Topical treatment in dermatology

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Topical preparations

Semi-solid preparations containing either dissolved or suspended functional ingredients.

Ointments

- one-phase preparations in which a soluble part and a solid ingredient are mutually dispersed

Creams

- double-phase preparations, contain a lipophilic phase and a water phase

Lotions

- double-phase preparations, contain mostly water phase

Gels

- colloidal mass of a water-soluble medicated material

Ointments

- Contain about 80% of oil
- Cannot be removed or dissolved with water
- **Base of ointments (examples):** vaseline, animal oils, plant oils, esters of glicerol, wax, silicones
- **Action:** highly oclusive, soften stratum corneum of epidermis, decrease the trans-epidermal water loss
- **Indications:** diseases with hyperkeratois (removal of scales and crusts)
- **Contrandications:** acute dermatitis with exudate

Creams

- Semi-solid emulsions of oil and water
- Less greasy than ointments, contain about 50% of oil
- **Properties:** less oclusive than ointments, smooth texture, easily absorbed
- **Indications:** acute dermatitis with exudate, also in intertriginous areas
- **Warning:** a higher content of water require an addition of preservatives which may cause irritation

Lotions

- Contain mostly water, may contain also alcohol,
- **Properties:** low-viscosity, much thinner formulation than ointment and cream, absorb quickly

Gels

- Colloidal mass of a water-soluble medicated material, usually translucent
- Combination of cellulose, water, and alcohol
- **Properties:** non-oclusive, non greasy, easy-absorbable
- **Indications:** application on mucous membranes, scalp and acne-prone skin

Topical corticosteroids - classification

European classification: 4 classes (I-IV): I the least potent, IV the most potent

Classification in US: 7 classes – 7 the least potent, 1 the most potent

The division is based on a result of a **vasoconstriction test**

The stronger vasoconstriction of blood vessels, the more potent corticosteroid

European classification: 4 classes (I-IV): I the least potent, IV the most potent

Class I: mild
- Hydrocortisone 0,5%
- Hydrocortisone acetate 1,0%
- Metyloprednisolone 0,25%
- Dexametasone 0.1-0.2%
- Flucinilone acetonide 0,0025%

Class II: moderate
- Flumetasone pivalate 0.02%
- Betametasone benzoate 0.025%
- Deoximetasone 0.05%
- Betamethasone dipropionate 0.05%
- Hydrocortisone butyrate 0.1%
- Triamcinolone acetonide 0.04%

Class III: potent
- Flucinilone acetonide 0,025%
- Triamcinolone acetonide 0,1%
- Metyloprednisolone aceponiate 0.1%
- Betamethasone benzoate 0.25%
- Betamethasone dipropionate 0.05%
- Mometasone furoate 0.1%

Class IV: very potent
- Clobetasol propionate 0.05%
- Flucinolone acetonide 0.1%
- Halcynonine 0.1%

Classification in US:

7 classes – 7 the least potent, 1 the most potent

Class 7 Least potent	Hydrocortisone 1.0%; Hydrocortisone 2.5%
Class 6 Mild	Desonide 0.05%; Fluocinolone 0.01%; Hydrocortisone butyrate 0.1%
Class 5 Lower mid-strength	Fluticasone propionate 0.05%; Triamcinolone acetonide 0.025%
Class 4 Mid-strength	Mometasone furoate 0.1%; Fluocinolone acetonide 0.025%; Triamcinolone acetonide 0.1%
Class 3 Upper mid-strength	Fluticasone propionate 0.005%; Amcinonide 0.1%; Triamcinolone acetonide 0.5%
Class 2 Potent	Betamethasone dipropionate 0.05%; Desoximetasone; Fluocinonide 0.05%
Class 1 Super potent	Clobetasol propionate 0.05%; Diflorasone diacetate 0.05%; Fluocinonide 0.1%

- Ference JD, Last AR. Choosing topical corticosteroids. *American Family Physician*. 2009;79(2): 135-140.

