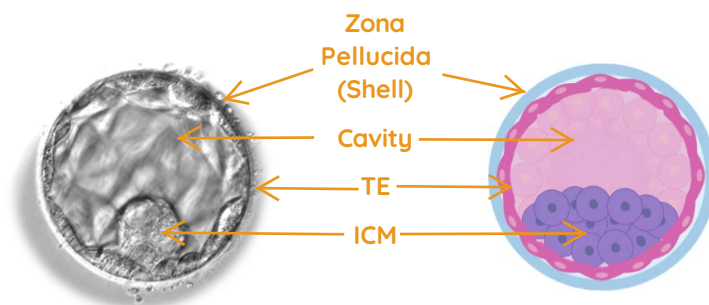


Blastocyst Grading

We expect the embryos to be at the blastocyst stage of development on day 5 to 6 after egg retrieval.

This stage of development is characterised by a fluid filled **cavity**, termed the blastocoel cavity and two different types of cells, the **Inner Cell Mass (ICM)** which goes on to become the embryo proper (fetus), and the **Trophectoderm cells (TE)**, which go on to become the extraembryonic tissue like the placenta.

In order for an embryo to be classified as a blastocyst it does need to have a visible cavity, ICM and TE. These components can be a function of time, this is why we grow embryos to day 6 in order to give them every opportunity to show themselves as viable embryos.



Embryo Grading:

The size of the cavity and the expansion of the entire embryo is used to describe the stage of the blastocyst (assigned a number 1-6) and the quantity and quality of the ICM and TE (assigned a letter A-D) respectively, determines the grade of the embryo. Embryo grading is one of several factors we use to assess embryos as it is highly subjective.

EXPANSION:



1. Early Blastocyst

Cavity less than 50% of the volume of the embryo



2. Blastocyst

Cavity greater than 50% of the volume of the embryo



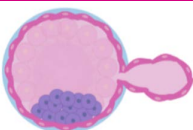
3. Expanding Blastocyst

Cavity completely fills the embryo and there is no space between the shell of the embryo (zona pellucida) and the embryo (blastocyst)



4. Expanded Blastocyst

Blastocyst expands larger than original embryo causing thinning of the zona pellucida



5. Hatching Blastocyst

Blastocyst has started to herniate through the zona

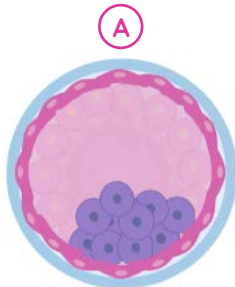


6. Hatched Blastocyst

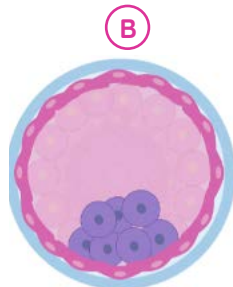
Blastocyst has completely escaped from the zona

Blastocyst Grading

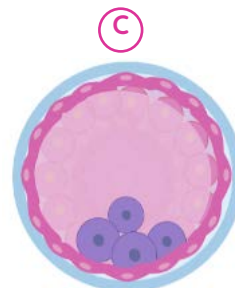
ICM



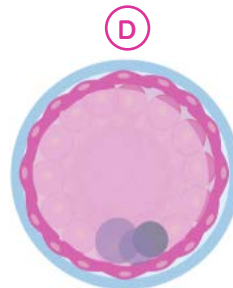
Many compacted/
tightly packed cells



Some cells and/or degree
of compaction less

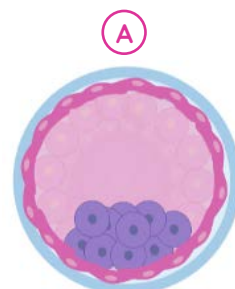


Fewer cells/no or little
compaction -
embryo viable

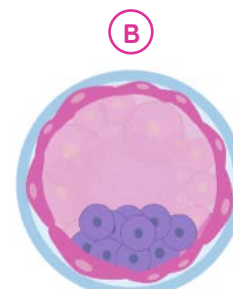


Degenerate/poor quality/
no cells -
embryo not viable

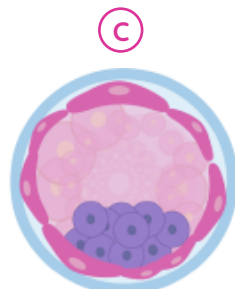
TE



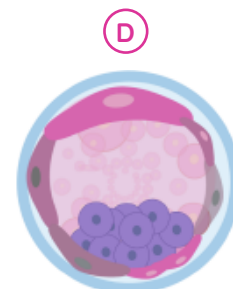
Cohesive layer of cells



Some cells/loose epithelium



Fewer large cells/
epithelium not cohesive -
embryo viable



Degenerate/poor quality/
very few/disorganised cells
- embryo not viable

Why do we grade embryos?

We grade embryos to assist in describing the appearance of an embryo. The grading system informs the stage of expansion of the blastocyst and the quality of the ICM and TE.

What does the grade mean?

The embryo grade describes the appearance of the embryo at the time of assigning the fate of the embryo and is highly subjective. An embryo that is classified as 4AB is an embryo that is an expanded blastocyst with an ICM that is A grade (many compacted cells) and a TE that is B grade (some cells with loose epithelium). We will only use (transfer, biopsy &/or freeze) an embryo that has the developmental potential to form a viable pregnancy. This means that an embryo that has an ICM and/or TE classified as A, B or C in our system is considered suitable for use. If an embryo is suitable for transfer, biopsy and freezing, then this embryo has been classified as having all the required qualities to achieve a viable pregnancy based on embryo morphology. This unfortunately does not guarantee that the embryo will result in a pregnancy. There is a correlation with pregnancy rate and morphology. Generally, higher quality embryos do have a higher success rate. However, if the embryo has undergone genetic testing to determine if the embryo has the correct chromosome complement, then morphology is irrelevant, and the grade of the embryo doesn't really matter as long as it is euploid (contains correct chromosome copy number). Lower grade embryos that implant have the same birth rate as higher graded embryos.

