Diseases of Skin its associated Structures
Dermatology is the science, which deals with the study of the skin or coat of the animal either from the normal physiological and anatomical picture, or from the diseases which affect the skin and its effects on the animal health and production. The skin forms the largest single organ of the body, performing not only a supportive anatomical role but also a wide variety of important physiological functions essential to the well being of the animal.

The skin is a heterogeneous organ, which serves as principal medium of communication between the animal and to environment. The anatomical, histological and physiological features of the skin vary between species & breeds.

Anatomical and Histological Consideration
The skin is divided into two layers an outer layer which is called epidermis and an inner layer known as dermis, and associated structures which known as skin appendages including hairs, horns, claws, nails, hooves. Sebaceous and sweat glands all develop from the epidermis in addition to the smooth muscle fibers attached to hair follicles and distributed in the dermis.

In general epidermis of mammals is composed of 5 layers as the following:
1. Stratum germinativum or basal layer.
2. Stratum spinosum or stratum Malpighii.
3. Stratum granulosum.
4. Stratum lucidum.
5. Stratum corneum.

While the dermis composed of bundles of collagen, elastic and reticular fibers within a homogenous ground of sulfuric and hyaluronic acids within the matrix is population of Fibroblast, most cells and histocytes, blood vessels, nerve endings are present.

Physiological Consideration
The main functions of the skin are:
1. Physical protection from trauma, temperature variations, invasion of microorganisms and over exposure to sunlight.
2. The skin acts as biological barrier, which prevents the passage of harmful agents into the body. Mechanical protection of the keratinized structures against the environment.
3. Skin maintains the internal conditions of the individual so it acts as a barrier for water and electrolytes and prevent their loss.
4. Synthesizing vitamin D by the action of ultra violet rays and transforming steroids to vitamin D.
5. Aids in maintaining the normal Blood proteins by the action of peripheral vascular dynamics.
6. Help in recognition of foreign protein as contact allergens and venom and stimulate the antibody production. this is due to the presence of specific immunoglobulin movement into and through the epidermis.
Skin lesions and their terminology

Nodules
Nodule is a circumscribed, solid elevation greater than 1 cm in diameter that does not deform when palpated. Nodule extends into the deeper layers of the skin, and it results from cellular infiltrates into the dermis and subcutis.

Ulcers
An ulcer is a cutaneous defect resulting from a complete loss of the epidermis and usually part of the underlying tissues.

Erosion
An erosion is a cutaneous defect resulting from partial loss of the epidermis that does not penetrate beneath the basal laminar zone.

Papules
A papule is a solid, circumscribed, elevated lesion up to 1 cm in diameter. Papules are essentially small nodules that do not extend beneath the dermis.

Pustules
A pustule is a pus-filled, fluctuant, circumscribed, elevated accumulation of pus up to 1 cm in diameter.

Vesicles
A vesicle is a fluid-filled, cellular, circumscribed, elevated lesion up to 1 cm in diameter. While, a bulla is a vesicle that is greater than 1 cm in diameter.

Scaling
Scale is a visible accumulation of fragments of the horny layer of the skin (stratum corneum). It represents the final product of epidermal keratinization. Histologically, scale is recognized as hyperkeratosis, which may be either parakeratosis or orthokeratosis. Grossly, it varies in appearance (color), consistency, and adherence.

Crusts
Crusts are dried exudate that adheres to the skin surface and hair. Crusts often cover erosions or ulcer; crusts are composed of serum, cells, fibrin, infectious agents, dirt and medications.

Diseases of the skin and its associated structures

Importance of skin diseases
- As well as being involved directly in a variety of disease process, the skin and coat are influenced indirectly by the general health status of the individual animal.
- The incidence of skin diseases in domestic animals is high and it is important to remember that some skin diseases are contagious, so that prompt recognition is important and essential in order to prevent further dissemination of the infection, and to assist control.
• The risk to persons handling the animals affected with certain parasitic disease of skin is an important public health responsibility for the veterinary clinician as mange and ringworm.
• Skin diseases cause restlessness at least to the animal and decrease body weight gain and decreased its production.

