

THE REGULATION OF SURVIVAL OF THE PRE-IMPLANTATION EMBRYO

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There are many aspects of the regulation of the growth and survival of the pre-implantation embryo that remain enigmatic. The increasing production of such embryos by assisted reproductive technologies (ART) in human medicine, animal production and conservation biology has highlighted the relatively poor viability of such embryos. Many embryos fail to survive past the normal time of implantation. Population biology theory predicts that any circumstance that results in high death rates within a population creates a potential for genetic selection. This occurs if the surviving individuals have a genetic make up that preferentially favours survival.

Since ART clearly favours the survival of some embryos over others, it is a high priority to develop a sound understanding of those factors that normally govern embryo survival and how they may be affected by ART. It raises the question, do embryos that survive ART have a genetic make up that favours their survival compared to the proportion of the population that does not survive?

It is now demonstrated that autocrine and paracrine factors are essential for embryo survival and that these act via the 1-o-phosphatidylinositol-3-kinase (PI3K) survival signalling pathway (1). PI3K activates many downstream pro-survival and anti-apoptotic mediators.

ART changes the expression of some of these mediators. Pharmacological and genetic moderation of their expression can influence embryo survival, highlighting potential targets for genetic selection through ART. Studies in appropriate models will allow rational approaches to safety assessment of ART and spawn new strategies for media and procedural design.

(1) Lu, D. P., Chandrakanthan, V., Cahana, A., Ishii, S., O'Neill, C. (2004) *J. Cell Sci.* **117**, 1567–1576.