

## Skin Care for the Newborn

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Skin of the newborn differs from that of an adult in several ways. It is more susceptible to trauma and infection and requires special care. Certain principles of skin care have to be emphasized to the mother or caregiver such as gentle cleansing, adequate hydration and moisturization of the skin, preventing friction and maceration in body folds, and protection from irritants and bright sunlight. The initial bath in full term infants can be given once the baby's temperature has stabilized and the infant is hemodynamically stable. All soaps, cleansers, and syndets should be used infrequently during the newborn period and it is better if their use is limited to groins, axillae and napkin areas. The use of emollients on newborns should be limited in warm weather.

**Key words:** *Newborn, Skin care.*

**T**he major functions of the human skin are maintenance of water and electrolyte homeostasis, thermoregulation, antimicrobial defense, protection from trauma, environmental toxins and ultraviolet radiation, synthesis of vitamin, immune surveillance and cosmetic function. It also serves as a sensory organ and facilitates mother-child attachment.

The birth of the baby represents a sudden transition from the intrauterine life to the external environment. Although the skin of the newborn has similar structural components as that of an adult, it differs in some characteristics from adult skin(1-3). The chief differences between the skin of the adult from that of full term and preterm newborns are listed in **Table I**. The most important anatomical differences are: a higher skin surface area (skin surface area of infant is 700 cm<sup>2</sup>/kg as compared to adult skin which is 250 cm<sup>2</sup>/kg) to weight ratio; the connection between the dermis and the epidermis is less strong; the skin is thinner and less elastic; the permeability of the stratum corneum is higher and the epidermal barrier is not well developed; and melanin production is decreased. The sebaceous

glands, although large in number at birth, have no function until puberty and similarly there are dense but less active sweat glands. In newborns and small infants, the pH of the skin surface is higher and the free fatty acid content is less than in adult skin(1-3).

### CLINICAL IMPLICATIONS OF INFANT SKIN

1. Blisters can be formed easily during inflammatory processes due to loose adherence of epidermis to dermis.
2. Increased transepidermal water loss, increased percutaneous absorption, increased thermal instability.
3. As the epidermal barrier is not fully developed, it is more susceptible to antimicrobial attack, more apt to react to irritants and more prone to maceration due to moisture retention.
4. Neonatal skin is more susceptible to ultraviolet (UV) light induced damage because of less melanin content of epidermis.
5. Soaps and cleansers can disturb the epidermal barrier and acid mantle of the skin making it drier and more prone to damage.

**TABLE I** STRUCTURAL DIFFERENCES BETWEEN NEWBORN AND ADULT SKIN

Skin structure	Premature newborn	Full-term newborn	Adult
Epidermis	Thinner cells, compressed fewer layers of stratum corneum, low melanin production	Stratum corneum adherent, low melanin content	Epidermis normal with good resistance to penetration, normal melanin content
Dermo-epidermal junction	Less cohesion between epidermis and dermis	Less cohesion between epidermis and dermis	Good cohesion between epidermis and dermis
Dermis	Less elastic fibers, thinner	Less elastic fibers, thinner	Fully developed elastic fibers
Sweat glands	Ducts patent, secretory cells undifferentiated, decreased sweating capacity	Dense distribution of sweat glands, decreased sweating capacity	Less dense distribution, full sweating
Hair	Lanugo hair	Vellus Hair	Vellus and terminal hair
Sebaceous glands	Large and active	Large and active	Large and active
Nerve and vascular system	Not fully organized, unmyelinated nerves, fetal in structure	Nerves small, unmyelinated, vascular system fully organized at 3 months	Adult pattern
Permeability	Highly permeable to fat soluble substances and increased absorption due to higher surface area to body weight ratio	Although has good resistance to penetration, increased permeability to fat soluble substances and increased absorption due to higher surface area to body weight ratio	Good resistance to penetration

### PRINCIPLES OF SKIN CARE OF THE NEWBORN

Certain principles of skin care have to be emphasized such as gentle cleansing, adequate hydration and moisturization of the skin, preventing friction and maceration in body-folds, and protection from irritants and bright sunlight. It is to be remembered that microbial colonization is nil at birth. Coagulase negative staphylococci (*Staphylococcus epidermidis*), the most commonly found micro-organism gradually increases over the axillae, groins and scalp. *Staphylococcus aureus* is a contaminant from mother or the nursing staff(7,8).

