— The skin has a dual origin

1. A superficial layer, the epidermis, develops from the surface ectoderm
2. Deep layer, the dermis, develops from the underlying mesenchyme.

— **Epidermis**

— Initially, the embryo is covered by a single layer of ectodermal cells. In the beginning of the second month, this epithelium divides, and a layer of flattened cells, the *periderm*, or *epitrichium*, is laid down on the surface. With further proliferation of cells in the basal layer, a third, intermediate zone is formed.

— Finally, at the end of the fourth month, the epidermis acquires its definitive arrangement, and four layers can be distinguished.

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— The basal layer (germinative layer) is responsible for production of new cells.

— This layer later forms ridges and hollows, which are reflected on the surface of the skin in the fingerprint.

— Spinous layer thick, consists of large polyhedral cells containing fine tonofibrils.

— The granular layer contains small keratohyalin granules in its cells.

— The horny layer is made up of closely packed dead cells containing keratin.

— Cells of the periderm are usually cast off during the second part of intrauterine life and can be found in the amniotic fluid.

— **Melanocytes**

— Late in the embryonic period, neural crest cells migrate into the mesenchyme of the developing dermis and differentiate into melanoblasts. Later these cells migrate to the dermoepidermal junction and differentiate into melanocytes. The differentiation of melanoblasts into melanocytes involves the formation of pigment granules. The melanocytes begin producing melanin before birth and distribute it to the epidermal cells.

**Clinical Correlates**

— **Pigmentary Disorders**

— Diseases of melanocyte function include the various forms of albinism characterized by globally reduced or absence of pigmentation in the skin, hair, and eyes.
— These cases are classified as different types of oculocutaneous albinism (OCA).

— In most cases, abnormalities of melanin synthesis or processing produce the abnormalities.

**Vitiligo**

— results from a loss of melanocytes due to an autoimmune disorder. There is patchy loss of pigment from affected areas, including the skin and overlying hair and the oral mucosa. Vitiligo is also associated with other autoimmune diseases, particularly of the thyroid.

**Fingerprints**

— The epidermal ridges that produce typical patterns on the surface of the fingertips, palms of the hand, and soles of the feet are genetically determined. They form the basis for many studies in medical genetics and criminal investigations (dermatoglyphics). In children with chromosomal abnormalities, the epidermal pattern on the hand and fingers is sometimes used as a diagnostic tool.

**Dermis**

— Dermis is derived from mesenchyme that has three sources:

— (a) lateral plate mesoderm supplying cells for dermis in the limbs and body wall,

— (b) paraxial mesoderm supplying cells for dermis in the back, and

— (c) neural crest cells supplying cells for dermis in the face and neck.

— During the third and fourth months, the corium forms many irregular papillary structures, the dermal papillae, which project upward into the epidermis.

— Most of these papillae contain a small capillary or sensory nerve end organ.

— The deeper layer of the dermis, the subcorium, contains large amounts of fatty tissue.

** vernix caseosa**

— At birth, the skin is covered by a whitish paste, the vernix caseosa, formed by secretions from sebaceous glands and degenerated epidermal cells and hairs.

— It protects the skin against the macerating action of amniotic fluid.

**Hair**

— Hairs appear as solid epidermal proliferations from the germinative layer that penetrates the underlying dermis. At their terminal ends, hair buds invaginate. The invaginations, the hair papillae, are rapidly filled with mesoderm in which vessels and nerve endings develop.
Cells in the center of the hair buds become spindle-shaped and keratinized, forming the **hair shaft**, while peripheral cells become cuboidal, giving rise to the **epithelial hair sheath**.

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**The dermal root sheath** is formed by the surrounding mesenchyme.

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A small smooth muscle, **arrector pili muscle**, derived from mesenchyme, is usually attached to the dermal root sheath.

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Continuous proliferation of epithelial cells at the base of the shaft pushes the hair upward.

**Lanugo hair**

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by the end of the third month **the first hairs** appear on the surface in the region of the eyebrow and upper lip. The first hair that appears, **lanugo hair**, is shed at about the time of birth and is later replaced by coarser hairs arising from new hair follicles.

**Sebaceous glands**

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develop as buds from the sides of developing **epithelial root sheaths** of hair follicles.

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The glandular buds grow into the surrounding connective tissue and branch to form the primordia of several alveoli and their associated ducts. The central cells of the alveoli break down, forming an oily secretion—**sebum**—that is released into the hair follicle and passes to the surface of the skin, where it mixes with desquamated peridermal cells to form **vernix caseosa**.

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Sebaceous glands independent of hair follicles (e.g., in the glans penis and labia minora) develop in a similar manner to buds from the epidermis.

**Eccrine sweat glands**

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develop as epidermal downgrowths (cellular buds) into the underlying mesenchyme.

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As the buds elongate, their ends coil to form the primordium of the secretory part of the gland. The central cells of the primordial ducts degenerate, forming a lumen.

**Apocrine sweat glands**

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develop from downgrowths of the stratum germinativum of the epidermis that give rise to hair follicles. As a result, the ducts of these glands open, not onto the skin surface as do eccrine sweat glands, but into the upper part of hair follicles superficial to the openings of the sebaceous glands. They begin to secrete during puberty.

**Mammary Glands**

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The mammary line or mammary ridge is the first indication of mammary glands.

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is found in the form of a **band-like thickening of the epidermis**.
— In a 7-week embryo, this line extends on each side of the body from the base of the forelimb to the region of the hindlimb.

— Although the major part of the mammary line disappears shortly after it forms, a small portion in the thoracic region persists and penetrates the underlying mesenchyme. Here it forms 16 to 24 sprouts, which in turn give rise to small, solid buds.

— By the end of prenatal life,

1. the epithelial sprouts are canalized and form the lactiferous ducts, and
2. the buds form small ducts and alveoli of the gland.

— Initially, the lactiferous ducts open into a small epithelial pit. Shortly after birth, this pit is transformed into the nipple by proliferation of the underlying mesenchyme.

— **Clinical Correlates**

**Polythelia**

— is a condition where accessory nipples have formed due to the persistence of fragments of the mammary line. Accessory nipples may develop anywhere along the original mammary line, but usually appear in the axillary region.

— **Polymastia** occurs when a remnant of the mammary line develops into a complete breast.

— **Inverted nipple** is a condition in which the lactiferous ducts open into the original epithelial pit that has failed to evert.