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Demodex Unmasked: The Tiny Mites Living on our Skin

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Abstract

Demodex mites are microscopic arachnids that inhabit hair follicles and sebaceous glands on the face. Their prevalence increases with age and certain conditions like obesity, diabetes, and immunosuppression. While usually harmless commensals, they become pathogenic when their density exceeds 5 mites/cm² or when the skin's balance is disrupted, leading to demodicosis. This condition manifests with various skin and ocular symptoms, including rosacea-like eruptions, blepharitis, and chalazion. Diagnosis relies on mite density assessment through methods such as standardized skin surface biopsy and dermoscopy. Factors such as prolonged mask use during the COVID-19 pandemic and immune reconstitution diseases influence mite proliferation. Treatment involves topical agents like permethrin and ivermectin, oral ivermectin or isotretinoin for resistant cases, and adjunctive therapies including intense pulsed light and microblepharoexfoliation. Management should be individualized based on severity and resistance to optimize outcomes.

Keywords: Demodex folliculorum, Demodex brevis, Demodicosis, Facial dermatitis, Ivermectin treatment

Introduction

Demodex mites, members of the arachnid family, include two species prevalent in humans: *Demodex folliculorum* and *Demodex brevis*. These mites inhabit hair follicles and sebaceous glands, typically on the face. Found in all ethnicities and genders, they thrive under favourable pH and temperature conditions. Mite density exceeding 5/cm² or dermal penetration indicates infestation, which is more common with age and increased sebum production. [1,2]

Epidemiology

Demodex folliculorum adults measure 0.3-0.4 mm, with females smaller than males. Their eight legs facilitate nocturnal movement, as they avoid light. The mites feed on sebum and skin cells, aided by needle-like mouthparts. Scales on their bodies help them adhere to hair follicles.These mites primarily affect facial regions such as the cheeks, nose, forehead, and eyelids. *D. folliculorum* resides in the upper pilo-sebaceous unit, whereas *D. brevis* penetrates deeper into sebaceous glands. Infestation is considered pathogenic when densities exceed 5 mites/cm². [1-3]

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Prevalence

Demodex mites are common ectoparasites, affecting 33% of children and young adults, 50% of adults, and 66% of elderly individuals, with prevalence increasing due to sebaceous gland activity and factors like obesity, diabetes, immunosuppression, and chronic kidney failure. DNA analysis by Thoemmes (2014) revealed mites in 100% of adults and 70% of children, indicating earlier underestimation. Use of topical steroids and altered skin conditions also promote mite proliferation. Immunocompromised individuals, including those with HIV, are more vulnerable. Demodicosis manifests as folliculitis, rosacea-like hypopigmentation, and may cause inflammation and hair follicle damage. Notably, 60–86.4% of patients with meibomian gland dysfunction show Demodex infestation, underscoring its ocular impact. [3-5]

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Pathogenesis

Demodex mites typically reside harmlessly in hair follicles and sebaceous glands at low densities (<5 mites/cm²), coexisting with the host's immune system. However, immune suppression, rosacea, or prolonged topical steroid use can disrupt this balance, causing overgrowth and a pathogenic state called demodicosis. In this state, mites secrete lipase enzymes that degrade sebum and damage follicles, block sebaceous ducts, and provoke inflammation. They also harbor *Bacillus oleronius*, further stimulating immune responses. Their chitinous exoskeletons can trigger foreign body reactions. Clinically, demodicosis manifests as itching, redness, scaling, and papulopustular lesions, particularly on the face and eyelids. [2-4]

Clinical features

Demodex infestation can cause various skin conditions collectively known as demodicosis, which presents with multiple clinical forms such as pityriasis folliculorum (dry, rough, scaly skin), rosacea-like eruptions (papulopustular lesions with burning and itching), folliculitis-like, and perioral dermatitis-like types. Less common forms include seborrheic dermatitis-like lesions, eczema, scalp folliculitis, and even otitis externa. Ocular involvement includes blepharitis, chalazion, madarosis, and dry eye, with a strong link to meibomian gland dysfunction. Long-term use of topical steroids is a significant risk factor. Demodicosis is often underdiagnosed despite its varied presentations, and eyelash mite screening is recommended in all suspected cases. [4]

Diagnosis

Demodicosis diagnosis relies on detecting high Demodex mite density, typically >5 mites/cm². Common methods include Standardized Skin Surface Biopsy (SSSB) and Direct Microscopic Examination (DME). Newer techniques like superficial needle-scraping (SNS), dermoscopy, and confocal laser scanning microscopy (CLSM) offer improved, non-invasive detection. SSSB may miss mites deep in follicles, causing false negatives. Some patients with high mite counts show no symptoms, while others react severely, indicating the role of host immunity. Diagnosis should correlate clinical signs with mite density and treatment response. Due to similarities with scabies and treatment overlap, extensive testing may be unnecessary in clear clinical cases. [4-6]

Conditions resembling Demodex infestation include:

i. Scabies: Nocturnal itching, rashes, and sores with thick crusts.
ii. Seborrheic Dermatitis: Red skin, oily scales on the scalp and other seborrheic areas.
iii. Rosacea: Demodex-related rosacea features follicular scaling and dryness, unlike common rosacea.
iv. Madarosis: Loss of eyelashes due to follicular inflammation.
v. Androgenetic Alopecia (AGA): Sebaceous gland enlargement and inflammation linked to mite infestation.
vi. Non-specific Facial Dermatitis: Redness, scaling, and skin roughness differing from rosacea and seborrheic dermatitis.[7]

Associations

i. Face Mask Usage: During COVID-19, COVID-19 pandemic's widespread mask usage has been associated with changes in facial skin microenvironment, potentially altering *Demodex* prevalence and contributing to increased cases of demodicosis or related skin conditions
ii. Immune Reconstitution Disease: Immunosuppressive treatments and HIV can exacerbate Demodicosis due to immune system changes.[8]

Prevention is by maintaining facial hygiene, avoiding oily cosmetics, and regular exfoliation help reduce mite proliferation. Non-soap cleansers and avoiding prolonged mask use are recommended. [2,3]

Treatment

Demodicosis management includes topical treatments like permethrin and ivermectin, which reduce mite density and inflammation. Oral ivermectin is used for moderate to severe cases; however, emerging resistance—linked to altered P-glycoprotein and glutamate-gated chloride channels—has prompted alternative approaches. Isotretinoin is effective in refractory cases, reducing sebum and mite load. Adjunctive therapies such as Intense Pulsed Light (IPL) outperform 5% tea tree oil in ocular demodicosis, while Microblepharoexfoliation (MBE) aids debris removal with limited effect on mites. N,N-diethyl-meta-toluamide (DEET) is also under investigation. Treatment must be individualized, considering resistance and clinical response, with professional oversight to optimize outcomes. [2-4]

Demodex mites, though harmless in small numbers, can cause significant dermatological issues when populations increase. Preventive hygiene, accurate diagnosis, and targeted treatments help manage infestations effectively.

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