



BACKGROUND BRIEFING

November 2025

The 14-day rule for embryo research:

Studying early human development



Introduction

The briefing presents a snapshot of evidence gathered to inform a broader inquiry into the 14-day rule in the UK.

The 14-day rule is a key feature of human embryo research governance in the UK. It stipulates that human embryos should not be grown, for whatever purpose, *in vitro* after the appearance of the primitive streak or for longer than 14 days after the process of creating the embryo began. As an interim output of this project, this briefing does not draw conclusions, but aims to support discussion about the future of embryo research and how it is regulated, providing information about:

- what we know about how human embryos develop;
- what embryo culture is and how it has contributed to research into early human development;
- how human embryos are sourced and used in research, and how this is regulated; and
- what has been achieved through research involving human embryo culture, and the focus and aims of ongoing research.

Possible future advances in, or applications of, embryo research will be considered in further outputs of this project and are not covered here. Ethical considerations raised by this research and possible changes to how it is regulated are explored in a [separate briefing](#).

Acknowledgements

The briefing draws partly on two evidence reviews commissioned by the Nuffield Council on Bioethics and undertaken by Victoria Boydell and Elizabeth Bohm in early 2025.¹ These reviews focussed on published literature and information about embryos used in research, and the focus and aims of embryo culture research in the UK and internationally.² We are also grateful to Norah Fogarty, King's College London, and Robin Lovell-Badge, Francis Crick Institute, for reviewing an earlier version of this briefing.

1 The reviews were wider in scope in order to support the Working Group's deliberations.

2 The review of UK research surveyed published literature since 1990 (when regulations that apply to embryo research came into effect) and publicly available information about ongoing research. The international review is based on a sample of the literature published since 2017 (when researchers first published studies involving the culture of embryos up to 14 days) and is necessarily less comprehensive but offers a snapshot of the range of research undertaken in this period.

What do we know about early human embryo development, and how do we know?

From fertilisation and up to 8 weeks, the entity that develops during pregnancy is described, in scientific terms, as an **embryo**. After this point it is considered a fetus, which is the term used until birth. The size and position of the early embryo within the body makes it very difficult or impossible to observe as it develops. Historically, researchers studying this period relied on material obtained from miscarriages or surgical procedures, and on studies in animals (see box on [page 6](#)).³

However, with the development of in vitro fertilisation (IVF) in the late 1960s, it became possible to create embryos outside the body and to maintain and study how live embryos develop in the laboratory.⁴ Both for IVF and for research purposes, embryos are kept in **culture**, a fluid or system made up of the nutrients and components needed to support cell growth and development at different stages.⁵ To **culture embryos** means to keep live embryos developing outside of the body (*in vitro*).

3 Hopkins N (2024) Species choice and model use: reviving research on human development *Journal of the History of Biology* **57**: pp 231–79.

4 Edwards R, Bavister B, Steptoe P (1986) early stages of fertilization in vitro of human oocytes matured in vitro *Nature* **221**: pp 632–5. See also BBC News (25 July 2018) *Louise Brown: World's first IVF baby's family archive unveiled*, available at: [Louise Brown: World's first IVF baby's family archive unveiled - BBC News](#).

5 Sciorio R, Rinaudo P (2023) Culture conditions in the IVF laboratory: state of the ART and possible new directions *Journal of Assisted Reproduction and Genetics* **40**(11): pp 2591–607.

The first two weeks of development

Following decades of research and clinical practice, embryonic development can now easily be (and, for the purpose of IVF, is routinely) maintained in culture for up to a week. During this period, the embryo progresses through a series of cell divisions to form a compact cluster of cells called a **morula**. At very early stages, all the cells in the cluster are **totipotent**, meaning that they have the potential to develop into any part of the embryo, as well as tissues that support embryonic development, including the placenta. During the next stages, the cells begin to organise into distinct groups of cells, and the embryo takes the shape of a hollow ball-shaped structure called a **blastocyst**, with an outer layer (the trophectoderm), which gives rise to much of the placenta, and an inner cell mass (ICM). Some cells within the ICM contribute to the **yolk sac**, another extraembryonic support tissue, while the remainder are **pluripotent** (they have the potential to develop into any part of the future body) and give rise to the embryo ‘proper’, containing the cells which will ultimately form all of the cells in the fetus.⁶

