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Objectives: To assess neonatal physiological adaptation and early neurodevelopment after neonatal transition (NNT) following Fetal Liquid Incubator (FLI) support in a preterm lamb model.

Methods: NNT involved controlled tracheal intubation, surfactant administration, and gradual initiation of mechanical ventilation. Post-transition care included invasive and non-invasive monitoring, nutritional support, and physiotherapy. Continuous cardiopulmonary and neurological data were recorded. Long-term neurodevelopment was evaluated in a maze test at three months of age compared.

Results: Four lambs were transitioned after FLI support (mean gestational age at cannulation 126.5 days, SD 3.87; mean support duration 9.6 days, SD 3.1). One subject reached 13 months of survival, with a behavioral test performed at 3 months of age that was comparable to age-matched controls.

Outcomes of neonatal transition experiments following FLI support.

ID	Gestational Age at Cannulation (days)	Weight (kg)	Days on FLI Support (days)	GA at NNT	Successful Extubation	Survival Time	Cause of Death
Animal 1	123	2.8	9	132	No, absence of respiratory drive	7 days	Euthanasia (iatrogenic complications)
Animal 2	125	2.0	24	139	No	2 days	Sudden CPA; suspected WMD
Animal 3	126	2.2	8	134	Yes, at 24 h	5 days	Sudden CPA; suspected WMD
Animal 4	129	2.7	7	139	Yes, at day 6	13 months	–

FLI, Fetal Liquid Incubator; NNT, neonatal transition; CPA, cardiopulmonary arrest; WMD, white matter disease.

Conclusion: All animals demonstrated satisfactory respiratory parameters. After correcting for vitamins and oligoelements, one animal could survive with long-term normal development. These preliminary findings support the system's safety and the translational potential of this technology for extreme prematurity.