What influences the grade of the embryo?

The quality and quantity of the cells influence the grade assigned to the blastocyst however timing of assessment is also very important. An embryo can change very quickly over a few hours. For example, below, the first embryo image is considered a 1 and we are not able to grade TE or ICM as it is too early, three hours later it would be classified as a 3BA and hours later is a 4AA. It is the same embryo with the same developmental potential however depending on when this embryo was assessed would determine its grade. We grade embryos when we need to decide their fate, for example prior to embryo transfer, biopsy or freezing, to determine if they are developmentally viable, and we give them every opportunity to develop by culturing the embryos to day 6.

1



3BA



4AA



Blastocyst Grading

How do we select which embryos will be transferred?

We use our blastocyst grading system, the appearance and timing of developmental events throughout the entire 5-6 days of culture, together with Artificial Intelligence (AI) to select blastocysts for transfer. Artificial intelligence that is embedded into our timelapse system uses different algorithms to score the embryos based on appearance, developmental patterns, timing of divisions and other cell cycle events which prioritise or de-prioritise the embryo based on these factors and rank the embryos. Like all technology, AI does have its limitations, and is used as an embryo ranking support tool, this is why we use a combination of AI, our grading system and the embryologists examining the development of the embryo across its time in the laboratory.

Are embryos for PGT graded differently?

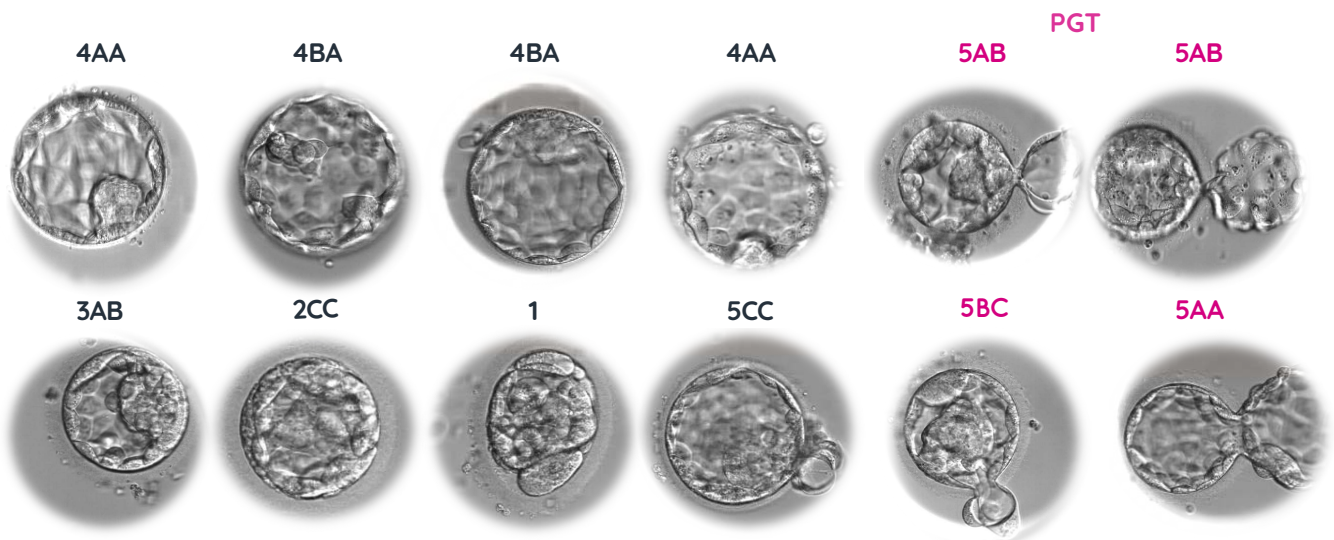
If you have consented to embryo biopsy and PGT testing of your embryos, then on day 3 we will make a hole in the shell of the embryos using a very fine laser. This does mean that these embryos, when they develop to the blastocyst stage will usually herniate out of the hole rather than undergo expansion that will cause the zona to thin. Other than the zona thinning due to expansion, we can assess the grade of these embryos using the usual grading system.

My blastocyst was classified as C grade, is it worth transferring?

Definitely! Our grading system is 4 tiered, A to D, and in our classification system, C grade embryos are considered viable and can result in healthy babies. Other clinics may use a different classification system and their lowest grade embryo may be C grade and considered non-viable.

Blastocysts come in different shapes and sizes!

Below are different blastocysts of different grades. Some are high grade embryos, others are lower grade embryos - All the embryos below have resulted in healthy babies.



We know how precious every single embryo is and every cycle counts. We will only transfer an embryo that has a chance of achieving a viable pregnancy. We use all the technologies and expertise at our disposal to give you the best chance of becoming pregnant as quickly as possible. Our Newlife IVF embryologists are always available to discuss your embryos or go through the development of your embryos to give you the information you need.

Source: Na et al, Front Endocrinol 2022 Effect of blastocyst morphology and developmental rate on euploidy and live birth rates in preimplantation genetic testing for aneuploidy cycles with single-embryo transfer; Vinals Gonzalez et al 2019 JARG, Euploid blastocysts implant irrespective of their morphology after NGS-(PGT-A) testing in advanced maternal age patients; Kirillova et al 2020 Should we transfer poor quality embryos? Fertility Research and practice.