



RECIPIENT OF THE 2000 EMBRYO TRANSFER PIONEER AWARD

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Professor Ryuzo "Yana" Yanagimachi has made outstanding contributions to the study and manipulation of gametes and embryos during a period that now stretches over almost 40 years. The Pioneer Award is to recognize outstanding research carried out more than 25 years previously, but Yana has continued to make such contributions up to the present day.

Yana was born in Hokkaido Japan where, in 1952 and 1960, he obtained his Bachelor of Science and Doctor in Science degrees, in biology and embryology, respectively. He then enjoyed a very productive period working with M.C. Chang at the Worcester Foundation in Shrewsbury, Massachusetts. They described the first mammalian *in vitro* capacitation in 1963 (1). Before this work fertilization in the laboratory had only been achieved with sperm recovered from the female reproductive tract. By contrast, *in vitro* capacitation laid the foundation for the current methods for human IVF. The methods used by Edwards were derived from Yana's experiments.

Methods for *in vitro* capacitation also allowed the first detailed study of changes in sperm before fertilization and of the molecular regulation of fertilization. Yana himself made many contributions to these studies, including an ultrastructural description of the acrosome before and during fertilization (2). He was also the first to describe hyperactivation of sperm motility, in 1970 (3). The acrosome reaction and hyperactive motility were shown to depend upon calcium ions (4). Lectins were used in the study of gamete membranes and of sperm binding (5). It was shown that after fertilization it is the cortical granules that bring about the zona reaction to prevent penetration of further sperm (6).

More recently Yana has developed several other techniques that are now used routinely in research and assisted human reproduction. The observation that acrosome reacted sperm of many species will bind to and penetrate zona-free hamster oocytes opened the way to assessment of human sperm karyotype (7). He was the first to observe pronuclear formation after injection of sperm into mammalian oocytes: intracytoplasmic sperm injection or ICSI (8). ICSI has already provided a means to study many events during reproduction and continues to offer new opportunities in assisted human reproduction and animal breeding. Spermatocyte and spermatid nuclei have been shown to be able to participate in embryo development (9). Sperm nuclei are known to tolerate a range of physical treatments including freeze-drying (10). Most recently, injection of sperm previously exposed to DNA solutions has yielded transgenic offspring (11).

The unique expertise of Yana's laboratory, in micromanipulation, along with oocyte and embryo culture, enabled them to be the first to clone mice by nuclear transfer (12) and in so doing also to be the first unequivocally to obtain development to term with differentiated cells, those of the cumulus.

His outstanding research contribution is published in more than 250 research papers and 25 reviews. More than 70 scientists have had the opportunity to work in his laboratory. His work has been honored by several societies, including the Zoological Society of Japan, Society for the Study of Reproduction and the Society for the Study of Fertility.

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