Guidelines for blastocyst morphology grading with time-lapse

Grading blastocyst morphology with the use of time-lapse technology facilitates a more thorough evaluation because the complete course of development can be considered. This means that e.g. cells that are excluded during compaction or subsequent blastocyst formation can be accounted for. Similarly, fragments disturbing the visual impression of a blastocyst can be identified as all focal planes can be reviewed throughout embryo development.

Altogether, this means that a comprehensive impression of the blastocyst can be used as the basis for grading morphology. This should be utilized when grading ICM and TE and is necessary when using KIDScore D5.

Blastocyst grading for KIDScore D5

Time-lapse monitoring of embryos gives you a different level of information regarding development of both ICM and TE. This includes number of cells that each layer originates from and extrusion of cells during the compaction or expansion phase. This information must be taken into account when grading blastocysts for KIDScore D5 application.

To use KIDScore D5 a separate and independent grade from A to C must be given for both ICM and TE for each embryo reaching the blastocyst stage. Grade "A" defines cell layers with highest quality morphology whereas grade "C" defines cell layers with lowest quality morphology.

Definitions for each grade for both ICM and TE is defined below.

| ICM grade	Description
A	Many tightly packed cells. Cell boundaries are not distinct and the layer is homogenous without vacuoles and debris.
B	Several cells and the layer can be less tightly packed. The layer can be less homogenous and few vacuoles or minor degenerations may be observed.
C	Very few cells that are loosely packed. Cells may be large and show distinct boundaries. The size of the ICM may differ in this group as a few big cells lead to an overall larger size. The larger size is, however, the result of poor compaction. The layer may show vacuoles, degenerated cells or independent cells. This grading group also covers cases where the ICM is not distinguishable.

TE grade	Description
A	Many flattened cells (often >40) forming a cohesive layer that lines the blastocoel cavity. The cells often contain clearly visible nuclei and the cytoplasm is homogenous.
B	Several (often > 20) cells. The layer is not completely cohesive and the shape of the cells varies within the layer. Cell cytoplasm may appear non-homogenous and it may be difficult to distinguish nuclei.
C	Very few cells which are often large and stretched over a large area. Cytoplasm often appears non-homogenous and vacuoles may be present.

For both layers the grade "N/A" is given to embryos in case the cell layer can not be evaluated.

Examples of blastocyst morphology grades with time-lapse

Below you can see the progression of some examples of blastocyst development with associated ICM/TE grades. A short description to illustrate the grade is given next to each embryo. Time is given in hours post insemination (hpi).
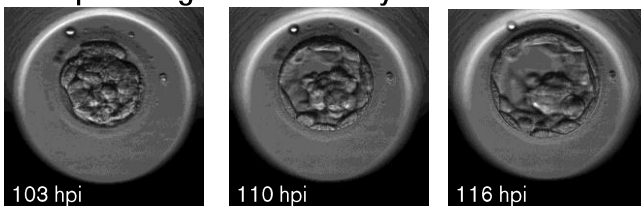
Example of a grade A/A embryo

109 hpi   112 hpi   117 hpi
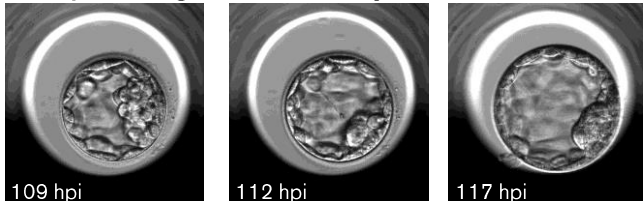
ICM is large, originates from many cells and ends up as a tightly compacted layer.
TE originates from many cells that end up forming a cohesive layer lining the blastocoel cavity.
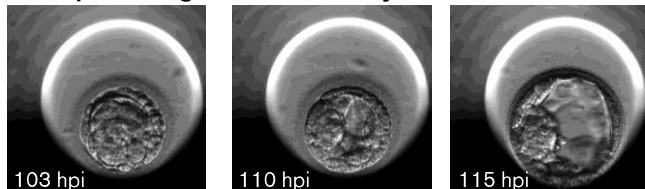
Example of a grade A/B embryo

103 hpi   110 hpi   116 hpi

ICM is composed of many cells and is tightly compacted.
TE is composed of several cells but varies in size and cohesiveness.
Note: At 103 hpi the embryo shows a blastomere that is pushed into the perivitelline space and does not take part in blastocyst formation. At 116 hpi this blastomere is degenerated and appears as debris in the same position.
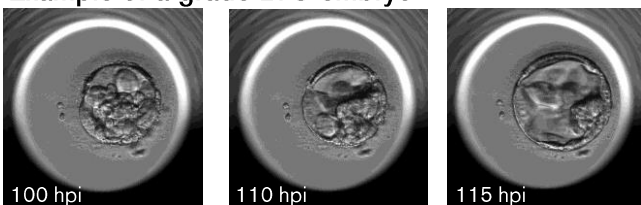
Example of a grade A/C embryo

103 hpi   110 hpi   115 hpi
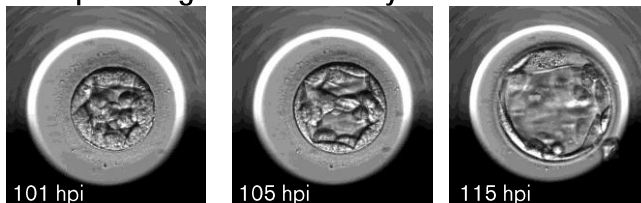
ICM is large and originates from many cells which are tightly compacted.
TE is composed of few, large cells and some are stretched over a long distance.

Example of a grade B/C embryo

100 hpi   110 hpi   115 hpi

ICM consists of several cells and is loosely compacted.
TE consists of very few and large cells.

Example of a grade C/C embryo

101 hpi   105 hpi   115 hpi

ICM is composed of few cells. Image 2 (105 hrs) shows a "bridge" that connects the two cell layers.
TE originates from few cells that are large and stretches over a long distance.
Note: The large cellular debris (fragmentation) pushed into the perivitelline space is not part of the actual blastocyst

> For KIDScore D5 to work as intended, the guidelines described here should be followed and blastocyst morphology grades must be annotated between 115 and 120 hours after insemination.