Master Biologie-Santé
UE Microbiologie-Pathologies

Parasitoses cutanées

F. Pagniez

Introduction

- Protozoaires, helminthes ou arthropodes

TABLE 2. Protozoa Parasites of the Skin and Subcutaneous Tissues

Parasite (Infection)	Cutaneous/Subcutaneous Manifestation	Geographic Distribution
Entamoeba histolytica (amebiasis cutis)	Anogenital ulcers, exophytic lesions; extension of visceral disease to skin around abdominal wounds/colostomy site	Primarily tropics and subtropics; regions with poor sanitation
Free-living amebae: *Acanthamoeba* species, *Balamuthia mandrillaris* (amebiasis)	Ulcers, pustules, nodules, plaques	Worldwide
Leishmania species (cutaneous and mucocutaneous leishmaniasis)	Cutaneous: varies by form of disease, ulcers, macules, papules, nodules, patches; Mucocutaneous: destructive ulcerative lesions	Tropics and subtropics worldwide
Toxoplasma gondii (toxoplasmosis)	Macules, papules; hemorrhagic, lichenoid, exfoliative lesions	Worldwide
Trypanosoma brucei (African trypanosomiasis, sleeping sickness)	Chancre at bite site, maculopapular rash with circinate forms	Sub-Saharan Africa
Trypanosoma cruzi (American trypanosomiasis, Chagas disease)	Nodule (chagoma) at bite site; plaques, papules, ulcers, panniculitis in reactivated disease in immunocompromised patients	Latin America, parts of the Southern United States

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TABLE 3. Helminth Parasites of the Skin and Subcutaneous Tissues

Parasite (Infection)	Cutaneous/Subcutaneous Manifestation	Geographic Distribution
Ancylostoma braziliense, other zoonotic hookworms (cutaneous larva migrans)	Initially pruritic papule which evolves into a serpiginous erythematous tract; may become vesicular	Tropics and subtropics
Dioctophyma renale (dioctophymiasis)	Subcutaneous nodule	Worldwide
Dirofilaria species (dirofilariasis)	Subcutaneous nodule	Worldwide
Dracunculus medinensis (dracunculiasis)	Initial vesicle; ulcerates with worm protrusion	Limited foci in rural regions of sub-Saharan Africa
Gnathostoma species (gnathostomiasis)	Migratory cutaneous/subcutaneous swelling	Primarily Asia and Mexico
Hookworms (ancylostomiasis, hookworm infection)	Pruritic vesicular rash at site of larva penetration (ground itch)	Tropics and subtropics; temperate regions with sufficient humidity
Lagochilascaris (lagochilascariasis)	Subcutaneous abscess, fistula; usually head and neck	Central and South America
Loa loa (loaiasis)	Migratory cutaneous/subcutaneous swelling (Calabar swellings)	Sub-Saharan Africa
Mansonella streptocerca (mansonellosis)	Hypopigmented macules, pruritus	Sub-Saharan Africa
Onchocerca volvulus (onchocerciasis, onchocercal dermatitis)	Subcutaneous nodule (onchocercoma), pruritic papular rash with pigmentation alteration	Sub-Saharan Africa, Latin America, Middle East
Schistosoma species (schistosomiasis, cercarial dermatitis/"swimmer's itch")	Urticarial maculopapular rash (initial cercariae penetration, Katayama syndrome), papules and nodules (usually genital/perineal skin; due to egg deposition)	Tropics and subtropics. Also self-limited cercarial dermatitis due to zoonotic schistosomes worldwide
Spirometra species (sparganosis)	Subcutaneous nodule; may slowly migrate	Primarily tropics
Strongyloides stercoralis (strongyloidiasis)	Pruritic vesicular rash at site of larva penetration (ground itch), serpiginous erythematous tract, usually on buttocks, lower abdomen and upper thighs (larva currens)	Tropics and subtropics, including regions of the rural southern United States
Taenia multiceps, *Taenia serialis* (coenurosis)	Subcutaneous nodule	Worldwide; most cases from Africa
Taenia solium (cysticercosis)	Subcutaneous nodules	Worldwide; primarily regions where humans live in close contact with pigs and eat undercooked pork*
Trichinella spiralis (trichinosis, trichinellosis)	Macules, papules, periorbital edema	Worldwide
Zoonotic *Onchocerca* and *Brugia* species, (zoonotic filariasis)	Subcutaneous nodules	Worldwide, including North America

*Cysticercosis is caused by ingestion of eggs shed in the feces of humans infected with the adult *Taenia solium* (intestinal form of disease), and not ingestion of pork. Cysticercosis is rare in Muslim-predominant countries where pork is not eaten for religious reason.

