Clinical Podiatry and Pharmacy
Conflicts of Interest

• None to disclose.
Objectives

• To understand basic pathophysiology foot.
• 5 most common foot pathologies that present to pharmacists.
• To recognize and recommend products to:
  a) Men & Women
  b) Children
  c) Pregnant women
• Myths about podiatric treatment.
• The role of podiatry and POM’s in Manitoba.
Acknowledge

• Kim McIntosh, Assistant Registrar to MPhA.

• Advit Shah, B.Sc. Pharmacy
Dr. Amar M. Gupta, Podiatrist

- Graduated from University of Winnipeg ‘96 – BSc. Biology

Positions Held:

- College of Podiatrists of Manitoba (COPOM)- treasurer (3 terms).
- Canadian Podiatric Medical Association (CPMA)
- Task force for Surgical regulations committee (SRC)

Research Interest within surgery

- To evaluate accuracy of percutaneous release of the deep transverse metatarsal ligament (DTML) from the web space for Morton’s neuroma using fresh cadavers under diagnostic ultrasound.
Foot & Ankle Clinic, 1365 Grant Ave.

- [www.winnipegfootclinic.com](http://www.winnipegfootclinic.com)
- Interest in MSK problems, DxUS, surgery.
Foot Anatomy

• How many bones are in the foot?

• What is a normal foot?

Angiology

- Arterial blood supply to the foot & ankle is provided by 3 arteries (Kelikian 2011):
  - Anterior tibial
  - Posterior tibial
  - Peroneal artery

- 12% population will have a absent dorsalis pedis artery (Huber 1941)

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Plantar arteries

• 2% population will have a absent posterior tibial artery (Huber 1941)

Dorsal and Plantar veins of the foot

Nerves

- The nerve supply to the foot & ankle is provided by the branches of the sciatic n.
- The branches are: Sural n., Superficial peroneal n., Accessory deep peroneal n., Deep peroneal n., posterior tibial n. (MPN & LPN).
- The Saphenous n., a branch of the femoral n., gives limited contribution.
pathophysiology

- Most difficult management scenario for pharmacists and health care professionals is Diabetes and foot problems.
- Diabetes world wide will increase 366 million by 2030 (Wild et al. 2004).
- Diabetic patient has 25 % risk of developing foot ulcer in their lifetime (Singh et al. 2005).
- Annual incidence of diabetic foot ulcer 3%-10% (Reiber et al. 1999).
- Diabetic ulceration has shown to proceed amputation in up to 85% of cases (Reiber et al. 1999).

4 Principal pathophysiologic factors responsible for foot ulcers:

- Neuropathy
- Ischemia
- Peripheral vascular disease
- Infection (Clayton & Elasy 2009).

Neuropathy, Ischemia & Infection

• Development of neuropathy to be a result of hyperglycemia-induced metabolic abnormality (Zochodone 2008).
• Current theory is through the Polyol pathway Feldman et al. 1999):

Diabetic pes cavus neuropathic foot
Peripheral Arterial Disease (PAD)

• PAD is a contributing factor to ulcers in 50% of cases (Boulton et al. 2008).
• Generally affects tibial and peroneal arteries of the gastrocnemius.
• Endothelial cell dysfunction and smooth cell abnormalities develop in peripheral arteries as a consequence of the persistent hyperglycemic state (Zochodone 2008).
• There is a resultant decrease in endothelium-derived vasodilators.

5 common foot pathologies presented to a Pharmacist

- Callus

- Keratoma (Corns)

- Warts (HPV)
• Athlete’s Foot / Fungal nail

• Heel Pain Syndrome
Callus

- Thickening of the Stratum Corneum (SC).
- Result of repeated friction, pressure, or irritation.
- Can be treated with keratolytics.
- **Pathophysiology:**
  1) Chronic pressure or irritation
  2) Initial vasodilation → Increased SC production → epidermal thickening (hyperkeratosis) → reduced desquamation

15 years

Which one is normal?