Classification of skin diseases

(1) According of its origin:

1- Primary skin diseases:
In this type of diseases initially at least the lesions are restricted to skin and its associated structures, spread to other tissues may occurs later as secondary complications. It is evidenced by the clinical examination, which reveals that the lesions are restricted to skin without systemic reactions.

2- Secondary skin diseases:
In this type the lesions occur as the result of extension of the disease process from another organ or tissues other than the skin, system reactions are present with cutaneous lesions.

(2) According to the causative agent:

(A) Non-infectious skin diseases includes:

Diseases affect Epidermis
1- Pityriasis.
2- Parakeratosis.
3- Hyperkeratasis.
4- Pachydermia.
5- Impetigo.
6- Urticaria.
7- Dermatitis.
8- Eczema.
9- Photosensitization.

Diseases affect skin appendages
1- Alopecia.
2- Achromotrichia.
3- Seborrhea.
4- Acne.

Disease of subcutis:
1. Subcutaneous edema.
2. Angio neurotic edema.
3. Subcutaneous emphysema.
4. Lymphangitis.
5. Skin-Hemorrhages.
7. Skin.Abscess.

(B) Infectious skin diseases includes:

(A) Viral diseases:
1- Cow pox - pseudo cow pox.
3- Swine pox - sheep, goat pox.
5- Warts = viral papillomatosis.
7- Viral popular dermatitis.
2- Contagious pustular dermatitis.
4- Bovine ulcerative mammilitis.
6- Epuine sarcoides.
8- Coital exanthema.

(B) Bacterial diseases:
1- Dermatophilosis = mud fever.
3- Contagious acne.
2- Impetigo.
4- Streptothrichosis.
5- Ulcerative Lymphangitis. 6- Glanders “Farcy”.
7- Subcutaneous abscesses.

(C) Mycotic diseases:
1- Ring worm.
2- Epizootic Lymphangitis.
3- Sporothricosis.

(D) Parasitic diseases:
1- Iice infestation.
2- Ticks infestation.
3- Mange.
   • Psoroptic mange (Body mange, ear mange).
   • Sarcoptic mange (Red mange, Barn itch).
   • Demodectic mange (Follicular mange).
   • Chorioptic mange (Leg mange, tail mange).
4- Other diseases.
   • Parafilaria multipilosa.
   • Cutaneous neoplasms.
   • Granulomatous lesions.
   • Congenital skin lesions.

DIAGNOSTIC METHODS IN DERMATOLOGY:
The sequence of procedures in laying the foundations for an accurate diagnosis is:
1- Case history,
2- Physical examination,
3- Skin scrappings.
4- Skin biopsy.
5- initial diagnostic tests.
6- differential diagnosis

(1) History:
A detailed history is obtained from the owner or person having most contact with the animal. A good case history provides assistance in diagnosis and treatment. The history must not be limited to cutaneous symptoms but should include information on other systems.

General history taking:
(1) Age: Some skin diseases are associated with specific age group as for example lymphadenitis.
(2) Sex: In females, skin disorders resulting from estrogenic imbalance frequently develop. In males testicular tumors cause specific skin lesions as hypotrichosis “Hairlessness” due to sertoli-cell tumor which is one type of Alopecia.
(3) Species and breed: Some species of animals and even certain breeds develop skin lesions specifically.
(4) Environment: including climate and geographical conditions which effect on the skin, such as distribution of trace elements in the soil may lead to many of skin lesions. Also allergic skin disorder as in photosensitization may be related to environmental condition.
Nutritional conditions: Some skin lesions are developed from deficient nutrient in some vitamins, minerals and tract elements as facial eczema due to vit. A and zinc deficiency and may due to excessive feeding Alopecia in a yearling bullock suffering from advanced molybdenosis.

**Principals of History taking “In Relation to skin only”**:–

1- Has the patient previously suffered a disease? If so, what is the diagnosis?
2- Do other animals of family have a similar skin disease?
3- Have the lesions been localized or generalized in many areas?
4- What has the duration of the lesions?
5- What is the usual behavior of the patient?
6- What type of the patient nutrient and source of water?
7- What is the patient history concerning external and internal parasite?