In early pregnancy (*in vivo*), this initial part of development takes place while the embryo is moving freely from the fallopian tube and into the uterus. Around day six or seven post-fertilisation, the embryo begins to attach and burrow into the lining of the uterus, a process called **implantation**. Recreating this process of implantation and the post-implantation period *in vitro* requires more complex culture systems, to mimic the interactions between the embryo and the uterus.⁷ While a small number of studies have succeeded in culturing human embryos for up to 12-13 days, these studies were not able to fully replicate all aspects of ‘normal’ embryo development (for example the embryos were cultured without maternal tissues).⁸ However, new culture systems are being developed which reportedly have supported improved development and survival of embryos.⁹ Approaches being tested in current research include incorporating endometrial cells (taken from the lining of the womb) in the culture system, or developing 3D structures (‘assembloids’) that model the physical organisation of cells in the inner lining of the uterus.¹⁰

6 Niakan KK, Han J, Pedersen RA, Simon C, Pera R (2012) Human pre-implantation embryo development *Development* **139**(5): pp 829–41.

7 Ojosnegros S, *et al.* (2021) Embryo implantation in the laboratory: an update on current techniques *Human Reproduction Update* **27** (3): 501-30; Carver J, Martin K, *et al.* (2003) An in-vitro model for stromal invasion during implantation of the human blastocyst *Human Reproduction* **18**(2): pp 283–90; and Teklenburg G, Weimar CHE, *et al.* (2012) Cell lineage specific distribution of H3K27 trimethylation accumulation in an In Vitro model for human implantation *PLoS ONE* **7**(3): e32701.

8 Deglincerti A, Croft GF, Pietila LN, *et al.* (2016) Self-organization of the in vitro attached human embryo *Nature* **533**(7602): 251-5, Shahbazi MN, Jedrusik A, Vuoristo S, *et al.* (2016) Self-organization of the human embryo in the absence of maternal tissues *Nature Cell Biology* **18**(6): pp 700-8; Rugg-Gunn P, Moris N, Tam PLP (2023) Technical challenges of studying early human development *Development* **150**(11): dev201797.

9 Xiang L, Yin Y, Zheng Y, *et al.* (2020) A developmental landscape of 3D-cultured human pre-gastrulation embryos. *Nature* **577**: pp 537–42.

10 Muter J, Lynch VJ, McCoy RC, Brosens JJ (2023) Human embryo implantation *Development* **150** (10): dev201507.

Development beyond 14 days

Under the current UK legal framework, and in most (but not all) jurisdictions that permit research on human embryos, *in vitro* culture must cease at 14-days post-fertilisation which is when the process of **gastrulation** begins (more detail about UK law and regulation is included below). Our reviews did not identify any studies where human embryos had been cultured beyond the 14-day mark, in those jurisdictions where this might be permissible. After this point, knowledge about embryonic development is mainly derived from historical tissue collections, studies of tissue recovered from miscarriage or pregnancy terminations, and animal or stem cell models (see box on **page 6**). However while these can offer insights about embryonic development, there are limitations to each which will mean none are suitable to study all types of scientific questions.

During gastrulation, the embryo transforms from a single layer of cells into a structure with three different cell layers, called the gastrula. In humans, like all other mammals, there are three tissue layers, called the endoderm, mesoderm and ectoderm, and each goes on to form different organ systems.¹¹ It is thought that adverse pregnancy outcomes, including congenital defects in the fetus, can arise from errors in this phase.¹²

In stem cell-based embryo (SCBEM) model research (discussed further below), human ‘gastruloids’ have been generated that closely resemble some parts of an embryo at around 18-21 days old, but generally lack other parts, such as the region where the brain develops, and also lack the extraembryonic tissues that are necessary for embryos to go through implantation.¹³ Research aiming to create a more complete model of embryos at these later stages has been able to replicate developmental processes from the immediate post-implantation stage through to early organ development and contain some (but not all) of the extraembryonic tissues.¹⁴

Non-human primate embryos have been cultured to about 27 days but further work is needed to create a reproducible and efficient system for this, for example, to ensure the embryo and extraembryonic tissues both grow successfully *in vitro*.¹⁵

11 Zhai, Jinglei, *et al.* (2022) Human embryonic development: from peri-implantation to gastrulation *Trends in Cell Biology* **32** (1): pp 18–29.

12 Ibid.

13 However methods to allow the development of a brain-like domain in gastruloids have been developed, see: Liu Z, Qiu C, Kubo CA (2025) Dual-patterned pluripotent stem cells self-organize into a human embryo model with extended anterior-posterior patterning *bioRxiv* preprint, available at: <https://doi.org/10.1101/2025.09.25.678678>.