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Introduction

- Protozoaires, helminthes ou arthropodes

TABLE 1. Arthropod Parasites of the Skin and Subcutaneous Tissues

Parasite (Infection)	Cutaneous/Subcutaneous Manifestation	Geographic Distribution
Demodex species (demodicidosis)	Usually asymptomatic; role in disease is unclear; may cause papulopustular rosacea, blepharitis, perioral dermatitis, folliculitis, and abscesses	Worldwide
Fly larvae (myiasis)	Furuncles and ulcers (furuncular myiasis), wound myiasis	Worldwide; varies by species (Table 5)
Pediculus humanus (pediculosis)	Adults/nits on hairs (head lice), adults/nits on body/clothing (body lice); erythematous pruritic rash	Worldwide
Pthirus pubis (pthiriasis)	Adults/nits on pubic and/or axillary hairs, eyebrows; bluish macula on trunk (maculae ceruleae)	Worldwide
Sarcoptes scabei (scabies)	Pruritic papules/vesicles and short erythematous tracts (classical scabies), widespread crusted hyperkeratotic plaques (crusted scabies)	Worldwide
Tunga penetrans (tungiasis)	Papules and nodules; central black dot with erythematous margin	Tropics and subtropics, primarily sandy regions

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Myiases

- Superfamille des oestrodiae : oestridae, calliphoridae et sarcophagidae.

TABLE 5. Common Myiasis Causing Flies

Common Name	Scientific Name	Geographic Distribution	Cutaneous Myiasis Type
Human botfly	*Dermatobia hominis*	Mexico to South America	Furuncular
New World screwworm	*Cochliomyia hominivorax*	Central to South America, Florida keys*	Wound
Old World screwworm	*Chrysomyia bezziana*	Sub-Saharan Africa, India, SE Asia	Wound
None; Wohlfahrt's wound myiasis fly (*W. magnifica*)	*Wohlfahrtia* spp.	North America, Europe, Middle East, Asia	Wound
Tumbu fly	*Cordylobia* spp.	Sub-Saharan Africa	Furuncular
Rabbit botfly	*Cuterebra* spp.	North, Central and South America Most frequent cause of US-acquired myiasis	Furuncular Migratory (rare)
Sheep botfly	*Oestrus ovis*	Worldwide in association with sheep	Ophthalmomyiasis
Horse botfly	*Gasterophilus intestinalis*	Worldwide in association with horses	Migratory
Gad fly	*Hypoderma bovis*	Northern Hemisphere	Migratory

**Cochliomyia hominivorax* was eradicated from the United States in 1982 but has recently made a reappearance in Monroe County, Florida.

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Myiases furonculeuses

- *Dermatobia hominis*

Amériques

Lésion suppurative, douloureuse et prurigineuse

Surinfection

Traitement : extraction, étouffement

Myiases furonculeuses

- *Cordyloba anthropophaga*

Afrique tropicale

Séchage vêtements à l'ombre

Exsudats, prurit, adénopathies

Traitement : extraction, étouffement
Prévention : repassage, séchage au soleil

Myiases migrantes

- *Gastrophyllus spp.*
- *Hypoderma bovis*

Bovin hémisphère nord
Eleveurs

Poils/cheveux => peau

Migration sous cutanée profonde
=> tunnel érythémateux
=> furoncle

Traitement : extraction

Myiases de plaie

- *Chrysomya bezziana*
- *Cochliomyia hominivorax*

Amériques nord -> Sud (caraïbe, am centrale)

Rares mais gravité ++

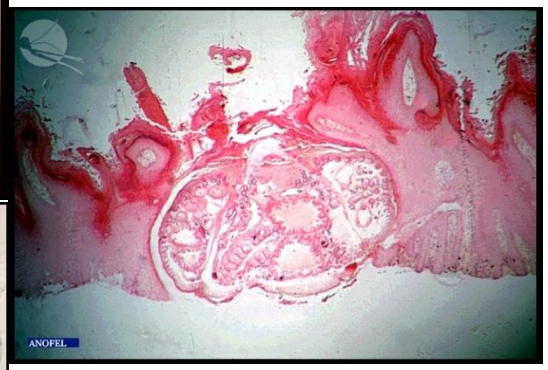
Population larve élevée

Lésion malodorante attirante pour adultes

Traitement : chirurgie

Tungose

- Puce chique, *Tunga penetrans*



Afrique subsaharienne, Amérique sud et caraïbes

Femelle creuse l'épiderme
Plaie ulcérante caractéristique
Formation de cluster

Surinfection

Traitement = extraction

Gale

- *Sarcoptes sp.*
- Pathologie

300 millions cas/an
Épidémiologie : surpeuplement/pauvreté
Gale commune # 15 sarcoptes
papules érythémateuses**, prurit**

