

# Green Nail Syndrome

Green Nail Syndrome (GNS), also known as *chloronychia*, is a bacterial infection of the nails characterized by a distinctive greenish discoloration, which can range from blue-green to dark green or bluish-grey. This discoloration typically occurs beneath the nail plate and does not wash off, differentiating it from superficial staining. GNS predominantly affects one or two nails, either fingernails or toenails, and while the nails themselves are often not painful, the surrounding skin, including the cuticle area, may become swollen, red, and tender. The underlying cause of GNS is infection by *Pseudomonas aeruginosa*, a bacterium commonly found in moist environments, which produces pigments responsible for the green coloration.

## Etiology and Pathophysiology

The causative agent of GNS, *Pseudomonas aeruginosa*, is a gram-negative, opportunistic pathogen that thrives in wet environments. It is widely distributed in nature, including in hot tubs, sinks, contact lens solution, and bath sponges. When *P. aeruginosa* infects the nail, it produces two primary pigments—pyocyanin and pyoverdin—which give the affected nails their characteristic greenish hue.

The infection is generally localized to the space beneath the nail, also known as the subungual space, and typically does not extend beyond the nail itself. This condition occurs when the nail plate is disrupted, creating a space between the nail and nail bed where *P. aeruginosa* can proliferate.

## Risk Factors

There are two major predisposing factors for the development of GNS:

- **Onycholysis:** This is the separation of the nail from the nail bed, which disrupts the natural waterproof seal and creates a subungual space that may accumulate dirt and debris, providing a potential entry point for *P. aeruginosa*. Onycholysis can be caused by trauma or repetitive friction, and is commonly seen in individuals whose hands are frequently exposed to water or other irritants. Professions such as gardening, plumbing, and cleaning, where frequent exposure to water or physical trauma occurs, are associated with higher risks of onycholysis and, consequently, GNS.
- **Damp Environments:** The presence of excessive moisture on the nails is another significant risk factor. Repeated exposure to water, as seen in occupations such as dishwashing, cooking, healthcare, and cleaning, creates an ideal environment for the proliferation of *P. aeruginosa*. Additionally, individuals who wear tight-fitting shoes or those who exercise for prolonged periods, leading to persistent moisture accumulation under the toenails, are also at risk.

Other minor risk factors include nail psoriasis, fungal nail infections, and compromised immune states, which may contribute to a predisposition for infection by opportunistic pathogens such as *P. aeruginosa*.

### Clinical Presentation

The hallmark feature of GNS is the greenish discoloration of the affected nails, which can range from a light blue-green to dark green or even bluish-grey. This discoloration is localized under the nail plate and does not wash off. The nail itself is typically not painful, though the skin around the nail, including the cuticle, may exhibit signs of inflammation such as swelling, tenderness, and erythema. GNS often involves one or two nails, and the infection is usually limited to the fingernails or toenails. Although the condition is often asymptomatic, it can cause significant cosmetic concern.

If there is any uncertainty regarding the diagnosis, nail culture can be performed to isolate *P. aeruginosa* and confirm the diagnosis, though clinical presentation alone is usually sufficient for a definitive diagnosis.

### Treatment and Management

GNS generally responds well to treatment, and the therapeutic approach focuses on eliminating the infection, addressing the underlying risk factors, and preventing recurrence.

- **Removal of Detached Nail Plate:** If onycholysis is present, trimming the detached portion of the nail is a crucial first step in treatment. This helps reduce the subungual space where the bacteria thrive and prevents further accumulation of debris.
- **Topical Antibiotics:** The first-line treatment for GNS typically involves the use of topical antibiotics. Common options include bacitracin and polymyxin B, which should be applied to the affected nails two to four times daily. These antibiotics effectively target *P. aeruginosa* and help resolve the infection within a few weeks to months.
- **Alternative Topical Treatments:** In addition to antibiotics, other topical treatments have been shown to suppress the growth of *P. aeruginosa*. Chlorine bleach diluted in a 1:4 ratio with water has been used successfully to treat GNS, as it creates an inhospitable environment for bacterial growth. Similarly, acetic acid (vinegar) has been reported as an effective topical agent in managing *P. aeruginosa* infections, although it is less commonly employed in clinical practice.
- **Systemic Antibiotics:** In severe cases or when topical therapies fail, systemic treatment with oral antibiotics may be necessary. Ciprofloxacin, a fluoroquinolone, is the most commonly prescribed systemic antibiotic for GNS due to its broad-spectrum activity against *P. aeruginosa*. Oral antibiotics are usually reserved for extensive or recurrent infections.
- **Nail Removal:** In some cases, when the infection is particularly persistent or extensive, partial or complete nail removal may be indicated. This allows for better access to the nail bed and facilitates the elimination of the infection. This option is typically considered when conservative treatments have failed.

## Prevention

Preventive measures are key to managing and reducing the risk of recurrence of GNS. Avoiding trauma to the nails and keeping them dry are critical components of prevention. For individuals at high risk of developing GNS due to occupational factors, the use of protective gloves or moisture-wicking footwear may help reduce exposure to moisture and physical trauma. Additionally, patients with compromised nail integrity should be advised to avoid prolonged exposure to water, as damp conditions promote the growth of *P. aeruginosa*.

## Conclusion

Green Nail Syndrome is a bacterial infection of the nails caused by *Pseudomonas aeruginosa*, which leads to the characteristic greenish discoloration of the nails. The condition is typically self-limited but can be troublesome if not managed appropriately. Treatment involves a combination of removing the affected nail portion, applying topical antibiotics, and maintaining good nail hygiene to prevent further trauma and moisture exposure. In severe or persistent cases, systemic antibiotics or nail removal may be required. Preventive measures, including minimizing nail trauma and moisture exposure, are essential for reducing recurrence. Early recognition and treatment of GNS are crucial in ensuring effective resolution and minimizing the risk of complications.

## References

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