

Clinical Guideline: Management of a baby requiring humidity Version 2.0

Humidity for infants <30 weeks gestation

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For use in: EoE Neonatal Units
Guidance specific to the care of neonatal patients.

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Clinical Guideline:

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Humidity for infants <30 weeks gestation

Scope

For use in neonatal units in the East of England

1. Aim

- To reduce high levels of transepidermal water loss (TEWL) and maintain/stabilise electrolyte/fluid status and body temperature in the optimal range (36.5-37.5°C) for infants <30 weeks gestation.
- All neonates <30 weeks will be provided with incubator humidity, as full keratinisation of skin does not occur until after this time.

2. Background

As the foetus is maturing in the womb their skin begins to keratinise from 18 weeks gestation onwards, until by 32 to 34 weeks gestation the stratum corneum (which controls evaporative heat loss and transepidermal water loss (TEWL) Has become well developed. For babies born before 30 weeks their skin immaturity puts them at increased risk of dehydration and hypothermia. For those babies born 26 weeks and below it is certain that they will lose large amounts of fluid from their skin by TEWL (approximately 150mls/kg/day) affecting urine output, causing electrolyte disturbances and requiring high fluid maintenance volumes. In addition the water lost by evaporation uses up precious calories and heat, often more heat than the baby is able to produce itself at rest.

After birth the skin of preterm babies is exposed to a gaseous environment and has been seen to mature rapidly. So that by 2-3 weeks after birth (regardless of their gestation) the neonate's skin functions like that of a term baby.⁶

During this period of 'adaptation' health professionals caring for premature babies have the challenge of trying to prevent heat loss and minimize TEWL. One method commonly used is to heat and humidify the environment in which the premature infant is nursed. This environmental humidification (EH) is able to reduce TEWL and improves temperature regulation.

Nursing babies in EH has also been shown to slow the natural process of epidermal barrier formation or 'skin adaptation' to the external environment

Consequently, the challenge for health professionals is to balance the infants' need for heat and humidity with the adaptive benefits of a drier environment for stimulating epidermal DNA synthesis. In addition babies of different gestations will have different EH requirements and room humidity.

3. Reasons for Humidity

- Humidity reduces skin water loss and improves temperature maintenance.
- Infants can become hypothermic even when nursed under radiant heat if the relative humidity is low
- Limiting the TEWL by use of humidity will help maintain serum sodium levels.

4. Equipment

- Incubator
- Bottle of sterile water

5. Process

- All infants less than 30 weeks gestation should be nursed in humidity.
- Infants less than 30 weeks gestation are delivered into a polyethylene bag (as per Thermoregulation guideline) which should remain in place until central lines placed and set percentage of humidity is reached. This prevents heat loss and limits TEWL.
- The infant should be nursed in a double walled incubator, to help reduce heat loss by radiation and conduction.
- If an infant is admitted to an open warmer they should be transferred to a closed incubator as soon as possible.
- The temperature of the incubator/radiant warmer should be sufficient to create a neutral thermal environment (at least $>35^{\circ}\text{C}$).
- Fill the humidity chamber with sterile water to prevent colonisation by bacteria.
- The chamber should be emptied, washed, dried and refilled once in 24 hours (as per manufacturer's guideline). Tap water must never be used.
- Assess the infant's need for humidity according to their gestation, postnatal age and maturity of the skin, current sodium levels and their ability to maintain their temperature at a normal range ($36.7\text{-}37.2^{\circ}\text{C}$) with minimal fluctuations.
- Remember that the TEWL is going to be greatest in the first few days after birth and as the functioning stratum corneum develops this loss will decrease.

