



Research with gametes, pre-embryos and embryos and as well as pre-clinical and clinical research are areas of science where scientific freedom is often limited by regulation. While legal disagreements over the status of embryos are not new, the advent of genome editing has reignited discussions of the proper role of laws and regulations. Monitoring scientific freedom in this area is thus particularly insightful as comparative analysis quickly unveils legal regimes in which scientists enjoy a higher degree of freedom.

Approach

To measure the realization of the right to science with regard to research with gametes and embryos, we looked at whether the following are prohibited, restricted or permitted: basic research with gametes and embryos; pre-clinical research using germline modification technologies in animals; clinical research using germline modification technologies; and clinical applications of research using germline modification technologies.

Very few countries permit the creation of embryos for research purposes. When legal systems do not prohibit research with embryos, only embryos that are no longer used in assisted reproduction (supernumerary embryos) can be used. The problem is that, by the time they reach the lab, these embryos have already undergone substantial development.



As a result, they are not ideal candidates for research using genome editing techniques. The ideal situation for scientists is to be able to experiment on gametes and pre-embryos. Currently, this is arguably possible only in a handful of countries (Belgium, China, Singapore, Spain, Singapore, Sweden, the United Kingdom, and the United States).

Pre-clinical trials are permitted in a majority of countries. Clinical trials on humans, although currently premature because of the lack of sufficient knowledge coming from basic and pre-clinical research, are prohibited in several countries. This raises a red flag because, when sufficient knowledge will be accumulated, clinical trials are needed to enable the transfer of benefits to patients.

An important footnote to our research is that laws and regulations are often ambiguous about the legality of certain practices. Legal uncertainty works to the detriment of scientists, who may be hesitant to invest professional and personal energies in research that is not expressly lawful.

Data sources

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Measurement questions

- Is basic research using germline modification in human embryos/gametes permitted?
- Is pre-clinical research using germline modification technologies in animals permitted?
- Is clinical research using germline modification technologies in humans permitted?
- Are clinical applications of research using germline modification technologies (i.e., to initiate a pregnancy with edited embryos or with edited gametes) permitted?



Research with Embryos

List Nations	Tot	%
Australia	30	100,00%
Belgium	100	100,00%
Canada	23	100,00%
China	100	100,00%
France	61	100,00%
Germany	38	100,00%
Israel	30	100,00%
Italy	53	100,00%
Japan	38	100,00%
South Korea	38	100,00%
Mexico	46	100,00%
Netherlands	46	100,00%
Spain	23	100,00%
Sweden	53	100,00%
Switzerland	23	100,00%
United Kingdom	61	100,00%
United States	61	100,00%

