# OCCUPATIONAL DERMATOSES

## OCCUPATIONAL MEDICINE

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## Learning Objectives:

- To better understand the epidemiology and economic impact of Occupational Dermatoses.
- To review medical definitions and terminology in order to better describe Occupational Dermatoses.
- To review the proper way to examine the skin in order to more effectively assess Occupational Dermatoses.

## Introduction

- Skin is the most prominent interface between the worker and the environment.
- Largest organ of the body - 15% of the total body weight.
- Marked size and exposure cause increase vulnerability to occupational injury and diseases.

## Definitions

- **Occupational Skin Disease** - any abnormality of the skin induced or aggravated by the work environment.
- **Dermatitis** - describing a skin disease as having an inflammatory component involved in its pathogenesis.
- **Dermatosis** - describes a skin disease from any cause including inflammatory and non-inflammatory causes.

## Epidemiology

- Occupational skin diseases and disorders are the most common non-trauma occupational illnesses.
- Skin diseases account for approximately 30-45% of all occupational illnesses.
- Bureau of Labor Statistics (BLS) data 2009 estimated that greater than 15% of occupational injury/illness was due to skin diseases (estimated that total number of occupational skin disorders may be 10-50 times greater than what BLS is able to estimate).
Epidemiology “Cont’ d”

- Affects approximately one worker per thousand in private sector. Annual incidence rate in 1993 by the BLS was 76 cases per 100,000 workers.
- Greatest number of cases of occupational skin disease are seen in manufacturing industry but the highest incidence rate is seen in the agriculture/forestry/fishing industry.
- BLS data reveals that approximately 20% of all occupational skin disease result in days away from work with a median work absence of 3 days.

Epidemiology “Cont’ d”

- Economic cost is a result of:
  - medical costs
  - lost work time
  - rehabilitation cost
  - worker’s compensation litigation
  - re-hiring and training new workers

Epidemiology “Cont’ d”

- Only 1/3 of U.S. workforce is employed in large place facilities which are more likely to have a comprehensive occupational health program.
- 2/3 of U.S. workers employed by small companies employing less than 500 workers. Incidence rates of occupational diseases are higher in these facilities usually due to lack of comprehensive health programs.

Evaluation of Occupational Dermatoses

- Physicians engaged in evaluating occupational dermatoses should be familiar with:
  - importance of their appearance
  - causes
  - methods of evaluation
  - diagnosis
  - treatment
  - prevention

Evaluation of Occupational Dermatoses Cont’ d”

- It is crucial to evaluate a potential occupational skin disorder thoroughly.
  - enables the worker to benefit from appropriate diagnosis and treatment
  - Proper diagnosis is essential
    - may be difficult to change later
    - Wrong diagnosis may make the worker ineligible for many other positions in the same company or other industries.

Types of Skin Lesions

- PRIMARY LESIONS
  - how skin diseases begin
  - key to accurate description and interpretation
- SECONDARY LESIONS
  - develop during the evolutionary process of the skin disease
  - may be created by scratching or infection
Primary vs Secondary

- Primary Lesions
  - Macule
  - Papule
  - Nodule
  - Vesicle
  - Petechiae
  - Patch
  - Plaque
  - Tumor
  - Bulla
  - Ecchymosis
  - Wheal
  - Pustule

- Secondary Lesions
  - Atrophy
  - Crust
  - Erosion
  - Excoriation
  - Fissure
  - Lichenification
  - Scar
  - Telangectasia
  - Ulcer

Primary Lesions

- Macule - up to 1 cm in size, circumscribed, flat discolorations of the skin.
  - Examples: freckles, flat nevi.

Primary Lesions

- Patch - larger than 1 cm, circumscribed, flat discolorations of the skin.
  - Examples: vitiligo, senile freckles, measles rash.