2 years
Products to recommend

- Kerasal 15 g or 30 g (5% SCA + 10% urea)
- Uremol 20% (emollient) or 40% (keratolytic)
- UriSec 22% or 40%
- Lactic Acid (Lac-Hydrin 12%, Dermalac 12%)

**Mechanism**: Urea works by enhancing the water-binding capacity of the stratum corneum and long-term treatment with urea has been demonstrated to decrease transepidermal water loss (TEWL) (Flynn et al. 2001).

Who to refer?

- Diabetics → “Do not pass go” → Podiatrist for **risk assessment** & treatment protocol
- Men & woman → recommend OTC 20% urea-based products → no improvement after 8 weeks → refer for podiatry consult.
- Kids → Normally should not have callus → Refer before it becomes a chronic problem.
- When callus becomes painful? → DDx: mechanical, plantar wart, foreign body granuloma, Porokeratosis, corns (hard, soft, ID) → Podiatry → dermatology.
Corns

• A corn is a circumscribed hyperkeratotic lesion with a central conical core of keratin.

• **Pathophysiology:**
  1) Chronic pressure or irritation
  2) Initial vasodilation → Increased SC production → epidermal thickening (hyperkeratosis)
  3) hyperkeratosis → increases localized SC → 3 types of corns
Products to recommend

• OTC products that contain salicylic acid should be avoided in neuropathic and immuno-compromised patients because they may damage surrounding normal tissues especially (Akdemir et al. 2011, Singh et al. 1996)


What is happening here?
Better alternative to corn removers

- Men & Woman → Recommend digital cap versus corn removers → try for 4 weeks + change footwear → no improvement, refer to Podiatry.

- Kids → Normally, should NOT get corns → refer to Podiatry for biomechanical examination.

- Diabetics → recommend digital caps to prevent further mechanical injury → Podiatry → GP
Warts

- Warts are common and benign epithelial growths caused by human papillomavirus (HPV).
- Currently more than 100 types of HPV, with type 2, 4 (common wart) & type 1 (Palmoplantar wart).
- **Pathophysiology**: Thickening of stratum corneum (→ hyperkeratosis), thickening of stratum spinosum (→ acanthosis), thickening stratum granulosum, rete ridge, blood vessels at dermoepidermal junction.
- S.C.C., most common on the plantar surface that can resemble warts.
• A RCT, cryotherapy versus 50% salicylic acid with 240 pts (12 YOA>) demonstrated no evidence of a difference b/w treatments for clearance of warts within 12 weeks (Cockayne et al. 2011).
• Imiquimod 5% cream (Aldara) to treat mosaic warts demonstrates 30% clearance (Grussendorf-Conen et al. 2002).
• 5-Fluorouracil (Efudex) recent study 2006, prospective, RCT demonstrated 85% cure rate 12 weeks (Salk et al. 2006). Sample \( n = 40, p = 0.001 (0.1\%), \) can not base any inference to general population

- Studies are very limited to plantar mosaic warts
- Cost benefit / ratio?

Products to recommend

• Men & Woman, Teenagers → SCA products (27% >) because of the thick stratum corneum.

• Kids → <27% due to no thickening SC.
When to refer?

• HPV (verruca vulgaris) – Men/Woman → If no improvement with OTC after 8 weeks → Podiatry (Cryotherapy, electrosurgery, Laser surgery)

• Pregnant woman → no caustics or acids (SCA) → Podiatry (Cryotherapy)

• Kids → no pain with single lesion < 0.5 cm → No treatment
  → pain present with single lesion → Treat with OTC and wait 6-to-8 weeks
  → pain with multiple lesions → Podiatry review of options
Fungus

- Tinea pedis (prevalence 15%) and onychomycosis - O/C (prevalence 6-8%)

- 4 types of O/C:-
  - Distal subungual O/C (DSO)
  - White superficial O/C (WSO)
  - Proximal superficial O/C (PSO)
  - Candidial O/C
Topical creams

• **Topical Allylamines** (Naftifine & Terbinafine)
  - compared with placebo, Topical allylamines used for between 1 and 4 weeks are more effective at curing athlete's foot (defined as negative results on microscopy and no growth of dermatophytes in culture) at 2-to-6 weeks (Crawford & Hollis 2007).