Babies ≤27+6 weeks gestation	Babies 28-29+6 weeks gestation
1) Commence humidity of at least 80% 2) Maintain humidification at 70-80% for first 7 days 3) If temperature and fluid balance stable on day 8, begin to wean by 5% each day. 4) Discontinue incubator humidity when 40% is achieved or at 21 days (whichever is reached first).	1) Commence humidification at 70-80% 2) If temperature and fluid balance stable after 48 hours, begin weaning by 5% each day 3) Discontinue incubator humidity when 40% is achieved

- If the serum sodium levels are high it may be necessary to increase the humidity as an adjunct to medical decisions about fluid increase and sodium decrease.
- Nappies should be weighed to assess urine output. Humidity should not affect the wetness of the nappy. Clothing should not be worn.
- Skin temperature should be recorded continuously with a skin probe and axilla temperatures taken and recorded 4-6 hourly. If axilla temperature is unstable check every 2 hours.
- Consider swabbing any moist, red areas. This will help identify any skin infection, which may need treatment.
- If there are problems maintaining the infant's temperature: See chart below

Low Temperature <36.5	High Temperature >37.5
<ul style="list-style-type: none"> ❖ Ensure the temperature probe is secured properly ❖ Check baby's axilla temperature to confirm the skin probe is correlating. ❖ Ensure that the bedding has not become damp or wet from condensation. ❖ Increase the incubator temperature and recheck axilla temp in 30 mins. ❖ Consider infection and other causes of temperature instability. 	<ul style="list-style-type: none"> ❖ Ensure the temperature probe is secured properly ❖ Check baby's axilla temperature to confirm the skin probe is correlating. ❖ Decrease the incubator temperature and recheck axilla temp in 30 mins. ❖ Consider infection and other causes of temperature instability. ❖ Inform medical team if the problem persists ❖ Decreasing the humidity should be

<ul style="list-style-type: none"> ❖ Inform medical team ❖ Increasing the humidity should be the last choice and only done after consultation with a senior member of the medical and nursing team 	<p>the last choice and only done after consultation with a senior member of the medical and nursing team</p>
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- In order to maintain humidity:
 - Ensure that the water chamber is kept full
 - Keep the incubator doors shut as much as possible
 - Ensure that the room temperature around the incubator is warm and that draughts are limited.
- Leads/probes and ET tape/duoderm may need replacing frequently, because the humidity levels may cause loss of adhesion.
- The incubator should be changed and cleaned according to the manufacturer's instructions and Infection control recommendations.
- Once humidity has been discontinued the infant should continue to be nursed in the incubator where possible as this still creates the environment that will encourage developmentally supportive care - the incubator limits sound and handling exposure.

6. Weaning

Although high humidity will reduce the large evaporative water losses through the skin, it may also result in a slower rate of skin barrier formation as compared with lower humidity. Consequently, very high ambient humidity should only be used during the initial period with extremely high TEWL, that is, as long as it is needed to maintain an adequate fluid balance. By the end of the first postnatal week, the levels of TEWL in the smallest infants have dropped to approximately 50% of those during the first days after birth, and the commonly encountered increase in the serum sodium level is usually normalised.

A gradual reduction of incubator humidity from 85% to 50% after the first postnatal week will allow a higher TEWL, thereby promoting skin barrier formation. It has been found that a Relative Humidity (RH) of 50% was of greater advantage than a RH of 75% from the second postnatal week. Because experimental studies have shown that an abrupt and large decrease in ambient humidity might lead to abnormal skin barrier function, it is strongly recommended that changes in environmental care conditions for preterm infants should always be gradual and carefully monitored and that extremely low humidity should be avoided.

Incubator Humidification:

Infants <28 Weeks Gestation	
Age (Days)	Humidity
0	80
1	80
2	80
3	80
4	80
5	80
6	80
7	75
8	70
9	65
10	60
11	55
12	50
13	45
14	40
15	Discontinued

Infants 28 to 29 ⁺⁶ Weeks Gestation	
Age (Days)	Humidity
0	80
1	80
2	75
3	70
4	65
5	60
6	55
7	50
8	45
9	40
10	Discontinued
11	-
12	-
13	-
14	-
15	-

7. Audit

Audit will be through annual benchmarking activity and consequent action planning using infant's charts and care plans to assess quality outcomes and guideline adherence. Poor scores may necessitate more frequent audits to ensure progress is being made.

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