Primary Lesions

- Papule - up to 1 cm in size, circumscribed, elevated, superficial, solid lesions.
  - Examples: elevated nevi, warts, lichen planus
  - A wheal is a type of papule that is edematous and transitory.
  - Examples: hives, insect bites

Primary Lesions

- Plaque - larger than 1 cm, circumscribed, elevated, superficial, solid lesions.
  - Examples: mycosis fungoides, localized neurodermatitis.

Primary Lesions “Cont’ d”

- Nodule - range to 1 cm in size, solid lesions with depth; may be above, level with, or beneath the skin surface.
  - Examples: epithelomas, xanthomas
Primary Lesions “Cont’d”

- Tumor - larger than 1 cm, solid lesions with depth; may be above level with, or beneath the skin surface.
  - Examples: tumor stage of mycosis fungoids, larger epitheliomas

Primary Lesions Cont’d

- Vesicle - range to 1 cm in size and are circumscribed elevations of the skin containing serous fluid.
  - Examples: early chickenpox, zoster, contact dermatitis.

Primary Lesions

- Bullae - larger than 1 cm, circumscribed elevations of the skin containing serous fluid
  - Examples: pemphigus, second-degree burns

Primary Lesions “Cont’d”

- Pustule - vary in size, circumscribed elevations of the skin containing purulent fluid.
  - Examples: acne, impetigo

Secondary Lesions

- Scales - shedding, dead epidermal cells that may be dry or greasy
  - Examples: dandruff, psoriasis

Secondary Lesions

- Excoriation - abrasions of the skin, usually superficial and traumatic
  - Examples: scratched insect bites, scabies
Secondary Lesions “Cont’d”

- Lichenification - diffuse area of thickening and scaling with resultant increase in skin lines and markings.

Secondary Lesions

- Erosion - loss of all or part of the epidermis

Secondary Lesions

- Ulcer - irregularly sized and shaped excavations in the skin extending into the dermis as well as the epidermis
  - Examples: stasis ulcers of legs

History Taking in the Evaluation of Occupational Dermatoses

- When did lesions begin
- Where did lesion begin
- What do you do (occupation)
- Previous jobs held
- Current part-time jobs
- Changes in rash symptoms when away from work
- What does patient believe is the cause

History Taking in the Evaluation of Occupational Dermatoses “Cont’d”

- Any co-workers with similar complaints
- Any recent changes in the workplace

History Taking in the Evaluation of Occupational Dermatoses “Cont’d”

- Description of workplace and workplace activities
  - Any MSDS’ s available?
  - Previous contact allergies
  - Current self-treatments
  - Hobbies
  - Current medications
Skin Examination

- Well-lighted room
- In order to understand the effects of various occupational agents on the skin, a concept of its barrier function is needed.
- The skin consists of three major units:
  - Epidermis
  - Dermis: includes follicle, sweat gland
  - Subcutaneous fat

Skin Examination

- Examine all of the skin surface
- Regional inspection
  - Begin at a distance
  - Distribution
  - Grouping
  - Stage of the lesions
- Lesion inspection

Clinical Morphologic Patterns of Skin Disease and Their Occupational Causes

Contact Dermatitis

- Irritant or allergic contact dermatitis
  - Acute - blistering reactions
    - e.g. hydrofluoric acid (HF), ethylene oxide
  - Chronic - rough scaling and thickened skin
    - e.g. chronic turpentine exposure or solvent exposure, rubber compounds

Acute Contact Dermatitis

Routes of Entry

- Interact Directly With Cells
- Penetrate Intercellulars of The Cells
- Through The Pilosebaceous And Sweat Gland Orifices
Acneiform

- Cosmetic Acne
- Actors, models and cosmetologists
- Oil Acne and Folliculitis
- Machine operators, food service workers, roofers, pavers
- Ultraviolet Acne
- Models and lifeguards
- Acne Mechanica
- Truck drivers, those with frequent use of respirators
- Chloracne - characterized by straw-colored cysts on face (face and genitalia mostly affected)
  - Exposure to halogenated chemicals, especially dioxin, found in herbicides