(2) **Physical Examination:**

A complete physical examination is carried out and the status of all body system evaluated and noted. All parts of the skin are examined; the coat being parted and skin palpated where necessary. Good lighting and use of the magnifying lens are essential. The condition of the coat and the nature and distribution of any lesions are noted and it is important to recognize the different types of skin lesions and to describe them accurately.

(3) **Differential diagnosis and selection of diagnostic tests:**

Careful consideration of the history, together with the results of the physical examination, will suggest a number of possible causes of condition. The diagnostic procedures must be selected, which will confirm or eliminate these possibilities. It is important to differentiate primary and secondary skin disease.

* **Diagnostic tests include:**

**Procedure**

1- Wood’s lamp illumination.
2- Skin scrapings.
3- Hair plucking.
4- Coat brushings.
5- Swab / crust samples.
6- Smear / wet preparation.
7- Biopsy.
8- Blood.

**Pathogen pathology demonstrated**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Pathogen pathology demonstrated</th>
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<tbody>
<tr>
<td>1- Wood’s lamp illumination.</td>
<td>Some of Microsporum species.</td>
</tr>
<tr>
<td>2- Skin scrapings.</td>
<td>Ectoparasites, dermatophytes, helminthes.</td>
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<tr>
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<td>Ectoparasites, dermatophytes, hair morphology.</td>
</tr>
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<td>Fungi, bacteria, virus.</td>
</tr>
<tr>
<td>6- Smear / wet preparation.</td>
<td>Bacteria, fungi, protozoa, cytology.</td>
</tr>
<tr>
<td>7- Biopsy.</td>
<td>Bacteria, fungi, virus, histopathology, histochemistry.</td>
</tr>
<tr>
<td>8- Blood.</td>
<td>Cytology, Biochemistry, hormonal status, and serology.</td>
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**Wood’s lamp illumination:**–

The wood’s lamp illumination depends on a source of ultra-violet radiation at wave length which excites a characteristic apple-green fluorescence in about 50% of naturally occurring Microsporum canis infection, and other Microsporum species also fluoresce. It is seen only in infection of actively – growing hair. The disadvantages of this method are, it may give + ve result with other chemical agents as tetracycline, and failure to demonstrate such fluorescence dose not rule out dermatophytosis.
Skin Scrapings:
The skin scraping is one of the most valuable and commonly used tests in veterinary dermatology, confirming the diagnosis of the ectoparasites and dermatophytosis. The hair, superficial scales, epidermis and contents of the hair follicle mouths may be sampled by this technique.

Protocol of skin scrapings:
1. Select the area of scraping with great care to the predilection site for the disease either ectoparasites or dermatophytes.
2. The hair should be firstly trimmed short.
3. Skin should be gently wiped with swab moistened with sterile water.
4. Scraping is done with scalpe blade held firmly between the thumb and first two fingers of one hand at angle of about 50% to the skin and drawn firmly across the surface towards the operatory. The surrounding skin is tensed with fingers of other hand.
5. Scraping is continued until the first signs of bleeding appear. Moistening the skin with water, mineral oil or glycerin for adherence of the scrapings to the blade.
6. Microscopical examination of the scraoings.
   • Scrapings are suspended in a drop of oil on microscope slide, and covered with cover slip, and examined under the x 10 objective. Microscope condenser should be lowered to increase the contrast.
   • Scrapings are collected dry or moistened with water and suspended on slide in 20% potassium hydroxide.
   • Suspension is warmed to accelerate clearing.
   • Cover slip is applied and the preparation is examined under the x 40 oblective.
   • Scrapings are collected in test tube or small beaker and add 4-10% sodium or potassium hydroxide.
   • Heat gently, but not boil, until the hair is dissolved for about 5 minutes. “If the sample is boiled the parasite will be transparent and difficult to diagnosis”.
   • Maceration overnight without heat may be sufficient.
   • Allow the tube to stand for minutes and cooling.
   • Centrifuge the sample and examine the sediment.
   • Sample from the bottom by glass rode or dropper and transferred to slide than cover with cover glass and examined microscopically under the low power.
   • Scrapings can be collected dry in sealed paper envelope and then cultured directly for isolation of dermatophytes on specific media.