Gale profuse > 100 sarcoptes
Idem + Hyperkératose, croutes

Galeries
Localisations : mains, poignets…

Gale

- Recherche hôte : chaleur, « odeur » >> CO_2
- Pénétration par production liquide enveloppant
- Progression avec pattes : « crowling »
- Choix de la zone en fonction composition en lipides…
- Se nourrit de lymphe, sérum
- Aérobie => sortie/entrée galerie

Gale : réponse de l'hôte

- Complément
- Réponse immune :
  - Hyperéosiniphilie
  - Mastocytes
  - PN basophiles
  - PNN +/-
  - DC, rôle ?
  - Ig M, G, A, E

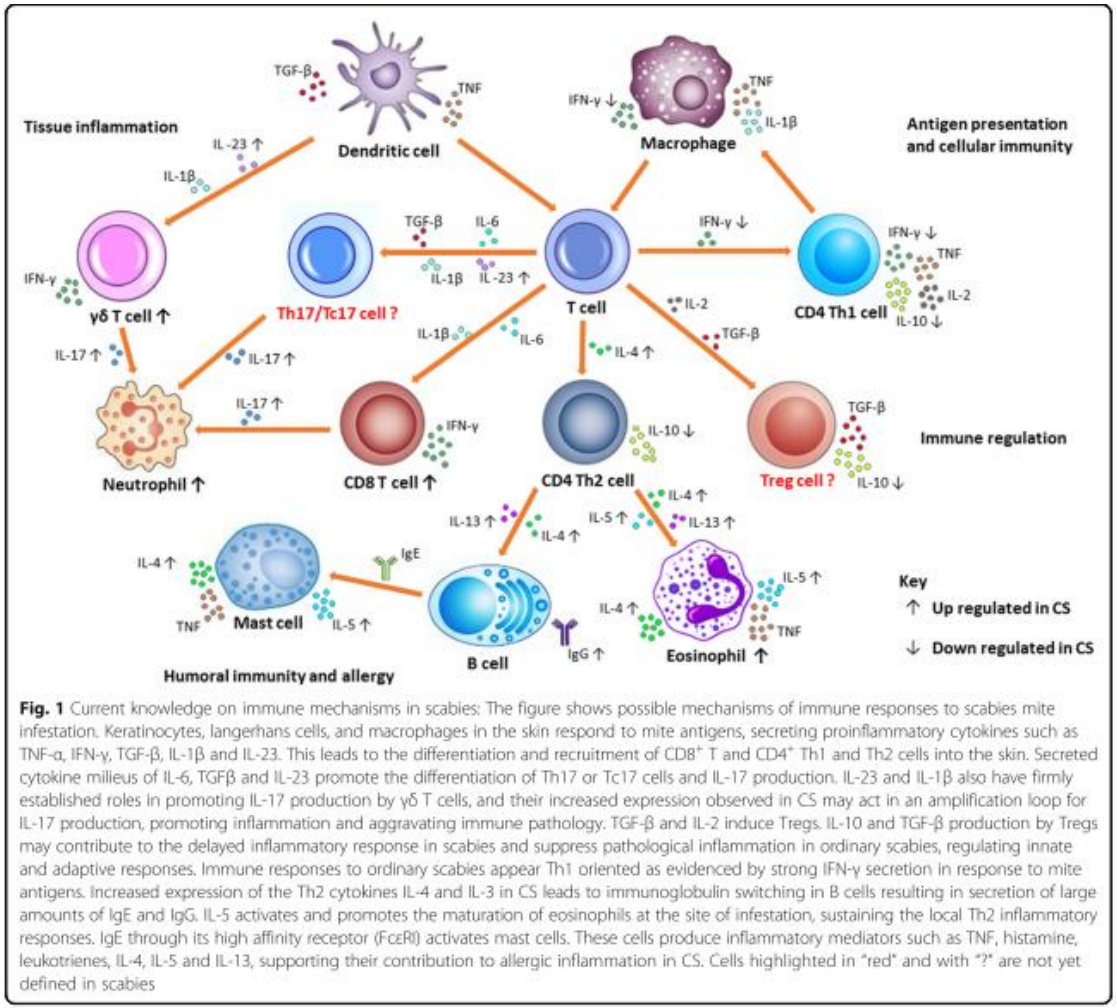


Fig. 1 Current knowledge on immune mechanisms in scabies: The figure shows possible mechanisms of immune responses to scabies mite infestation. Keratinocytes, langerhans cells, and macrophages in the skin respond to mite antigens, secreting proinflammatory cytokines such as TNF-α, IFN-γ, TGF-β, IL-1β and IL-23. This leads to the differentiation and recruitment of $CD8^+$ T and $CD4^+$ Th1 and Th2 cells into the skin. Secreted cytokine milieus of IL-6, TGFβ and IL-23 promote the differentiation of Th17 or Tc17 cells and IL-17 production. IL-23 and IL-1β also have firmly established roles in promoting IL-17 production by γδ T cells, and their increased expression observed in CS may act in an amplification loop for IL-17 production, promoting inflammation and aggravating immune pathology. TGF-β and IL-2 induce Tregs. IL-10 and TGF-β production by Tregs may contribute to the delayed inflammatory response in scabies and suppress pathological inflammation in ordinary scabies, regulating innate and adaptive responses. Immune responses to ordinary scabies appear Th1 oriented as evidenced by strong IFN-γ secretion in response to mite antigens. Increased expression of the Th2 cytokines IL-4 and IL-3 in CS leads to immunoglobulin switching in B cells resulting in secretion of large amounts of IgE and IgG. IL-5 activates and promotes the maturation of eosinophils at the site of infestation, sustaining the local Th2 inflammatory responses. IgE through its high affinity receptor (FcεRI) activates mast cells. These cells produce inflammatory mediators such as TNF, histamine, leukotrienes, IL-4, IL-5 and IL-13, supporting their contribution to allergic inflammation in CS. Cells highlighted in "red" and with "?" are not yet defined in scabies