Pigmentation Changes

- Hypopigmentation
  - E.g. some phenolic compounds - especially hand involvement
- Hyperpigmentation
  - E.g. any inflammatory process, especially in dark-skinned individuals

Miliaria

- Diffuse papulovesicular eruption
  - usually trunk and intertriginous areas
  - from excessive heat exposure
Urticaria

- Local or generalized hives
  - E.g. latex allergy

Nodules

- Foreign body (e.g. Silica, fibrous glass)
- Allergic (beryllium)
  - Predisposed workers will form granulomas in multiple tissues, similar to sarcoidosis
- Fibrous glass dermatitis
- Infectious
  - Classic lesions of sporotrichosis are nodular

Neoplasms (Tumors)

- Squamous cell carcinoma (SCC)
  - Ultraviolet light
  - Ionizing radiation
  - Arsenic (systemic or topical)
  - Polyaromatic hydrocarbons
- Basal cell carcinoma (BCC)
  - Ultraviolet light and arsenic
- Malignant melanoma
Ulcerations

- Chromium (metal)
  - Exposure to fumes happens in the production of stainless steel
  - Chronic exposure may cause erosion of the nasal septum
  - Chrome holes are painless erosive ulcerations usually found on the fingers, knuckles and forearms

Direct Causes of Occupational Dermatoses

- 4 direct causes of occupational dermatoses, in order of frequency:
  - Chemical
  - Mechanical
  - Physical
  - Biological

Irritant Contact Dermatitis

- 80% of all occupationally caused contact dermatitis
- Caused by substances that damage the skin at the site of contact by non-immunologic mechanisms
- Many factors contribute to irritant reactions:
  - Potential Irritant(s):
    - Chemical properties
    - Physical properties
  - Quantitative Aspects of Exposure
    - Concentration
    - Duration of exposure
    - Frequency and number of exposures
  - Qualitative Aspects of Exposure
    - Occlusion of substance against skin
    - Temperature of substance on skin surface
    - Pre-existing skin damage to prevent skin barrier
    - Anatomic skin site
  - Host susceptibility
    - Atopic disease
    - Race (?)
    - Sex (?)
    - Age (?)
    - Allergies
    - Cleanliness
    - Season
- Most common predisposing factors in development of irritant dermatitis are atopy, dry skin, and advancing age.
Irritant Contact Dermatitis

“Cont’d”

- Irritant Dermatitis is divided into two types:
  - Immediate (absolute)
  - Delayed

Immediate Irritant Dermatitis

- Single contact with a strong chemical substance causes acute, toxic reaction similar to burn.
- Erythema, blistering, and ulceration occur at site almost immediately after contact.
- Examples
  - Strong alkalis
  - Acids
  - Certain metallic substances and their salts
  - Many organic compounds

Chief Determinants

- Intrinsic nature of chemical
- Concentration of the chemical
- Duration of contact
- Almost everyone will respond the same way to these substances

Delayed Irritant Dermatitis

- Repeated or prolonged chemical contacts
- Clinical findings of erythema, increasing dryness and thickening, patchy hyperkeratosis with pruritus, and painful fissuring are characteristic
Delayed Irritant Dermatitis
“Cont’ d”
- Most Common Causes:
  - Soaps
  - Detergents
  - Mild acids and alkalis
- Most Common Contributing Factors:
  - Friction
  - Occlusion
  - Minor lacerations
  - Excessive environmental heat or cold
  - Low relative humidity
  - Often confused with allergic contact dermatitis

Allergic Contact Dermatitis
“Cont’ d”
- Less frequent than irritant dermatitis
- Greater importance to diagnose because ordinary protective measures usually are ineffective, and many patients must change jobs or learn a new trade.
- Is an immunologic reaction classified as a Type IV, delayed or cell mediated hypersensitivity

Allergic Contact Dermatitis
“Cont’ d”
- Sensitization is variable among individuals and also dependent on numerous factors
- Allergic contact dermatitis must be differentiated from atopic dermatitis, psoriasis, Herpes Simplex & Zoster, idiopathic vesicular reactions to Trichophyton infections of feet, dyshidrotic eczema, and drug eruptions.