Hair plucking:
Hairs from the chosen site are grasped firmly with forceps and plucked and it may be inoculated directly onto specific media for mycological isolation and identification. Or examined under the microscope with low power objective x 10 and the hairs are mounted between glass slides held together with tape. Or under x 40 objective and hair held with mineral oil gives better resolution.

Coat brushing:
It is useful where the skin lesions are diffuse and infection of the hair or superficial stratum corneum is suspected. Coat brushings enable the loose hairs, scruff and crusts from large areas of the skin to be collected.
- The animal is placed on a sheet of clean paper.
- The coat is ruffled with a coarse brush causing any loose material to fall onto the paper.
- The collected materials are examined under the microscope under x10 objective between glass slides.
- Some debris is screened with a wooden lamp.
- Sample may be put on a slide and examined microscopically in mineral oil or in 20% potassium hydroxide.
- If fungal or dermatophytes are suspected, the brush cultures are made in specific media.

Swab and Crust samples:
Cotton swabs are commonly used to sample pustular or exudative lesions for smear preparation and isolation of bacteria and fungi, e.g., Candida from the skin.
- The hair is first clipped from around the lesions.
- Gentle cleaning with 70% Alcohol.
- Pustules are opened with the tip of a sterile needle.
- The adjacent skin is gently squeezed.
- The emerging pus collected on the tip of the swab and avoiding contact with the skin.
- The furuncular and scabby lesions are also sampled as pustules but scabs are a potent source of microorganisms as pox virus and dermatophilosis. Portion of scabs may be emulsified.

Smears and wet preparations:
Smears and wet preparations provide a rapid and relatively simple means for the demonstration of m.o. and host cells in skin lesions. It is particularly useful in demonstration of yeast and neoplastic cells.

Smears may be prepared in three ways:
1. Direct impression smears are made by pressing the surface of moist skin lesions, the base of freshly removed scab, or the cut surface of a biopsy specimen causing cells and exudate to adhere to it.
2. Smear also can be made from pus or exudate taken from the lesion and spread thinly onto the slide.
3. Samples are collected on swab by scraping the affected skin or by aspiration using needle and syringe.
4. They are smeared onto the slide with swab or using bacteriological loop.

Smears may also be made from emulsified scabs:
- Slides should be cleaned with alcohol prior to use to promote adherence and even distribution of the material.
- The smears are air-dried, fixed by flooding with alcohol for one minute and allowed to dry.
- Staining smear with an appropriate technique depending on the features which are to be demonstrated. Most common stains are: Gram’s, methyleneblue, Giemsa.
- Wet preparations are unstained specimens prepares from exudate or scab emulsions; as described by many researchers.
- Drop of specimen is placed on the slide.
- Normal saline is added to dilute the material or as mounting medium.
- Cover slip is applied.
- Examination under the microscope by phase-contrast illumination or with the condenser lowered.

**Biopsy samples:**

These samples are usually obtained for histopathology:
- Local anaesthesia.
- Hair is clipped with scissors.
- Cleaning with 70% alcohol.
- Incision of the skin or punch method is applied.
- Specimen put in 10% formaline for at least 24 hours.

**Blood samples:**

- Changes in the cellular or biochemical composition of the blood are useful in confirming or ruling out differential diagnosis in dermatology.
- Specialized tests as hormonal assays, and serological tests may be used to identify specific conditions.
- Collection of blood.

(A) **Clotted blood or serum:**

- Cleaning the site of vein puncture.
- Obtaining the blood in the containers as centrifuge tubes vials, …
- The container is left to clotted in sunlight in sleep manner to give large surface area for oozing of serum.
- Then centrifuge the sample for obtaining maximum amount of serum.
- Transfere the serum into other tubes or vials and closed then preserved in deep freezer.
- Serum is collected for demonstration of biochemical composition such as minerals including: Copper, Zinc, Manganese, Sulfur and other elements…. Iron and calcium.