14 Nuffield Council on Bioethics (2024) *Human stem cell-based embryo models: A review of ethical and governance questions*, available at: <https://www.nuffieldbioethics.org/publication/human-stem-cell-based-embryo-models-a-review-of-ethical-and-governance-questions/>.

15 Gong Y, Bai B, Sun N, *et al.* (2023) Ex utero monkey embryogenesis from blastocyst to early organogenesis *Cell* **186**(10): pp 2092–110, Zhai J, Xu Y, Wan H, *et al.* (2023) Neurulation of the cynomolgus monkey embryo achieved from 3D blastocyst culture *Cell* **186**(10): pp 2078–91, Zhou J, West RC, Ehlers EL, *et al.* (2021) Modelling human peri-implantation placental development and function *Biology of Reproduction* **105**: pp 40–5.

There are differences between the way mouse or primate and human embryos develop and implant, and it is not certain that it would be possible to culture human embryos to this point using the same or similar approaches.

Beyond these early stages, even more complex systems are likely to be required to support development of a human embryo *in vitro*, including the establishment of additional support tissues, for example to replicate the functions of the placenta and umbilical cord.¹⁶ Possible approaches might include using bioengineering to create support structures or new ways to mimic the environment provided by the inner lining of the uterus.¹⁷

Alternative ways to study human embryo development

Research with human embryos *in vitro* is not the only way to investigate questions about early development. Other approaches include the use of models grown from stem cells and from other species, tissue recovered from medical procedures (e.g. tissue from pregnancy terminations); and collections of tissue samples such as the Carnegie Collection of Embryos ('Carnegie Collection').

The Carnegie Collection was started in the late 1800s and created a classification of 23 stages for the developing embryo (covering the first 8 weeks of human development) based on the physical features of a series of fixed specimens from multiple sources.¹⁸ Building on this classification system, researchers are able to visualise the development of embryos based on observable features and the timing of their appearance. It has been recognised that the creation of these historical collections involved approaches to informed consent and donor autonomy that would be viewed as unethical today.¹⁹

It is also possible to compare human embryos with other species to understand the similarities and differences. In particular, rodents and non-human primates have been used to study embryonic development before and after the 14-day limit. Such research is permitted in the UK, but is subject to the Animals (Scientific Procedures) Act 1986, and requires a licence from the Home Office.²⁰ ►

16 Zhai J, Xiao Z, Wang Y, Wang H (2022) Human embryonic development: from peri-implantation to gastrulation *Trends in Cell Biology* **32**: pp 18–29.

17 Rossant, J (2024) Why study human embryo development? *Developmental Biology* **509**: pp 43–50.

18 HDBR Atlas (2024) *Carnegie staging criteria*, available at: <https://hdbratlas.org/staging-criteria/carnegie-staging.html>.

19 Fourniquet SE, Beiter KJ, Mussell J (2019) Ethical rationales and guidelines for the continued use of archival collections of embryonic and fetal specimens *Anatomical Sciences Education* **12**(4): pp 407–16.

20 Home Office (2025) *Research and testing using animals: licences and compliance*, available at: <https://www.gov.uk/guidance/research-and-testing-using-animals>.

Research in animals raises distinct ethical considerations, as acknowledged in a new UK Government strategy to accelerate the uptake of alternatives to animal research.²¹

In recent years, the development of stem cell-based embryo models (SCBEM) have also opened up new possibilities for research. SCBEM is an umbrella term for a range of structures created from stem cells which resemble or replicate aspects of an embryo at varying levels of complexity, using a range of methods. There are no specific legal or regulatory frameworks for human SCBEM research in the UK, but a Code of Practice has been proposed, and in 2024 the Nuffield Council on Bioethics published a review of ethical and governance questions raised by this area of research.²²

21 DSIT, Home Office and DEFRA (2025) *Replacing animals in science: A strategy to support the development, validation and uptake of alternative methods*, available at: <https://www.gov.uk/government/publications/replacing-animals-in-science-strategy/replacing-animals-in-science-a-strategy-to-support-the-development-validation-and-uptake-of-alternative-methods>.

22 Cambridge Reproduction and Progress Educational Trust (2024) *Code of practice for the generation and use of human stem cell-based embryo models*, available at: <https://www.repro.cam.ac.uk/scbemcode>, Nuffield Council on Bioethics (2024) *Human stem cell-based embryo models: A review of ethical and governance questions*, available at: <https://www.nuffieldbioethics.org/publication/human-stem-cell-based-embryo-models-a-review-of-ethical-and-governance-questions/>. International guidance has also been published, see: <https://www.issor.org/guidelines>.