Gale

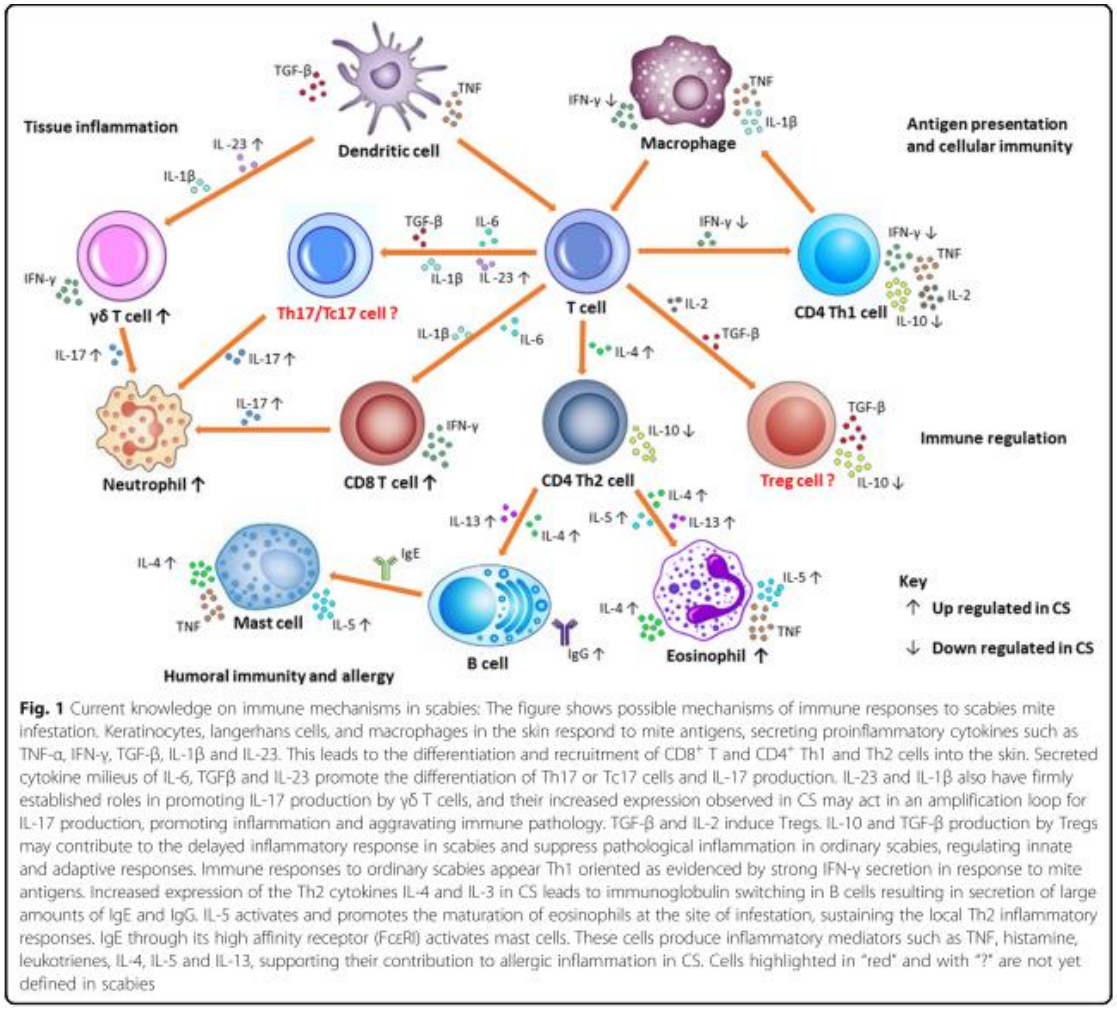
- Réponse immune hôte

Table 2 Effect of scabies mites or mite extracts on key cytokines and molecules from cultured cells in vitro and in vivo

Cell type(s)	Cytokines upregulated	Cytokines downregulated	Reference
Cultured cells treated with mite extracts			
Human skin equivalents (HSE)	CTACK, IL 1α, IL 1β, IL 1Rα, IL-6, IL-8, IL-23A, GM-CSF, M-CSF	Not reported	[18, 83]
Human dermal microvascular endothelial cells (HMVEC-D)	ICAM-1	IL-6, IL-8, VCAM-1	[114, 122]
Human keratinocytes, fibroblasts	IL-6, CTACK, TGF α, CXCL1, G-CSF	IL-8, GM-CSF	[84, 113]
Dendritic cells	TNF-α	IL-6, IL-8	[60]
In vivo studies: humans			
PBMCs	IL-10, IFN-γ, IL-6, IL-8, TNF-α, IL 1β, IL-4, IL-5, IL-13	IL-10	[35, 46, 57]
Serum	IL-10, TNF-α, IFN-γ	IL-6	[47]
Skin biopsies (crusted scabies)	IL-1β, TGF-β	IFN-γ, IL-10?	[23]
In vivo studies: other animals			
Porcine PBMCs	IL-17, IFN-γ	Not reported	[88]
Spleen (from exposed/vaccinated mice)	G-CSF, IL-2, IL-13	ICAM-1, ICAM-2, L-selectin, M-CSF, TNF α, TGF β	[112]
Canine PBMCs	IL-4, IL-5, TGF-β	TNF-α	[123]
Pig skin biopsies	IL-13, IL-17, IL-23, IL-4, IL-2, TGF-β	Not reported	[46]