(B) **Whole Blood sample:**

Blood samples are obtained by vein puncture using sterile needle and adding anticoagulants as heparin and EDTA. Whole blood samples are obtained for detection the cellular changes, which may be the cause, are as result of diseased skin. This changes to be detected necessitate the following:-
- Erythrocytic count.
- Total leucocytic count.
- Differential leucocytic count.
- Haematocrite value.

**SPECIAL PATHOLOGY:-**

The reaction of the skin to noxious stimuli varies with the severity and depth of injury. In the corium or dermis the reaction is the same as that of other tissues due to presence of blood vessels, nerve fibres, lymphatic vessels and connective tissues. The epidermis due to purely cellular composition reacts differently.
(A) Acute Reaction:
If the reaction is acute, the development of lesions begin with swelling and oedema of prickle cell layer and so called spongiosis. If the oedema is severe enough, cell rupture and fluid collects as foci which gradually emerge through the stratum corneum and appear as vesicles. Should the foci rupture before reaching surface, the result is weeping of the area.

(B) Sub-Acute Reaction:
The intercellular edema interferes with the normal functions of the granular cells in the prickle layer and gives rise to abnormal formation of cornified epithelium, and result in thickening of epidermis. All layer are affected specially stratum corneum because of improper keratinization and failure of exfoliation this is so called parakeratosis; it may be accompanied by pronounced thickening of prickle cell layer with prolongation of interpapillary processes and so called acanthosis, the disease state in this case named pachydermia.

Acanthosis in association with the deposition of keratin pigment described as Acanthosis nigricans, which is common in dog and human, associated with thyroid dysfunction.

Skin diseases due to allergens:
When an allergen is applied on sensitized skin, local rise in histamine levels leading to an accumulation of eosinophils. If the histamine level increased about the detoxifying capacity of eosinophils, it will escape to vascular system and blood level of histamine rise. This is transitory and be overcomed in about 1-2 hours after removal of allergen.
- Examination of histamine level or eosinophil count may be of diagnostic value.
- The local skin reaction to the allergen is due to the vascularity effect of histamine.
- If the reaction is severe enough other organs may showing histamine toxicity, this also may occurs when the allergens ingested which produce reactions on other end organs and including skin.

PRINCIPLES OF TREATMENT OF DISEASES OF THE SKIN
1. Removal of hair coat and debris to enable topical applications to come into contact with the causative agent is preferable.
2. Accurate diagnosis must be precede the selection of drugs.
3. In bacterial diseases sensitivity tests on culture is advisable.
4. In allergic diseases and photosensitization may be impossible and the only symptomatic treatment is the solution.
5. Removal of causative agents by specific treatment for each once.
6. Prevent secondary infection by using bacteriostatic drugs.
7. Prevent further damage from scratching by using local anaesthetic ointments or centrally acting sedatives.
8. When large area of skin is involved, prevent absorption of toxic subs. by continuous irrigation or application of absorptive dressing.
9. In cases of fluid losses; it must be given as isotonic fluid by the parenteral administration.
10. Good ration specially protein and sulfur containing amino acids to help in repair of skin.

**SKIN DISEASES**

(1) **PITYRIASIS = DANDRUFF:**
It is non-infectious condition characterized by the presence of bran-like scales on the skin surface.

**Etiology:**
1. Hypovitaminosis A and B especially riboflavin and nicotinic acid mainly in pigs.
2. Nutritional deficiency acids. as linolenic acid.
3. Poisoning by iodine which causing fatty acid deficiency.
4. Ice, flea and mange infestations.
5. May be with ringworm.

**Pathogenesis:**
The scales are keratinized epithelial cells and these are sometimes softened and become greasy due to exudation of sebum or serum. Avitaminosis A results in overproduction of keratinized epidermis. Excessive desquamation due to parasitic infestation, is another way of pathogenesis and developing scales.

**Diagnosis:**
Primary Pityriasis depends upon the examination of skin scrapings. Differentiation from hyper-and parakeratosis. Skin scrapings to eliminate parasites and Fungi.

**Treatment:**
1. Correction of primary agents.
2. Using of balanced ration emollient ointment and alcoholic lotion.
3. Salicylic acid incorporated in ointment and lotions.