Co-culture of embryos and uterine explants to develop an in vitro model of early implantation

Md. Rashedul ISLAM1,2, Yuka YOSHII1, Yuko IKEGUCHI1, Nobuhiko YAMAUCHI1

1Laboratory of Reproductive Physiology and Biotechnology, Department of Animal and Marine Bioresource Sciences, Faculty of Agriculture, Kyushu University, 2Department of Genetics and Animal Breeding, Faculty of Veterinary and Animal Science, Hajee Mohammad Danesh Science and Technology University, Bangladesh

Although a number of studies describe the in vitro co-culture model, still the positioning of embryos to the uterine lumen and examination of blastocysts attached to the endometrial tissue was not so easy due to the small size of blastocysts compared to the endometrial tissues. The current study was aimed to develop an in vitro co-culture system to study the early implantation. Rat uterine explants (1–2 mm) were isolated, cultured and further characterized. Then from uterine horns morphologically normal embryos were flushed and hatching was induced by Acidic Tyrode’s solution (pH-2.5) for 15–30 second to remove the zona pellucida. Individual hatched blastocyst and cultured explant was placed in a 96U (U shaped round bottom) well plate. Results showed that stable attachments were observed after 48 hours of co-culture, where embryos were stably attached to the explants and could not be dislodged after mild shaking and/or pipetting. Furthermore, steroid hormones are critical for endometrial receptivity and further implantation process. The steroid hormone treatment revealed that the rate of attachment of embryos to the explants were significantly increased in P4 treated group (63.63%) compared to the control or non-treated group (35.48%). On the other hand, attachments of embryos to the explants were significantly reduced in E2 treated group compared to the control group, where no stable attachments were observed in E2 treated group (0.0%). The study suggests that the co-culture model is suitable for the study of early implantation and steroid hormones influence the rate of attachment in this system.