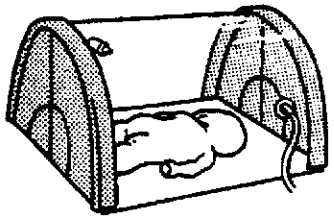
Uses

NICU level 2 & 3

In recent times the value of such a heatshield system used with the extremely low birth weight infant has been appreciated. In the first days of life, babies less than 1000g may incur massive fluid losses from



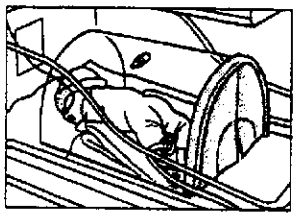
their skin alone, especially when nursed under radiant warmers. In addition the evaporation of the fluid reduces their ability to maintain a normal body temperature. Replacing the fluid intravenously may bring with it difficulties of hypernatraemia or hyperglycaemia. A better way is to control the losses from the skin by putting the baby into a near 100% humidified microenvironment. This can decrease fluid loss from the skin to very low levels.

To achieve this environment the baby is placed in an IGLOO into which 100% warmed and humidified air is introduced from a humidifier. This technique can be used within incubators and under radiant warmers.

Within the humidified IGLOO babies have been shown to have a more constant and better controlled skin temperature and their fluid losses are greatly decreased compared to those without. The Igloo does not interfere with the servo-control of the overhead warmer.

Other uses:

1 Igloo facilitates temperature maintenance in babies under phototherapy



2 [illegible]ngle walled incubators, IGLOO reduces radiant heatloss by providing a double walled environment.

NASCOR IGLOO Heatshield System

Heat shields have been in use in neonatal units for over 20 years in one form or another. Usually they were home-made devices without accessories which limited their use. NASCOR designed the Igloo Heatshield System to provide a professionally produced integrated system that improved functionality and overcame the limitation of these conventional heat shields. It has multiple uses in neonatal units, nurseries and postnatal wards, for phototherapy, as a oxyhood for large babies, and under radiant warmers.

In recent times the value of such a heat shield system with the extremely low birth weight infant has been appreciated. This group of infants, who weigh less than 1,000 gm (2 1/2 lbs) and are 24-28 weeks gestation, have a major problem of water loss from their skin.

A normal fullterm baby loses approximately 40 ml/Kg/day through the skin from insensible water loss. The more premature the baby the higher the skin loss, as the skin becomes thinner and the relative surface area to body volume becomes greater.

At 24 - 28 weeks the baby's relative surface area is very great and the skin is extremely thin and fragile. The appearance of these babies confirms this: their skin looks wet, gelatinous, damp and shiny.

Their fluid loss is considerable. Many of these babies who will lose up to **250 ml/Kg/day** through their skin alone in the early days. This is especially so when the baby is nursed under radiant warmers which tend to double the insensible fluid losses for all babies under them. In addition the evaporation of the fluid from the skin removes energy as heat and these babies, when nursed in incubators, often cannot maintain a normal body temperature even with the incubator heating maximally.

Compensating for this massive fluid loss, by replacing it intravenously, brings with it considerable difficulties. Intravenous fluids have to be isotonic, that is, at the same dilution as blood, otherwise it will cause disruption and breakage of blood cells as it enters the body. Consequently the fluid has to be administered either as saline or dextrose solution. At volumes adequate to replace these torrential fluid losses the baby may get too much salt (hypernatraemia) or sugar (hyperglycaemia).

A better way would be to control the losses from the skin. This has been described in the United States as **"swamping"** that is putting the baby into a near 100% humidified micro-environment (like in a swamp).

When enclosed in this atmosphere fluid loss from the skin can drop to close to zero and daily fluid replacement can be at a much more reasonable levels of 60-80 ml/Kg/day, mostly to replace urinary, stool and respiratory losses.

To achieve this environment the baby is placed in a "micro-incubator" (such as the Igloo) into which 100% warmed and humidified air is introduced from a humidifier. This technique can be used most effectively under radiant warmers.

Babies have been nursed in incubators and under radiant warmers with heatshields and within Igloos for many years with complete safety and success at controlling not only fluid loss but convective heat loss as well. Indeed our (graph included) studies show that under radiant warmers babies within Igloos (with humidity) have a more constant and better controlled skin temperature than those without. This is due to the control of convective currents and drafts surrounding the baby as well as the elimination of evaporative fluid loss from the skin.

It has been suggested that as acrylic is relatively impervious to infrared wavelengths that the Igloo might interfer with the servo-control of the overhead warmer. However studies show that the radiant warmer warms the top of the Igloo (to around 40^0) and this re-radiates to the baby and servo-control is maintained.

However there are a few tips that are worth remembering when nursing small babies under Igloos:

1. The Igloo should be prewarmed before being placed over the small infant or the infant body heat will contribute to the warming of the Igloo until it has reached a steady state.

2. Care must be taken to ensure the temperature probe on the baby's abdominal skin remains securely attached, and regular core temperature measurements are made.

3. Small babies should be swamped (nursed within a humidified Igloo) for at least the first 5 days after birth, after which the skin fluid losses tend to fall and humidity may be ceased at about 7 days.

4. Experience in neonatal units shows that the small babies should be started at fluid volumes of approximately 80 ml/Kg/day and very carefully monitored. Fluid intake should be regulated using urinary flow volumes (aiming for 1-2ml/Kg/hour), frequent urinary S.G. or osmolality, and serum electrolyte estimations.

5. Careful infection control procedures must be adhered to in the use of all humidifiers. There is a danger of overgrowth of hydrophilic organisms such as pseudomonas or candida if swamping is used for longer than 10 days.

6. For newcomers to "swamping", care should be taken not to overload the infants with intravenous fluid with the risk of patent ductus arteriosus, hyponatremia etc.

7. A absorbent pad should be placed under the deflector plate as a condensation trap and changed regularly.

8. In this weight of infant (<1000gm) the anterior abdominal skin temperature controlling the radiant warmer should be set at 36.5^0 C (in comparison to larger babies whose skin temperature is rather lower at 36.1^0 to 36.2^0).

This is the one of the commonest uses of the Igloo in NICUs in Australia and elsewhere. Previous strategies that have been tried are the use of plastic film stretched across the walls of the radiant warmer tray. This has the advantage of being penetrable to infrared (hence uses a lower heater output) but has an important disadvantage. It is vital to maintain a constant high level of humidity within the environment to minimise the skin fluid loss. Once the humidity has been built up it is vented rapidly by opening the cavity widely to air, such as is necessary with the regular interventions necessary in the care of these infants. The plastic film needs replacing frequently (often after each intervention with the baby). The silicon end flaps of the Igloo allow repeated access for the carers but maintain the humidity.

The other uses of the Igloo around the NICU must not be overlooked.

1) under phototherapy to minimise convective losses.

2) Its use as a oxyhood for large babies (either as a body box or a headbox). A shortened version (250mm long) with an end wall of acrylic, the other being a silicon flap is now available just as a oxyhood for the larger baby (up to 12Kg).

3) Use in single walled incubators to make them double walled and reduce radiant losses.

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