

Reviewing the routine clinical utilization of closed incubation systems with time lapse photography

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While our systems for culturing human embryos have improved significantly in recent years, progress has been much slower regarding development of reliable non-invasive methods for the evaluation and assessment of embryo developmental competency. Despite considerable efforts in the realms of genomics, proteomics and metabolomics, embryologists still largely depend on static morphological grading of embryos in which standard variables for stage and grade are assessed either on each day of culture or only once, immediately before selection for transfer or cryopreservation. However, it is generally acknowledged that these grading approaches are not perfect and that, unfortunately, we sometimes miss-classify developmentally competent embryos as incompetent, and select for transfer those we believe will successfully implant and yet they do not.

In the last five years, there has been renewed interest in performing embryo assessment using time-lapse imaging (TLI) for embryo assessment, a technology that was used on bovine embryos more than three decades ago. Indeed, it is reasonable to assume that images captured more frequently will provide substantially more developmental information than data obtained with static observations and, also that a more integrated appraisal of overall developmental kinetics will be acquired. It is therefore not surprising that TLI technology has been introduced into the clinical IVF laboratory. Tracking algorithms have been developed and some validation work of their application for embryo selection has been performed. However, the majority of the studies are retrospective and, due to design issues, the few prospective studies provide only low quality evidence supporting benefit of TLI *per se* for improving ongoing pregnancy/live birth rates.

In this lecture will briefly review the potential benefits and limitations of using TLI for embryo selection. We will then consider the kinetic and phenotypic markers that most consistently appear to be associated with improved selection; and we will outline the published selection algorithms and summarize the available evidence for their application. We will conclude with a discussion of the studies needed to establish the true benefit (or not) of using TLI with or without pre-implantation genetic screening for embryo selection.