Classification in US:

7 classes – 7 the least potent, 1 the most potent

Examples:

Class VII (least potent)

Class VI (mild)

Class V (lower mid-strength): **fluticasone propionate 0.05% cream**

Class IV (mid-strength): **mometasone furoinate 0.1% cream**

Class III (upper mid-strength): **fluticasone propionate 0.05% ointment**

Class II (potent): **betametasone dipropionate 0.05% cream, mometasone furoinate 0.1% ointment**

Class I (super potent): **betametasone dipropionate 0.05% ointment**

Classification in US:

7 classes – 7 the least potent, 1 the most potent

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Class VI (mild)

Class V (lower mid-streng **ropionate 0.05% cream**

Class IV (mid-strength): **mometasone ream**

Class III (upper mid-strength): **fluticasone propio ent**

Class II (potent): **betametasone dipropionate 0.05% cream furoinate 0.1% ointment**

Class I (super potent): **betametasone dipropionate 0.05% ointment**

OINTMENTS ACT MORE POTENT THAN CREAMS

The choice of appropriate corticosteroid

Very potent corticosteroids

- Should be used only in **severe course of dermatitis**
- Shoud be used in localizations **OTHER than** face and intertriginous areas
- May be applied on a small skin surface, scalp, palms and soles, nails, extensor surfaces of limbs, skin with thic scales
- Period of time (usage): **less than 4 weeks** with maximal frequency once a day
- EXAMPLES: **clobetasole propionate, betamethasone dipropionate**

The choice of appropriate corticosteroid

Moderate and potent corticosteroids

- Usage in „moderate" course of dermatitis
- Applied on skin **OTHER** than face and intertriginous areas
- May be used on flexor surfaces of limbs but in a period of time **< 6-8 weeks** with maximal frequency once a day
- EXAMPLES: **mometasone furoinate, fluticasone propionate**

The choice of appropriate corticosteroid

Mild corticosteroids

- May be used on a large skin surface areas, thin skin, face, eyelids, genital areas, intertriginous areas
- May be applied on a skin for longer period of time, **e.g repetitive cycles of 1-2 weeks treatment, up to once or twice a day**
- EXAMPLES: **hydrocortisone, dexamethasone**

Methods of treatment with topical corticosteroids

- **Classical continuous therapy**
  - First – potent cotricosteroid
  - Then – mild corticosteroid
- **Intermittent therapy**
  - 3 times a week
  - Weekends
  - Alternating (e.g. clobetasole/ hydrocortisone)
  - Pulses

Adverse reactions of topical corticosteroids

- Atrophy of epidermis and dermis
- Acne
- Local infections
- Hypertrichosis
- Stretch marks
- Purpura
- Erythema and teleangiectasias
- Contact allergic dermatitis
- Impaired wound healing
- Perioral dermatitis
- Glaucoma

The probability of cutaneous adverse effects depends on a **potency** of corticosteroid used for treatment

To minimalize the risk

Use a corticosteroid of a lowest potency for the shortest period of time and only when indicated

How to calculate the amount of corticosteroid required for the treatment?

1 surface of a hand of a patient

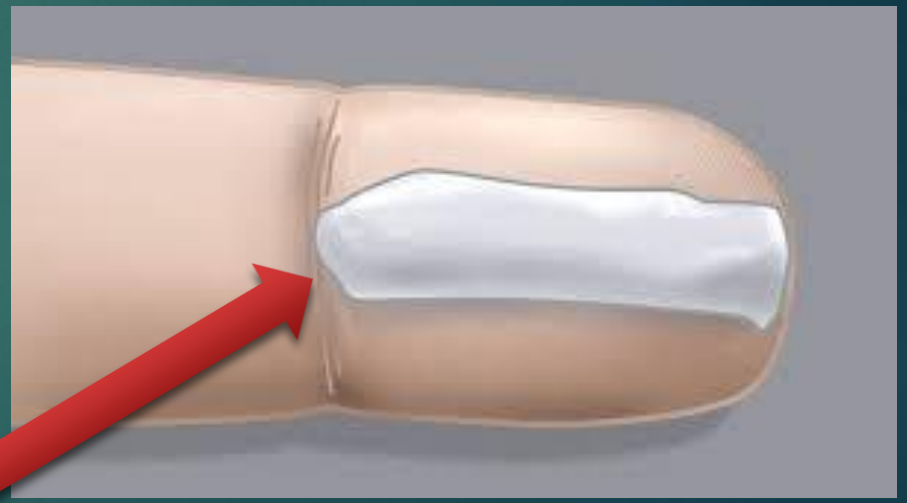
=

1% of **B**ody **S**urface **A**rea (**BSA**)

Fingertip unit (FTU)

- Defined as the amount of ointment or cream expressed from a tube with a 5 mm diameter nozzle applied from the distal skin-crease to the tip of the index finger of an adult
- 1 FTU = 500 mg of ointment/cream
- 1 FTU for the treatment of 2% BSA