<table>
<thead>
<tr>
<th>84 people</th>
<th>Mycological cure rates, 4 weeks</th>
<th>P &lt;0.0001</th>
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<tbody>
<tr>
<td></td>
<td>18/29 (69%) with terbinafine 1%</td>
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<td>4/27 (16%) with placebo</td>
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<table>
<thead>
<tr>
<th>84 people</th>
<th>Mycological cure rates, 6 weeks</th>
<th>P &lt;0.0001</th>
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<tr>
<td></td>
<td>25/29 (86%) with terbinafine 1%</td>
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<tr>
<td></td>
<td>3/27 (11%) with placebo</td>
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• Meta-analysis of 11 trials comparing allylamines and azoles showed a risk ratio of treatment failure RR 0.63 (95% CI 0.42 to 0.94) in favour of allylamines (Crawford & Hollis 2007).

• Allylamines cure slightly more infections than azoles.


Antifungals

- An open non-comparative study of Ciclopirox 8% demonstrated 36% cure rate of 40 patients in 9-months (Shemer et al. 2010).
- **Inclusion criteria NOT** mentioned based on selection of fungus growth/penetration along proximal or distal part of nail;
- **Selection bias**

Griseofulvin

- **Griseofulvin** first isolated from a *Penicillium spp.*, used to treat ring worm.
- insoluble in water
- administered orally
- reaches the skin and hair
- it is deposited primarily in keratin precursor cells
- mainly effective against *Trichophyton rubrum* and *T. mentagrophyte*
- adverse reactions are uncommon
metaphase
Interactions:

• Nicotinamide (Vitamin B3), Alpha-tocopherol (Vitamin E) and dietary fat affect drug performance and toxicity
  
  – Vitamin B3 and dietary fat increase griseofulvin solubility
  – Vitamin E slows down the biotransformation rate of griseofulvin elevating its blood serum and skin concentrations

• Vitamin K levels are reduced by griseofulvin

• Affects Probiotic intestinal flora
  – overgrowth of nonsusceptible organisms particularly
Oral Terbinafine

- synthetic antifungal agent
  - highly lipophilic
- accumulates in skin, nails, and fatty tissues

- more effective and significantly less toxic than griseofulvin
• **Mode of Action:**
  - inhibits ergosterol biosynthesis via inhibition of squalene monooxygenase (squalene epoxidase)
  - the enzyme that is part of the fungal sterol synthesis pathway
    
    Squalene
    # Terbinafine #
    2,3-oxidosqualene

![Chemical Structures](image)
What product to recommend?

- Nails → No OTC products → systemic → white superficial onychomycosis → 1% Clotrimazole 6 weeks bid.

- Skin → 1% Clotrimazole 60 g (Canestan), Tolnaftate (Tinactin)
When to refer to?

• **Nails?** → Podiatry for KOH test + C&S → GP (Oral lamasil 250 mg PO OD x 30 w/repeat x2 + Liver test: AST, ALT, Bilirubin)

• **Skin?** → OTC Azole (2-4/52) → 6/52 no improvement → refer to podiatry / GP → dermatology/ Orthopedics
Heel Pain Syndrome/ Plantar Fasciitis

• “fasciitis” or “Fasciosis”??
  – What clinical evidence would constitute “itis”?