Gale

- Réponse immune hôte



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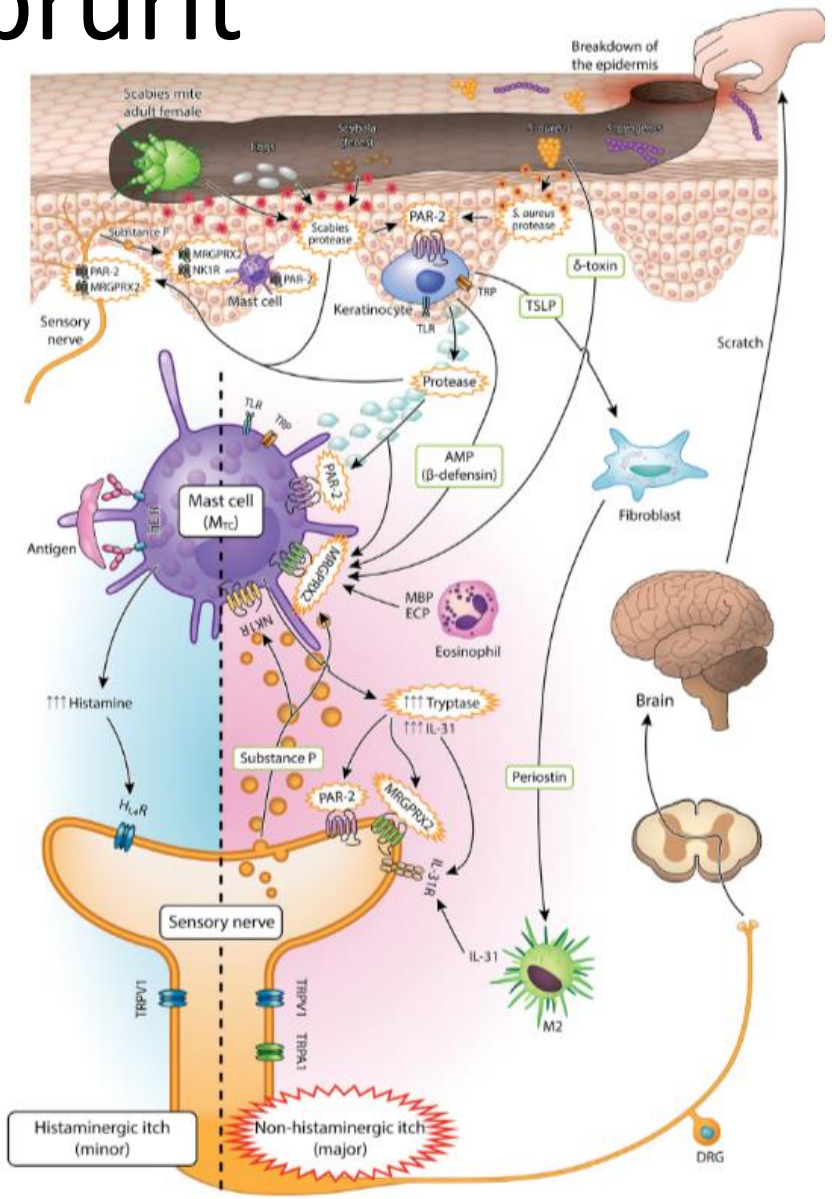
Gale : échappement

- Echappement parasite
- SMIPPs et SMS : inactive complément
- Secrétions d'inhibiteurs migration macrophages ?
- Perte activité des neutrophiles *in vitro*
- IL1-ra

Gale : prurit

- Action directe du parasite
- Infection bactérienne secondaire
- Réaction de l'hôte



Gale

- Gale profuse, gale norvégienne

Table 1 Immune response in scabies

	Ordinary scabies (OS)	Crusted scabies (CS)
Skin cellular responses	Mostly $CD4^+$ T cells, eosinophils and macrophages [24]	Mostly $CD8^+$ T cells, increased $\gamma\delta^+$ T cells, eosinophils and few macrophages [14, 24, 35, 88]
Blood cell responses	T and B cells and T-cell subsets within normal ranges	T and B cells and T-cell subsets within normal ranges. Increased $\gamma\delta^+$ T cells, eosinophilia [24, 88]
Th1/Th2 responses	Th1 mediated with increased production of Th1 cytokines IFN-γ, IL-2 and TNF-α [35, 46, 51]. Increased production of IL-10 [51]	Th2 mediated with increased production of Th2 cytokines IL-4, IL-5 and IL-13 [14, 35, 46]. Increased production of Th17 cytokines IL-17, IL −23 [46, 88]. Decreased production of IL-10 [24, 35]
Systemic Ig responses	Variable reports of elevated levels of total IgG, IgE, IgA and IgM. Increased levels of scabies-specific IgE, IgG and IgA [24, 35]	Increased levels of total IgG, IgG1, IgG3, IgG4, IgE and IgA. Elevated levels of scabies specific IgG4, IgE and IgA [24, 35]

IgE et IgG4 ++
IL5 et IL13 ; IL17/IL20

Complément moins actif
Patient à prédisposition Th2 ?

=> Hyperprolifération sarcopte

Gale

- Implications pour le diagnostic et vaccination
  - Diagnostic clinique /dermatologique
  - Traitement classique : Ivermectine, benzoate de benzyle…
  - Réaction croisée avec autres acariens
  - Diagnostic :
    - Sérologie
    - Homologie acariens : *Dermatophagoides farinae*…
    - Apparition Ig lente
  - Vaccination :
    - Si réinfestation => Th2
    - Si préstimulation par extrait => Th1 et protection
    - Homologie acariens
    - Forte homologie entre Sarcoptes mais variété hominis diffère des espèces animales

Conclusions

- Nombreux parasites => localisation cutanée
- Protozoaires, helminthes, arthropodes
- Arthropodes; peu de connaissances
- Gale : TH2 => gale profuse ?
- Prévention voyageurs
- Diagnostic sérologique /vaccination ?