It is important to understand the “barrier function of skin” which mainly resides within the stratum corneum layer of the epidermis. It consists of the keratinocytes (constituted by proteins and lipids) embedded in a lipid rich matrix consisting of cholesterol, ceramides and fatty acids. Another class of lipids is also secreted at the surface of the epidermis which when in contact with the environment, interacts with water forming a hydrophilic film which is important for maintaining

the moisture content and sensorial attributes of the skin. The lipid fraction of this hydrophilic film can also penetrate in the upper layer of the epidermis merging with the epidermal barrier and also contributing to its functions(4,5). This is extremely important when considering what cleanser to apply on the newborn skin.

Another important developmental variation of the infant skin is the “acid mantle” or the functional capacity of the skin to form a surface pH of less than 5. There is close association between the skin surface pH and its microbial flora, because an increased skin pH from acidic to neutral can cause a transient increase in the total number of skin bacteria and a shift in the species present(6), hence it is important to maintain this acid mantle on the baby’s skin.

### ROLE OF VERNIX CASEOSA

Vernix caseosa is a naturally occurring, complex, lipid rich substance clinging to the skin surface of the newborn and is produced partly by the fetal sebaceous glands(9). It consists of sebaceous secretions, shed epithelium and lanugo. It is

composed of water (81%), lipid 19% (epidermal-triglycerides and cholesterol; and dermal-squalene and waxes) and proteins (10%)(10). There is considerable inter-individual variation in the quality of vernix caseosa. Although some authors suggest the role of the vernix in multiple functions at birth such as barrier to water loss, temperature regulation and innate immunity(11), most feel that these functions are debatable. At birth, the newborn's skin is covered with vernix caseosa, blood, meconium and cellular debris and it is better to clean this from the head and neck area, soon after birth.

### BATHING THE NEWBORN

Bathing is an ideal way of cleansing the newborn to remove blood and vernix and also to decrease exposure to maternal blood and thus to HIV and hepatitis B viruses. The initial bath in full term infants can be given once the baby's temperature has stabilized and the baby is hemodynamically stable. Lukewarm water baths (temperature  $<37^{\circ}\text{C}$ ) are given in the first few weeks of life(8,12). The bath is usually given 2-6 hours after birth in a healthy term baby weighing more than 2500 g(12). In a study by Behring, *et al.*(13), it was observed that the timing of the bath, whether 1 hour of birth compared with 4 to 6 hours after birth, did not significantly impact infant temperature. In another randomized clinical trial with 111 full term infants, there was evidence of neonatal heat loss during bathing which was not related to who bathes or the location of the bath(14). However, bathing can be delayed in certain situations such as winter. In a low birth weight infant, bathing should be delayed till the cord has fallen off.

The bath of the newborn should not last more than 5 minutes, prolonged bath increases the hydration of the skin and reduces the threshold for friction(8). For the initial bath, sterile or potable clean water is sufficient. Gloves can be worn for the initial bath to reduce contact with blood on the infant's skin. Soaps and cleansers are best avoided in the first few weeks of life(15). The neonate should be bathed in a warm room, and should be dried quickly and thoroughly from head to toe, followed by wrapping in a warm dry towel and placing next to the mother.

### CLEANSING AGENTS

Cleansing is a process of removal of dirt, bacteria, dead skin cells, sweat and other debris from the skin surface. Newborn skin is more sensitive to cleansers. Various skin cleansers and soaps are available but in India, majority of those which are marketed for babies do not mention their active ingredients(15). Cleansers can be broadly categorized into two categories, alkaline soaps and acidic or neutral synthetic detergents (syndets).