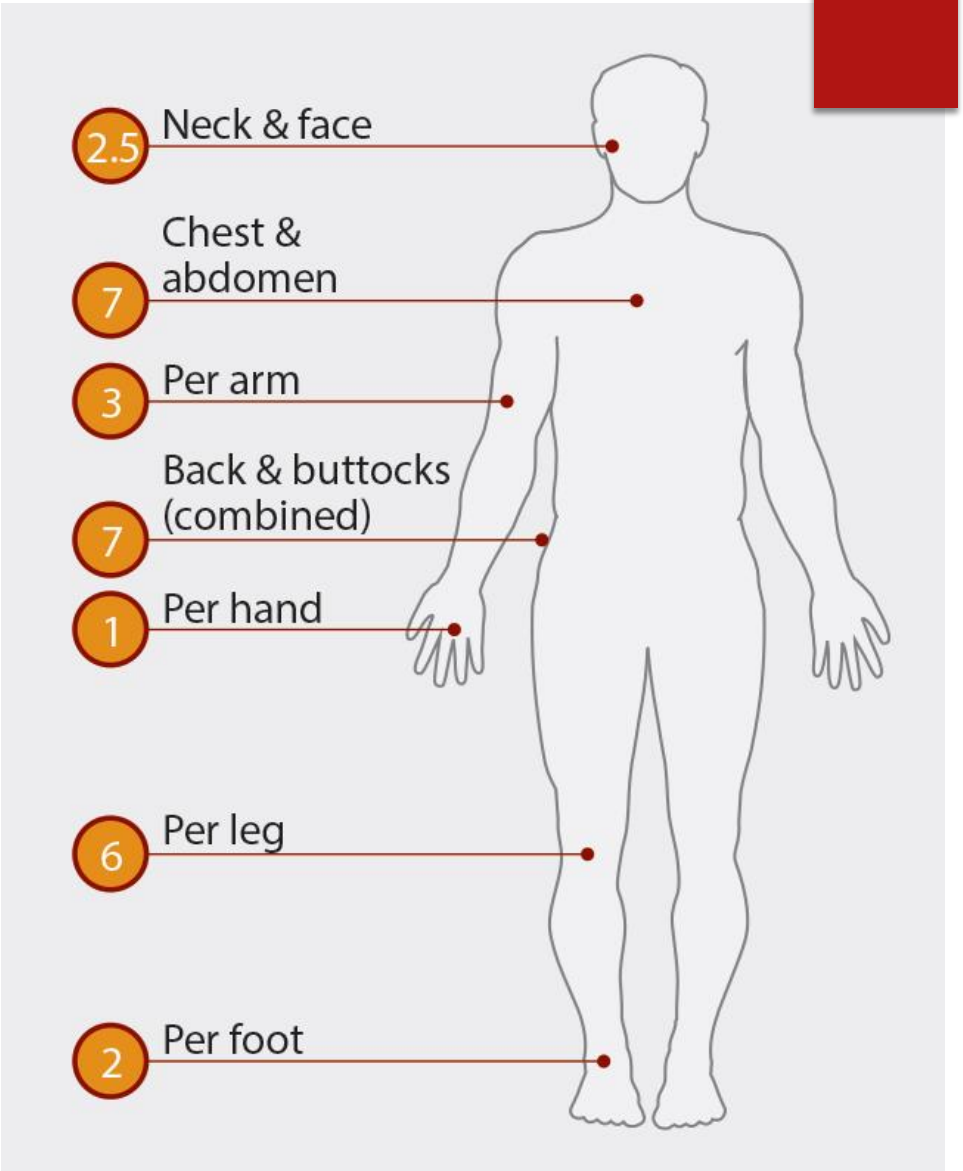
4 hand areas = 2 FTU = 1 g



Distal skin-crease

Fingertip unit (FTU)

- 1 FTU per hand
- 2 FTU per foot
- 2.5 FTU per neck and face
- 3 FTU per arm
- 6 FTU per leg
- 7 FTU per back & buttocks or chest & abdomen



Topical treatment in psoriasis

Indication

- **BSA** ≤10 % and **PASI** ≤ 10 and **DLQI** ≤ 10 points
- Residual skin lesions after systemic treatment

Topical treatment in psoriasis

It is advised to use keratolytic preparations at the beginning of treatment which contain:

- Urea
- Salicylic acid
- Ointments with sulphur

To remove the scale and improve the penetration and absorption of a medication

Topical treatment in psoriasis

Derivatives of vitamin D

- **calcipotriol**
- **tacalcitol**

Action

- Inhibit the proliferation of keratinocytes
- Induce the maturation of keratinocytes
- Verified clinical efficacy
- Good cosmetic properties
- High safety profile

It is advised to combine derivatives of vitamin D with topical corticosteroids regarding their synergic action.

