

Systemic contact dermatitis following oral neomycin therapy

Jocelyn M. Carnicle, BS^a , Timothy V. Tran, MS^a, and Sterling S. McKissack, MD^b 

^aPaul L. Foster School of Medicine, Texas Tech University Health Sciences Center, El Paso, Texas; ^bDepartment of Dermatology, William Beaumont Army Medical Center, El Paso, Texas

ABSTRACT

Systemic contact dermatitis (SCD) describes a hypersensitivity skin reaction following systemic re-exposure of an allergen in previously sensitized patients. Neomycin is an aminoglycoside antibiotic that, when taken orally, suppresses intestinal bacteria and is used in preoperative bowel surgery to reduce the risk of infection. While oral neomycin has been commonly associated with adverse reactions like nausea, vomiting, and *Clostridium difficile*-associated colitis, the poor intestinal absorption of oral neomycin makes systemic contact dermatitis an unusual adverse reaction. Herein we present a rare case of systemic contact dermatitis following oral neomycin administration.

KEYWORDS Dermatitis; neomycin; pruritic rash; systemic contact dermatitis

Neomycin is an aminoglycoside antibiotic with a broad spectrum of activity against both gram-positive and gram-negative organisms. The drug is poorly absorbed from the gastrointestinal tract, which serves as the basis of its main use as an oral agent to suppress intestinal bacteria in treatment of hepatic cirrhosis and hepatic encephalopathy, in preoperative bowel surgery, and in dental procedures.¹ While oral neomycin has been commonly associated with adverse reactions like nausea, vomiting, and *Clostridium difficile*-associated colitis, the poor intestinal absorption of oral neomycin makes systemic contact dermatitis a rare adverse reaction.^{1,2}

CASE DESCRIPTION

A 70-year-old woman with previous contact dermatitis secondary to topical antibiotics was admitted to the hospital for diverticulitis. Two days after starting oral neomycin for her diverticulitis, she developed a diffuse pruritic rash that began on her arms and spread to her face, trunk, and thighs. She denied fever, malaise, headaches, nausea, vomiting, diarrhea, arthralgia, weight loss, recent travel, or any other medication use. Examination revealed a diffuse exfoliative dermatitis over the face, upper extremities, and trunk (*Figure 1*). No bullae, mucosal involvement, facial swelling, or lymphadenopathy was noted, and the patient had a negative Nikolsky sign. Complete blood count revealed mild eosinophilia

(~400/μL), although no atypical lymphocytes were detected. Serum transaminases, renal panel, and urinalysis were within normal limits. A biopsy specimen was obtained and histopathologic examination displayed a spongiotic dermatitis with eosinophils. Systemic contact dermatitis (SCD) was diagnosed, and oral neomycin was discontinued. At follow-up, patch testing was positive to neomycin, bacitracin, and quaternium-15.

DISCUSSION

SCD traditionally begins with a primary cutaneous sensitization to an allergen hapten and is followed by a secondary systemic exposure to that allergen or a cross-reacting allergen, eliciting an inflammatory skin response. While the pathogenesis of SCD is still not well understood, several studies suggest that it may be mediated by type 4 and possibly type 3 hypersensitivity reactions. Systemic contact reactions can arise from various allergens including metals, plants, foods, natural resins, and medications used both topically and systemically (*Table 1*).^{3–5} Clinical manifestations of SCD result in multiple phenotypes, including eczematous flare-up eruptions at areas of previous dermatitis (recall reaction) or positive patch test sites, dyshidrotic eczema, symmetric drug-related intertriginous and flexural exanthema, erythroderma, and vasculitis-like lesions.^{3,5} Diagnosis of SCD primarily involves clinical appearance and history of the lesion usually occurring within hours to 3 days of

Corresponding author: Jocelyn M. Carnicle, BS, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center – El Paso, 5001 El Paso Drive, El Paso, TX 79905 (e-mail: jocelyn.carnicle@ttuhsc.edu)

The authors have no conflicts of interest to disclose. The patient gave permission for this case to be published.

Received February 11, 2020; Revised July 20, 2020; Accepted July 28, 2020.



Figure 1. Diffuse exfoliative dermatitis without bullae present on the (a) face and chest and (b) bilateral arms and dorsal hands.