A cleanser is composed of a surfactant or detergent; a skin conditioner like glycerine; fragrance, color and preservatives(15). Ideally, a baby soap or cleanser should be devoid of fragrance and colors to avoid irritation.

The bulk of most cleansers are made up of surfactants. Surfactants act by decreasing the surface tension between water and air, and create a foaming action which allows the fat soluble impurities to be removed from the skin(8). However, a higher foaming power increases the risk of skin damage and removal of too much lipids from the stratum corneum.

Soaps are the products of saponification i.e. created by an alkali acting on animal fat or vegetable oils. In synthetic soaps, lauryl sulfate or its derivatives are substituted for natural fats and oils(16). The use of soaps or detergents containing surfactant can have a deleterious effect on the barrier function of the skin in the following ways, *viz.* (a) they affect the integrity of the hydrophilic film by creating lipid-depleted areas, (b) surfactants from soaps can interact with proteins of the stratum corneum causing their denaturation, which ultimately triggers skin irritation; (c) the delipidation action of soaps can increase the pH of skin surface affecting also the acid mantle of the skin. All this can ultimately result in skin dryness, roughness, flakiness and a tightening effect (5,16-18).

Syndets or synthetic detergents are soap substitutes or non-soap surfactants which have a pH closer to normal skin and are less irritating and milder than soaps. A distinct advantage is that as they do not alter the pH of the skin and the skin microflora remains unaltered(19,20) However, the

disadvantage is that they are subject to rapid disintegration and can cause excessive dryness if moisturizers are not added. Cocoyl isethionate, sodium lauryl sulphate, and betaines are examples of commonly used syndets.

Certain agents that include excess fat in the form of lanolin, paraffin or mineral oil are added to soaps as conditioners to make the skin soft and supple(15). This is called superfatting. Glycerin is another conditioner used in soaps. There are some non-soap, lipid-free lotions which contain a syndet as a surfactant and emollients like glycerin, cetyl alcohol and propylene glycol, but no oils or fat. These liquid products can clean without water. They can be applied to the dry skin, rubbed to produce lather and the area can be wiped with a soft cloth.

According to the Textbook of Dermatology by Atherton and Rook (2004), "it is clear that nothing should be applied to the skin of any baby without careful consideration of the potential hazards" and most experts agree with it. Immediately after birth, skin pH may be >6.0. After birth pH falls to 4.95. This protective "acid" mantle protects against pathogens. Any attempt or application intended to raise the skin pH from acid to neutral would increase the total number of bacteria and increase in transepidermal water loss. Regeneration of skin pH takes at least an hour after washing with alkaline soaps. Thus soaps with alkaline pH should not be used in the neonatal period. If at all needed, healthy term newborns and infants can be washed using cleansers of neutral or slightly acidic pH, which have a gentle surfactant, be chemically and physically stable, and should contain an emollient. Again this should be used minimally in the newborn period.

### **BABY POWDERS**

Although they are useful to absorb moisture during hot and humid weather and prevent maceration in skin folds, they are best avoided in the newborn period. Excessive use can also lead to blockade of sweat duct pores and can lead to miliaria formation (8,27). Accidental inhalation is another potential hazard(27).

### **CARE OF THE DIAPER AREA**

The diaper area represents a large moist and humid, occluded environment which is more prone to maceration and attack by microorganism. The skin is also in contact with strong alkalinizing agents e.g. urine and feces and the high pH damages the skin integrity.

