."

Factors that may play a role in the increased live birth rates after egg collection in the summer and during more sunshine hours include melatonin. Levels of this hormone are usually higher in winter and spring, and eggs take three to six months to develop before they are

released from the ovaries.

Differences in lifestyles between winter and summer months may also play a role. The finding that miscarriage rates were highest when [embryo transfer](#) took place on the hottest days are consistent with epidemiological studies that show higher rates of miscarriage in the summer months.

"This suggests that the negative effects of high temperature are more likely related to early pregnancy rather than [egg development](#)," said Dr. Leathersich.

Limitations of the study include the fact that it is a retrospective rather than prospective study: looking back at what had already happened. For this reason, it cannot show that conditions at the time of egg collection cause the difference in live birth rates, only that they are associated with them.

Dr. Leathersich said, "Ideally, these findings should be replicated in other sites with different conditions and different treatment protocols to confirm the findings. It would also be interesting to look at the impact of season and environmental factors on sperm parameters, as this could have contributed to our observations. We are now planning to analyze this same group of patients using air quality data, as there may be seasonal changes in exposure to harmful pollutants which could negatively affect reproductive outcomes."

"Finally, given the huge increase in so-called 'social egg freezing' for fertility preservation and the fact that this group generally have flexibility about when they choose to undergo treatment, it would be very interesting to see if these observations hold true with frozen eggs that are thawed and fertilized years later. Any improved outcomes in this group could have big impacts for women making decisions about their

future fertility, but the long-term follow up required means it is likely to be some time before we can draw any conclusions for this population."

**More information:** Sebastian Leathersich et al, Season at the time of oocyte collection and frozen embryo transfer outcomes, *Human Reproduction* (2023). [DOI: 10.1093/humrep/dead137](https://doi.org/10.1093/humrep/dead137)

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