Embryo research in the UK

Oversight and regulatory requirements

Embryo research was not subject to legally binding regulation until the Human Fertilisation and Embryology Act (1990) came into effect. This included the establishment of the Human Fertilisation and Embryology Authority (HFEA) as the regulator overseeing this work. Under this legal framework, embryo research is permitted only with a licence from the HFEA and according to specific criteria (summarised below). With a licence, embryos can be grown in culture for up to 14 days, or the appearance of the **primitive streak**, a groove that forms in the epiblast layer, which establishes symmetry in the embryo and marks the beginning of gastrulation.

A licence can be granted where researchers can show that the research has a specific purpose, clear experimental endpoints, and that there will be auditable records to ensure embryos are not cultured beyond the legal limit.²³ By law, research must also relate to one or more of eight purposes²⁴:

- a increasing knowledge about serious disease or other serious medical conditions,
- b developing treatments for serious disease or other serious medical conditions,
- c increasing knowledge about the causes of any congenital disease or congenital medical condition that does not fall within paragraph (a),
- d promoting advances in the treatment of infertility,
- e increasing knowledge about the causes of miscarriage,
- f developing more effective techniques of contraception,
- g developing methods for detecting the presence of gene, chromosome or mitochondrion abnormalities in embryos before implantation, or
- h increasing knowledge about the development of embryos.

23 Human Fertilisation and Embryology Authority (2023) *Code of Practice, 9th Edition*, available at: <https://portal.hfea.gov.uk/knowledge-base/read-the-code-of-practice/>.

24 The purposes were amended in 2001 through the Human Fertilisation and Embryology (Research Purposes) Regulations 2001 (SI 2001/188), available at: www.opsi.gov.uk/SI/si2001/20010188.html.

No embryo created or used in research can be transferred to a woman. Culturing a human embryo beyond 14 days after fertilisation is a serious criminal offence that can result in a prison sentence of up to ten years, a fine, or both.²⁵

Embryos must be destroyed after the licensed research endpoint. No specific method is prescribed, but the HFEA Code of Practice calls for disposal with “appropriate sensitivity” and recognition of the embryo’s “special status”.²⁶

Source and number of embryos used in research

The majority of embryos in the studies identified in our research had been created in a clinical context for the purpose of IVF. They were either studied while they were being cultured for the purpose of fertility treatment or were surplus IVF embryos donated for research by patients who no longer require or wish to use them in fertility treatment.²⁷ Some were donated after they had been considered unsuitable for use in treatment.²⁸

UK law requires those donating embryos for research to give consent, and for this consent to be for the use of embryos in specific, named projects. This means research projects must be linked to a fertility clinic to recruit donors. Currently 12 clinics, about 10% of fertility clinics in the UK, actively recruit donors for research projects.²⁹

It is also legal in the UK to create embryos for the purpose of research using donated eggs and sperm.³⁰ A specific licence is required to be allowed to create embryos for research, and researchers must show that there is an exceptional need that cannot be met by the use of surplus embryos. The numbers of embryos created for research is much smaller than the numbers of donated surplus embryos.

A study drawing on data gathered by the HFEA has estimated that over 108,000 embryos were donated to research between 1990 and 2019.³¹ The annual number of donated embryos has varied considerably, peaking at around 17,000 in 2004, and declining steadily since down to 675 in 2019. Suggested reasons for the lower number of donations in recent years include a shift to using stem cells rather than embryos in

25 Human Fertilisation and Embryology (HFE) Act 1990 (as amended).

26 Maguire A (2020) An examination into the embryo disposal practices of human fertilization and embryology authority licenced fertility centers in the United Kingdom *Cambridge quarterly of healthcare ethics* **30(1)**: pp 161-74.

27 This was the case in studies where the source of embryos was reported, both in UK and internationally.

28 10 of 121 studies reviewed reported the embryos used as being arrested, abnormal, or unsuitable for transfer or freezing.

29 HFEA (2025) *Choose your fertility clinic*, available at: <https://www.hfea.gov.uk/choose-a-clinic/clinic-search/>. In 2024/25 there were 107 fertility clinics licensed by the HFEA to provide fertility treatment in the UK, see HFEA (2025) *The fertility sector 2024/25*, available at: <https://www.hfea.gov.uk/about-us/publications/research-and-data/the-fertility-sector-2024-2025>.