• To treat with NSAID’s or NOT??
Normal PF
Clinical Case

- 64 Female, worked in house keeping.
- PMHx: Nil;
- Current Meds: Voltaren gel 1%;
- Allergy: NKA;
Diagnostic Ultrasound

Normal PF

Fusiform, hypoechoic, with loss of fibrillar Pattern & ill-defined fascial plane
Neovascularization
To Rx NSAID’s or not to Rx?

- Retrospective study, 27% patients reported significant improvement with NSAID (Gill & Kiebzak 1996).
- Randomized, prospective, placebo-controlled Celecoxib 200 mg (Donley et al 2007). Concluded: NSAID, may increase pain relief.
- Sample size was not sufficient to show statistical significance, n= 23, p = 0.05, statistical power = 0.8 (n=128), with p= 0.01 (n=192).

Celecoxb (Celebrex)

- Is a sulfa NSAID and a selective COX-2
- Used to treat OA (osteoarthritis) and RA primarily.
For PF what to recommend?

• Remember, if complains post-static dyskinesia:
  • Men/Woman: control tensile stress, use a full-length arch support ¼” thick with MLA support

• **No** post-statis dyskinesia (Periosteal bone edema):
  • Men/Woman: Viscoelastic ¾” heel pad
Who to refer to for PF?

- Heel pain syndrome referral (men/woman) → if OTC product does not decrease symptoms 6/52 → Podiatry.
- Heel pain syndrome + burning (men/woman) → Podiatry → Neurology (EMG)
- Kids (Sever’s disease, Calcaneal apophysitis) → if OTC ¾” heel pad/ramp does not alleviate symptoms 6/52 → Podiatry (DxUS) → x-ray → Pediatrician.
Good night bunions?

- Cohort study 30 patients with complaint hallux valgus
- Randomly divided into two groups: Case group had a custom splint and control was given OTC splints.
- Inclusion criteria for hallux valgus angles were mild or moderate

- $p = \text{case group} < 0.001$, no significance found in control group (Mirzashahi et al. 2012)
- Night splints do not work for painful hallux valgus (Tehraninasr et al. 2008).

OTC insoles

• Whether OTC moulding process would significantly alter rearfoot, midfoot, or shank kinematics as compared to a no-orthotic condition.

• A semi-custom moulded orthotic does not control rearfoot, shank, or arch deformation but does, however, reduce plantar fascia strain compared to walking without an orthoses. Heat-moulding the orthotic device does not have a measurable effect on any biomechanical variables compared to the non-moulded condition (Ferber & Benson 2011).

Basic Algorithm

- Arch Pain → Medium density to reduce tensile stress
- Heel Pain → post-static dyskinesia → Heel pain arch support
- Heel Pain → No post-static dyskinesia → Heel pad ¾”
- Forefoot pain → metatarsal pad / Ball of foot
- Diabetic/ Rheumatoid foot → Tridensity insole (memory fit)
• **MYTH 1**: Banana peel, duct tape, nail polish, penny, and garlic are all efficient treatments for warts.

• **Myth 2**: Tea Tree oil (TTO) is efficient treatment for fungal nails.


<table>
<thead>
<tr>
<th>Fungal species</th>
<th>% (vol/vol)</th>
<th>MIC</th>
<th>MFC</th>
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<tbody>
<tr>
<td><em>Trichophyton mentagrophytes</em></td>
<td>0.11–0.44</td>
<td>0.25–0.5</td>
<td></td>
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<tr>
<td><em>T. rubrum</em></td>
<td>0.03–0.6</td>
<td>0.25–1</td>
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• **Myth 3**: Does Ranitidine clear verruca vulgaris?

• **Myth 4:** Flat feet and high arches are bad?

• **Myth 5:** All babies have flat feet

Podiatry and POM’s

• Pharmacy regulations will include Podiatry who have prescribing privileges.

• COPOM currently working on plan for independent prescribing within the RHP Act.

• Additional training will be required for U.K. Podiatrists (MSc. Program) and for DPM’s (from the United States).