Topical treatment in psoriasis

High potency topical corticosteroids

- Effective but treatment with the **high risk of adverse effects**
- Sudden withdrawal of topical corticosteroids may lead to **rapid reoccurence** and an exacerbation of psoriatic skin lesions – their severity may be even greater than before the treatment

Rebound effect – the relapse of skin lesions in a short period of time after discontinuation of treatment

Topical treatment in psoriasis

Combined formulations

- Betamethasone dipropionate + calcipotrol
- Betamethasone dipropionate + salicylic acid

Advantages

- Higher efficacy
- Better tolerance and easier application on the skin
- Better compliance

Topical treatment in psoriasis

Calcineurin inhibitors

- Pimecrolimus (cream)
- Tacrolimus (ointment) 0.03% or 0.1%

Indications

- Skin lesions localized on a face
- Treatment of inverse psoriasis (flexural, intertriginous areas)
- Treatment „off label”

Topical treatment in psoriasis

Cignoline

- Keratolytic and anti-proliferative properties

Numerous side effects

- Discoloration of skin and fabrics
- Characteristic irritating smell
- Skin irritation
- Cannot be used on a face, in intertriginous areas and in case of severely inflammed skin lesions

Currently cignoline **is not** a substance of a first choice in the treatment of psoriasis

Topical treatment in acne

Topical retinoids

- Derivatives of vitamin A
- Normalize the proces of keratinization

Action

- Anticomedogenic
- Keratolytic
- Anti-inflammatory (weak – adapalene)

Retinoids prevent the formation of „keratin plugs" in follicular ostia and in consequence the formation of comedones

Topical treatment in acne

Topical retinoids

Side effects

- Dryness of skin
- Erythema and irritation
- Burning sensation
- Itch

Topical retinoids:

- Adapalene
- Trifarotene
- Tretinoin
- Isotretinoin

Topical treatment in acne

Benzoyl peroxide

- Often combined with topical antibiotics or retinoids
- Prevent antibiotic resistance

Action

- Antibacterial
- Comedolytic

Formation of Reactive Oxygen Species (ROS) which act on a cell wall of *Propionibacterium acnes*

Side effects

- Dryness of skin
- Exfoliation of epidermis
- Burning sensation
- Erythema
- Discoloration of hair and fabrics

Topical treatment in acne

Topical antibiotics

Action

- Antibacterial – reduce the amount of *Propionibacterium acne*
- Anti-inflammatory – act anti-chemotactic and decrease the inflow of leukocytes

Topical antibiotics:

- Erythromycin 2% - solution, gel
- Clindamycin 1% - solution, gel

Topical treatment in acne

Side effects

- Skin dryness
- Excessive exfoliation of epidermis
- Itching
- Burning sensation

An indication for using emolients/moisurizers to decrease the erythema

Topical treatment in acne

An assessment of the results of treatment

- The improvement is visible only after 2-3 months of treatment
- Results are highly dependable on the patient's compliance

Combined formulations:

- Clindamycin 1%+ benzyl peroxide
- Adapalene + benzyl peroxide
- Erythromycin 2% + tretinoin
- Clindamycin 1% + tretinoin

Higher efficacy than monotherapy

Antifungal preparations

- Effective for superficial and limited infections of skin

Fungal infection of **scalp** and involvement of more than 3 **nails** > 50% of surface is an indication for **systemic treatment**.

- Topical preparations are often used in combination with systemic treatment of onychomycosis

Antifungal preparations

Antifungal antiseptics

- Undecylenic acid
- 3% resorcinol

Antifungal antibiotics

- Nystatin
- Natamycin

Antifungal chemotherapeutics

- Imidazoles (ketoconazole, itraconazole, miconazole etc.)
- Amorolfine
- Cyclopiroxolamine
- Terbinafine

Topical treatment of scabies

Permethrin 5% cream **Permethrin 4% gel**	One-time usage, repetition after 14 days
Crotamitone (ointment, solution)	Once daily for 3-5 days

Topical treatment in androgenetic alopecia

Minoxidil 2% or 5% solution

- Minoxidil was primarily used orally for the treatment of hypertension
- Its mechanism of action in not fully elucidated - stimmulated hair growth because of the increase of the blood flow in capillaries around hair follicle
- First results after 2 months
- The highest efficacy when used >12 months

Topical treatment of warts

palmoplantar warts →
- 5-fluorouracil
- Salicylic acid
- Lactic acid

anogenital warts →
- Podophyllotoxin
- Imiquimod