30 Our commissioned review on UK embryo research found 3 published UK-based studies which had used embryos created for research, compared to 121 studies using donated embryos.

31 Yue Z, MacKellar C (2024) A quantitative analysis of stored frozen surplus embryos in the UK, *The New Bioethics* **30(3)**: published online.

research, and challenges posed by the current requirement for consent to be linked to specific projects.³²

Studies vary in how many donated embryos are used in research studies. For example, in our discussions with stakeholders to date, we heard that an intensive lab might use around 300 embryos per year. Not all donated embryos are suitable for research, for example we heard that a significant proportion might not survive the process of freezing and thawing involved.

The scale and focus of embryo research

A list of all licenced research projects is published on the HFEA's website. Currently, 18 research projects at different research centres around the UK are licenced to use live human embryos.³³

While the number of embryos donated to research has declined, the number of published studies has increased steadily.³⁴ Our review of this literature found that research most commonly focussed on three of the broad purposes permitted by the HFEA (set out in [section above](#)):

- promoting advances in the treatment of infertility;
- developing methods for detecting the presence of gene, chromosome or mitochondrion abnormalities in embryos before implantation; and
- increasing knowledge about the development of embryos.

Examples of clinical applications and possible future treatments or therapies resulting from embryo culture research are included in the box below.

In addition, a considerable proportion of published papers focussed on developing methods to support and advance embryo research, and identified, for example, key similarities and differences between embryonic development in humans compared to animal models.³⁵

32 Ibid., Guardian (6 December 2023) *Call to help UK IVF patients donate unused embryos after shortage hinders research*, available at: <https://www.theguardian.com/science/2023/dec/06/call-to-help-ivf-patients-donate-unused-embryos-after-shortage-hinders-research>.

33 HFEA (2025) *Embryo research project summaries*, available at: <https://www.hfea.gov.uk/donation/donors/donating-to-research/embryo-research-project-summaries/>.

34 We have not so far identified a clear explanation for this but continue to explore the relationship between embryo supply and research outputs as part of our wider project.

35 Of the 121 studies reviewed, 22 studies focussed on this aim.

Case studies: Clinical applications of embryo research

Assisted reproduction

In vitro fertilisation (IVF) was established by researchers discovering the right conditions that would allow eggs to be fertilised by sperm in a dish and safely cultivated in the laboratory to develop into an embryo that could be then implanted into the uterus. This process was discovered using first animal and then human gametes (eggs and sperm). This led to the birth of the first IVF baby in 1978 and enabled fertility treatment with donated eggs and embryos. Continued research in early embryos has led to improvements in the accessibility and effectiveness of IVF treatments. It has also resulted in the introduction of new techniques in assisted reproduction, including the examples highlighted below.

Research within IVF clinics led to the discovery that embryos could safely be frozen following fertilisation and thawed at a later point to be used in treatment.³⁶ Embryo research has also contributed to advances in 'fertility preservation', where eggs, sperm or reproductive tissue is frozen to enable individuals to try for a biological family in the future, for example ahead of medical treatments likely to affect fertility.³⁷

Intracytoplasmic sperm injection (ICSI), a method which involves injecting a single sperm directly into the egg, was first used to create human embryos in 1992.³⁸ ICSI is now the most widely-used treatment in IVF worldwide,³⁹ and is the most common and successful treatment for male infertility.⁴⁰

Pre-implantation genetic testing (PGT) was pioneered by UK scientists and involves genetic testing on a biopsy of embryos to test for known genetic disorders. PGT can potentially offer couples the choice of selecting embryos that are not affected, or less likely to be affected, which can be used in IVF treatment.⁴¹ In the UK, PGT is regulated by the HFEA and can only be offered to patients for a specific list of approved conditions and where particular criteria are met. ►

36 Cohen J, Simons RF, Edwards RG, *et al.* (1985) Pregnancies following the frozen storage of expanding human blastocysts *Journal of in Vitro Fertilization and Embryo Transfer* **2**: pp 59–64.

37 HFEA (2025) *Fertility preservation*, available at: <https://www.hfea.gov.uk/treatments/fertility-preservation/>.

38 L O'connor, Z Werner, J Barnard (2024) The injection of conception: a brief review on the history intracytoplasmic sperm injection (ICSI) *The Journal of Sexual Medicine* **21**(7): qdae167.302.

