

INSTRUCTION MANUAL

KOALA[®] Brand Incubators for Babies Before Implantation

This manual explains operational aspects of Koala[®] brand incubators for babies before implantation. Koala[®] incubators offer patented features. Key patented features include gentle microfluidic ventilation of the infant in an open-top design providing thermoregulation with feedback from patient temperature.¹

Open-top designs allow the operator to access the patient on demand without any interruption of microfluidic flow or disruption of ambient pressure. Gentle microfluidic ventilation ensures the patient will receive a flow of fluid on par with what is naturally experienced by babies in the fallopian tube before implantation. It also ensures that the patient's body heat will be adequately dissipated to prevent overheating. Feedback from patient temperature by means of infrared microthermography ensures that variables such as ambient temperature and fluid flow rates are accurately adjusted to maintain optimal body temperature for the patient at all times.

FLOORING-VENTED VS. SIDE-VENTED MICROCRADLES

Koala[®] incubators with flooring-vented microcradles provide microfluidic flow in a vertical direction through vents in the cradle flooring. Koala[®] incubators with side-vented microcradles provide microfluidic flow in a horizontal direction through vents in the cradle walls; the patient is continuously visualized by high resolution microscopy via a cradle flooring 170 microns thick with a refractive index of 1.515.

Flooring-vented microcradles can also be adapted to a vertical path for optics by way of refractive index matching of the flooring material to physiological solution; in this way, vents in the flooring do not interfere with optical transmission. However, resolution is not as high as with side-vented microcradles.

A circulating temperature bath urged through a separate network of microfluidic channels maintains the ambient temperature of fluid ventilating the patient. Side-vented microcradles require a more elaborate temperature bath to avoid a heat sink between the cradle flooring and microscopy equipment.

KEY OPERATIONAL CONCEPTS

The most basic setting of a Koala[®] incubator is the ambient temperature $T(\text{amb})$ setting. Ambient temperature means the temperature of fluid circulating about the patient in the incubator's microcradle. The second most basic setting of a Koala[®] incubator is the ventilation flow rate (VFR). Ventilation flow rate means the linear flow rate of fluid past the baby's egg (embryo stage) or body (hatchling stage). Thermoregulation of patient temperature $T(\text{p})$ is controlled by a contrast of ambient temperature, the ventilation flow rate, endogenous heat production, and radiative sources. Endogenous heat production is the heat produced internally by infant metabolism.

¹ Protected by U.S. Patent Nos. 6,694,175, 7,121,998, 8,292,798, 9,056,039, and 10,245,075. See also Californiaa, "Thermoregulation of Human Embryos and Hatchlings in a Prenidial Incubator using Infrared Microthermography," Trends in Reproductive Biology, 2005, Vol. 1, pp. 63-67.

U.S. ACADEMIC LICENSING OPPORTUNITIES

Applications are being accepted for limited licenses to practice Koala[®] incubator technology. Applications are limited to research universities in the United States having both medical and engineering facilities. The research team must include at least one of each of the following: a professor of engineering skilled in microfabrication technology; a physician specialized in reproductive medicine; and, an embryologist. The team must conform to ethical standards of human and veterinary medicine. The team must also have the ability, either collectively or with outside assistance, to maintain and publish records of the results of testing in conformity with epidemiological practice.

Researchers affiliated with state-sponsored institutions must provide a waiver of sovereign immunity from the affiliated states respecting state liability for violations of the terms of licensing.

Qualified researchers wishing to submit proposals for academic licenses may send their inquiries to:

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