Example of Delayed or Cell Mediated Hypersensitivity Reaction
- The allergen in poison ivy or oak will sensitize nearly 70% of exposed persons where p-phenylenediamine, allergen in permanent hair dyes, sensitizes a small number of people with repeated exposure.
- Sensitization usually requires relatively short duration of exposure to develop though many workers may have repeated contact with an allergen in their workplace for months, and even years, before developing sensitivity.
- Once allergic sensitization occurs, the dermatitis begins quickly (24 to 48 hours) after contact.

Example of Delayed or Cell Mediated Hypersensitivity Reaction: “Cont’ d”
- A pruritic, erythematous rash develops rapidly, followed by papule formation and blistering.
- Itching is always a prominent symptom.
- Dermatitis originates at site of contact with the allergen but new lesions may appear at distant sites and may also be transferred by the hands.
- After several days, a subacute or chronic stage evolves that occasionally erupts into a more acute dermatitis after re-exposure to the allergen.

Mechanical Causes of Occupational Dermatoses:
- Friction
  - Callouses
  - Blisters
  - Abrasions
- Pressure
  - Bulkie
  - Atrophy
  - Necrosis
- Other
  - Wounds
  - Koebner Phenomenon
Physical Causes of Occupational Dermatoses:
- Heat
- Burns
- Hyperhidrosis
- Erythema
- Telangiectasia
- Cold
  - Raynaud’s Dz
  - Trench Foot
  - Frostbite
- Radiation
- Keratoses
- Sunburn
- Radiodermatitis
- Photosensitivities
- Cancers

Biological Causes of Occupational Dermatoses:
- Plants
- Insects
- Animals
- Microbiological
  - Viruses
  - Bacteria
  - Fungi
  - Fungi
  - Rickettsia
  - Protozoa

Worksite Evaluation
- Best place to evaluate etiology of occupational skin diseases
- Physicians should tour the plant with representatives of all interested groups.
- Note protective gear as well as personal hygiene.
- Examine tasks and work environment
- Ask to review MSDS’s

Diagnostic Studies:
- Skin scrapings for microscopic examination
  - Yeasts
  - Fungi
  - Parasites
  - Fibrous glass
- Cultures
- Patch testing
  - to detect contact allergy
- Skin biopsy

Role of Patch Testing:
- Useful if allergen is believed to be the cause of an occupational skin disease.
- Valuable laboratory test to add scientific support to one’s diagnosis.
- Cannot be used to determine the presence of an irritant.
- Limitations
  - Compounds can be primary irritants and can lead to false positive reactions
  - Can sensitize individual to number of different substances to which sensitization did not exist.
- True Test (1-800-TRUETEST):
  - Uses 24 common industrial allergens

General Treatment Strategies:
- Oral steroids
- Antihistamines
- Moisturizing agents
- Drying agents
- Identify cause and eliminate causal agents - basis for Occupational Medicine as a Preventive Medicine specialty
- Topical steroids
Prevention of Occupational Skin Disorders:

- Engineering Controls
  - Materials selection
    - ID potential irritants and allergens
    - Substitute for less irritating or allergic substances
  - Ventilation
  - Closed systems
- Personal Protective Equipment
  - Protective gear
  - Cleanliness
  - Barrier agents

Prevention of Occupational Skin Disorders: “Cont’d”

- Good Work Practices
  - Materials handling
  - Good housekeeping
  - Educational efforts to promote awareness of potential irritants and allergens both at work and home
- Administrative Controls
  - Pre-placement exams
  - Periodic monitoring
  - Job rotation
  - Motivational techniques to assure safe work practices

References

- www.cdc.gov pictures are all from CDC
- Cell 210-289-8606 Liz Clark, D.O.