39 Haddad M, Stewart J, Xie P, *et al.* (2021) Thoughts on the popularity of ICSI. *Journal of Assisted Reproduction and Genetics* **38**: pp 101–23.

40 HFEA (2025) *Intracytoplasmic sperm injection (ICSI)*, available at: <https://www.hfea.gov.uk/treatments/explore-all-treatments/intracytoplasmic-sperm-injection-icsi/>.

41 Handyside AH, Lesko JG, Tarin JJ, *et al.* (1992). Birth of a normal girl after in vitro fertilization and preimplantation diagnostic testing for cystic fibrosis *The New England Journal of Medicine* **327**(13): pp 905–9.

These include that there is a sufficient risk that the embryos could be affected by a condition or disorder, and that this condition is sufficiently serious. However there is debate about what counts as ‘serious’ and whether the lived experience of people living with conditions that are being screened for has been considered in the way this type of testing is offered.⁴²

Donor eggs were used to create embryos for research to test **mitochondrial transfer techniques**, which aim to help people who are carriers of mitochondrial DNA disorders and wish to have children reduce the risk of transmitting these potentially serious and life-limiting conditions.⁴³ The techniques are now being offered as part of a clinical trial in the UK. In July 2025 it was announced that the trials have resulted in eight children being born apparently free of mitochondrial disease.⁴⁴

Regenerative medicine

Studies in embryos have found that in the very early stages of development, cells of the embryo have a unique ability to regenerate and to develop into any cell type of the human body with the right stimuli.⁴⁵ In 1998 scientists discovered methods that enabled them to take stem cells from a human embryo and to keep them in this ‘pluripotent’ state called ‘stem cell lines’.⁴⁶ This has led to further research into how embryonic stem cells might be used in the treatment of a wide range of conditions, including macular degeneration, spinal cord injury, Type I diabetes, heart disease and Parkinson’s disease.⁴⁷ In the UK, all stem cell lines that are created from human embryos are held by the UK Stem Cell Bank and researchers must apply to an ethics committee and follow ethical guidelines to use them in research or clinical trials.⁴⁸

42 HFEA (2025) *Embryo testing and treatments for disease*, available at: <https://www.hfea.gov.uk/treatments/embryo-testing-and-treatments-for-disease/>, Boardman FK, Clark CC (2022) What is a ‘serious’ genetic condition? The perceptions of people living with genetic conditions *European Journal of Human Genetics* **30**: pp 160–9.

43 Hyslop LA, Paul B, Lyndsey C, *et al.* (2016) Towards clinical application of pronuclear transfer to prevent mitochondrial DNA disease *Nature* **534(7607)**: pp 383–6.

44 Hyslop LA, Blakely EL, Aushev M, *et al.* (2025) Mitochondrial Donation and Preimplantation Genetic Testing for mtDNA Disease *New England Journal of Medicine* **393(5)**: pp 438–49, McFarland R, Hyslop LA, Feeney C, *et al.* (2025) Mitochondrial Donation in a Reproductive Care Pathway for mtDNA Disease *New England Journal of Medicine* **393(5)**: pp 461–8.

45 Eguizabal C, Aran B, Chuva de Sousa Lopes SM, *et al.* (2019) Two decades of embryonic stem cells: a historical overview *Human Reproduction Open* **1**: hoy024.

46 Thomson JA, Itskovitz-Eldor J, Shapiro SS (1998) Embryonic stem cell lines derived from human blastocysts *science* **282(5391)**: pp 1145–7.

47 Eguizabal C, Aran B, Chuva de Sousa Lopes SM, *et al.* (2019) Two decades of embryonic stem cells: a historical overview *Human Reproduction Open* **1**: hoy024.

48 UK Stem Cell Bank Steering Committee, available at: <https://www.gov.uk/government/groups/uk-stem-cell-bank-steering-committee>.

Conclusions

This briefing has provided a summary of available information about how embryos are used in research and how this research is regulated in the UK. It has also considered the knowledge this research has generated about early human development, and some of the ways in which insights from research have been translated into clinical applications.

In its ongoing work, the NCOB Working Group on the 14-day rule will consider in more detail possible future advances in this field. It will do so in light of the wider factors that shape and constrain research in this area, as well as the possible impact of any changes to the way research is regulated, and key ethical considerations.



Nuffield Council on Bioethics
100 St John Street
London
EC1M 4EH

 www.nuffieldbioethics.org

 bioethics@nuffieldbioethics.org

 [Nuffield Council on Bioethics](https://www.linkedin.com/company/nuffield-council-on-bioethics)