Table 1. Causative agents known to be involved in systemic contact dermatitis

Category	Agent	
Foods and plants	Balsam of Peru	Mangoes
	Propylene glycol	Propolis
	Aspartame	Sorbic acid
	Compositae plants, e.g., chamomile, echinacea	Garlic
	Cashew nuts	Cinnamon oil
		Parabens
		Toxicodendron
Metals	Nickel	Cobalt
	Gold	Metals in orthopedic implants
	Mercury	Dental metals
	Chromate	
Medications	Neomycin, gentamicin, streptomycin	Ethylenediamine
	Penicillin, ampicillin, amoxicillin	Phenothiazines
	Erythromycin	Aminosalicyclic acids
	Bacitracin	Piroxicam
	Chloramphenicol	Benzocaine, cinchocaine
	Cephalosporins	Bufexamac
	Sulfonamides	Diclofenac
	Nystatin	Corticosteroids, e.g., prednisone, dexamethasone
	Acyclovir	Estrogen
	Disulfiram	Benzodiazepines
	Aminophylline, hydroxyzine, cetirizine	Anticonvulsants
		Chloral hydrate
		Halogenated hydroxyquinolines

systemic exposure, along with confirmation of a positive patch test.⁵ Avoidance and elimination of the inciting allergen is important in treatment, while symptom relief can be managed with topical steroids and oral antihistamines.

Topical neomycin, a common component of many over-the-counter “triple topical antibiotic” preparations, has long been associated with contact dermatitis and has become a top 10 contact allergen in North America.⁵ In a recent retrospective study of a large group of patients with suspected contact dermatitis, 7% of all patients tested had a positive patch test for topical neomycin.⁶ While allergic contact dermatitis involving topical neomycin is well documented, there is minimal literature on systemic reactions secondary to oral neomycin. Furthermore,

the last time a case of SCD was reported after oral administration of neomycin was almost 4 decades ago.^{6–8}

In a well-designed 1969 clinical trial, 12 patients who previously reacted to topical neomycin were given oral neomycin, and 10 of those patients developed a systemic skin reaction,² suggesting that our patient likely had a skin eruption from oral neomycin due to ingestion of a contact allergen after previously being sensitized to topically applied neomycin. This is supported by her positive patch test to topical neomycin. Neomycin’s highly cross-reactive nature with gentamicin, tobramycin, and streptomycin^{6,9} poses a question of whether our patient would develop SCD from administration of another aminoglycoside in the future.

Because oral provocation with a suspected allergen is considered too hazardous for clinical practice and is infrequently investigated,¹⁰ we report a rare case of systemic contact dermatitis associated with oral neomycin. This case supplements previous research done in 1969² and highlights the lack of literature detailing systemic reactions to oral neomycin. We thus suggest that future research investigate the prevalence of how many topically neomycin-sensitized patients develop SCD in response to oral neomycin.

ORCID

Jocelyn M. Carnicle  <http://orcid.org/0000-0001-5304-0805>

Sterling S. McKissack  <http://orcid.org/0000-0003-0617-0871>

- Bratzler DW, Dellinger EP, Olsen KM, et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. *Surg Infect*. 2013; 14(1):73–156. doi:10.1089/sur.2013.9999.
- Ekelund AG, Möller H. Oral provocation in eczematous contact allergy to neomycin and hydroxy-quinolines. *Acta Derm Venereol*. 1969;49(4):422–426.
- Aquino M, Rosner G. Systemic contact dermatitis. *Clin Rev Allergy Immunol*. 2019;56(1):9–18. doi:10.1007/s12016-018-8686-z.
- Veien NK. Systemic contact dermatitis. *Int J Dermatol*. 2011;50(12): 1445–1456. doi:10.1111/j.1365-4632.2011.05104.x.
- Winnicki M, Shear NH. A systematic approach to systemic contact dermatitis and symmetric drug-related intertriginous and flexural exanthema (SDRIFE): a closer look at these conditions and an approach to intertriginous eruptions. *Am J Clin Dermatol*. 2011; 12(3):171–180. doi:10.2165/11539080-000000000-00000.
- DeKoven JG, Warshaw EM, Zug KA, et al. North American contact dermatitis group patch test results: 2015–2016. *Dermatitis*. 2018; 29(6):297–309. doi:10.1097/DER.0000000000000417.
- Menné T, Weismann K. Hämatogenes Kontaktekzem nach oraler Gabe von Neomycin [Hematogenous contact eczema following oral administration of neomycin]. *Hautarzt*. 1984;35(6):319–320.
- van Ketel WG. Contact allergy for clioquinol and neomycin. In: Christophers E, Goos M, eds. XXXII. *Tagung Gehalten in Westerland/ Sylt Vom 16. bis 20. September 1980. Verhandlungen Der Deutschen Dermatologischen Gesellschaft*. Vol. 32. Berlin: Springer; 1981. doi: 10.1007/978-3-642-81671-0_43.
- Guin JD, Phillips D. Erythroderma from systemic contact dermatitis: a complication of systemic gentamicin in a patient with contact allergy to neomycin. *Cutis*. 1989;43(6):564–567.
- Maibach HI. Oral substitution in patients sensitized by transdermal clonidine treatment. *Contact Derm*. 1987;16(1):1–8. doi:10.1111/j.1600-0536.1987.tb02607.x.