The mother should be advised to frequently change napkins, whether they are home laundered or of the superabsorbant variety. The skin should be dried and aired between napkin changes. If frequent changes are not feasible, mineral oil can be used on buttocks to form a physiologic barrier(8). Warm water and soft cotton wool can be used to wipe napkin area. The bottoms should be wiped from front to back. For feces that sticks, an emulsion like baby lotion can reduce the surface tension and clean the debris. If a napkin rash occurs, petrolatum jelly or zinc oxide containing pastes can be used. For home laundered diaper, usually washing in lukewarm water followed by rinsing and drying is sufficient.

### **CARE OF THE SCALP**

Application of mineral or vegetable oil limits the spread of lesions in infantile seborrheic dermatitis. Baby shampoos can be used to remove crusts and scales from the scalp(8). Shampoos are soaps or synthetic detergents especially formatted for cleaning the hair. Shampoos should have minimal time of contact with the scalp to avoid irritant dermatitis(16). They usually contain both cleansing agents and lather enhancers(21). The best cleansers are usually medium to long chain fatty acids such as laureth sulfate, which are good emulsifiers. Just as soap has "foaming action", lather is important for its visual and psychological effects in a shampoo, not so much for cleaning. Short chain fatty acids such as cocamide diethanolamine, are some of the best lather producers(21). The other ingredients are preservatives, dyes, antioxidants, chelators, fragrance and conditioners. Although a baby shampoo has most of these ingredients, they should be free from fragrance, anti-inflammatory agents and natural products. Most baby shampoos in the market contain anionic surfactant which ensures adequate cleaning. The pH of the shampoo should be close to

that of tears and should be non-irritating to the baby's eyes. Special ingredients such as ketoconazole, zinc pyrithione and selenium sulphide are added for seborrheic dermatitis.

### OTHER AREAS

After birth of the newborn, the umbilical cord dries out and drops off within five to ten days. Topical topical agents are best avoided to the umbilical cord. Nails should be cut and kept short and clean. Cotton swabs soaked in boiled water should be used to clean eyes very gently.

### EMOLLIENTS FOR THE NEWBORN

An emollient is an agent that softens and smoothes the skin. They are also referred to as "moisturizers" and "lubricants". They are essentially composed of lipids which may be animal or vegetable derived, or obtained from mineral oils or alternatively, may be synthetic in origin(22). Emollients can be of the following kinds:

- Hydrocarbons – Vaseline, paraffin
- Fatty substance – Cetyl or stearyl alcohol
- Waxes – Bees wax, lanolin
- Oils – mineral oil, vegetable oils such as coconut oil, palm kernel oil, ground nut oil, olive oil, mustard oil, synthetic oil.

There are two important types of emollient formulations i.e. oil in water emulsion (cream) or water-in-oil emulsion (ointment), out of which cream preparations are generally preferred because the other preparation would be occlusive in the hot Indian weather. The application of an emollient serves the following purposes in a neonate, namely: safe and effective way to decrease neonatal peeling and scaling dermatitis, maintains barrier function, reduces irritation in the napkin area, and also has a role in massage.

In the Indian scenario, vegetable oils are used extensively for baby massage and as moisturizers. Coconut oil is preferable for oil massage in newborn as it is time-tested and owing to its small molecular structure, allows easy use and is ideal for dry skin. Olive oil is also useful but nut based oils like almond

oil are better avoided for the massaging purpose(24). Mustard oil contains allyl isothiocyanate, an antigen, which is a volatile chemical capable of causing contact dermatitis(25). In a randomized double blind controlled trial conducted in Philippines, it was found that extra virgin coconut oil as well as mineral oil, both improved skin hydration by increasing skin surface lipids and were safe to use(26). However, all vegetable oils should be used cautiously during hot weather as they can cause increased occlusion of sweat pores in newborns, and irritant folliculitis.

### CONCLUSION

The skin of the newborn is susceptible and sensitive to trauma and infection and requires special care. All soaps, cleansers, powder and syndets, should be used with proper indications and cautious judgement. Coconut oil is easily available and economical emollient that can be applied to neonatal skin. However, emollients should be applied sparingly in warm weather.

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