

## Hydroxychloroquine (Pharmacogenomics)

### Genes of Interest

- [G6PD - Hydroxychloroquine](#)

Brand Names: US

Plaquenil

Brand Names: Canada

APO-Hydroxyquine; JAMP Hydroxychloroquine Sulf; MINT-Hydroxychloroquine; MYLAN-Hydroxychloroquine [DSC]; Plaquenil; PRO-Hydroxychloroquine-200 [DSC]

### Index Terms

Coronavirus; COVID-19; Hydroxychloroquine Sulfate

### Pharmacologic Class

[Aminoquinoline \(Antimalarial\); Antimalarial Agent](#)

### References

Agarwal V, Agrawal V, Aggarwal A, et al; Arthritis in Sarcoidosis Group (ASG). Arthritis in sarcoidosis: a multicentric study from India. *Int J Rheum Dis*. 2018;21(9):1728-1733. doi: 10.1111/1756-185X.13349. [\[PubMed 30187668\]](#)

American Society for Transplantation and Cellular Therapy (ASTCT). Interim guidelines for COVID-19 management in hematopoietic cell transplant and cellular therapy patients. [https://higherlogicdownload.s3.amazonaws.com/ASBMT/a1e2ac9a-36d2-4e23-945c-45118b667268/UploadedImages/COVID-19 Interim Patient Guidelines 3 18 20.pdf](https://higherlogicdownload.s3.amazonaws.com/ASBMT/a1e2ac9a-36d2-4e23-945c-45118b667268/UploadedImages/COVID-19%20Interim%20Patient%20Guidelines%203%2018%2020.pdf). Published March 18, 2020. Accessed March 24, 2020.

Anderson A, Bijlmer H, Fournier PE, et al. Diagnosis and management of Q fever--United States, 2013: recommendations from CDC and the Q Fever Working Group [published correction appears in *MMWR Recomm Rep*. 2013;62(35):730]. *MMWR Recomm Rep*. 2013;62(RR-03):1-30. [\[PubMed 23535757\]](#)

Anderson PO, Sauberan JB. Modeling drug passage into human milk. *Clin Pharmacol Ther*. 2016;100(1):42-52. [\[PubMed 27060684\]](#)

Andreoli L, Bertias GK, Agmon-Levin N, et al. EULAR recommendations for women's health and the management of family planning, assisted reproduction, pregnancy and menopause in patients with systemic lupus erythematosus and/or antiphospholipid syndrome. *Ann Rheum Dis*. 2017;76(3):476-485. doi:10.1136/annrheumdis-2016-209770. [\[PubMed 27457513\]](#)

Ang GC, Werth VP. Combination antimalarials in the treatment of cutaneous dermatomyositis: a retrospective study. *Arch Dermatol*. 2005;141(7):855-859. doi: 10.1001/archderm.141.7.855. [\[PubMed 16027300\]](#)

Arnold SL, Buckner F. Hydroxychloroquine for treatment of SARS-CoV-2 infection? Improving our confidence in a model-based approach to dose selection [published online, April 8, 2020]. *Clin Transl Sci*. doi:10.1111/cts.12797[[PubMed 32268005](#)]

Balevic SJ, Cohen-Wolkowicz M, Eudy AM, Green TP, Schanberg LE, Clowse MEB. Hydroxychloroquine levels throughout pregnancies complicated by rheumatic disease: implications for maternal and neonatal outcomes. *J Rheumatol*. 2019a;46(1):57-63. doi:10.3899/jrheum.180158.[[PubMed 30275257](#)]

Balevic SJ, Green TP, Clowse MEB, Eudy AM, Schanberg LE, Cohen-Wolkowicz M. Pharmacokinetics of hydroxychloroquine in pregnancies with rheumatic diseases. *Clin Pharmacokinet*. 2019b;58(4):525-533. doi:10.1007/s40262-018-0712-z.[[PubMed 30255310](#)]

Baer AN, Vivino FB. Treatment of Sjögren's syndrome: Constitutional and non-sicca organ-based manifestations. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 15, 2019.

Baer AN, Witter FR, and Petri M, "Lupus and Pregnancy," *Obstet Gynecol Surv*, 2011, 66(10):639-53.[[PubMed 22112525](#)]

Barlow A, Landolf KM, Barlow B, et al. Review of emerging pharmacotherapy for the treatment of coronavirus disease 2019 [published online April 7, 2020]. *Pharmacotherapy*. doi:10.1002/phar.2398[[PubMed 32259313](#)]

Bertsias GK, Tektonidou M, Amoura Z, et al, "Joint European League Against Rheumatism and European Renal Association-European Dialysis and Transplant Association (EULAR/ERA-EDTA) Recommendations For the Management of Adult and Paediatric Lupus Nephritis," *Ann Rheum Dis*, 2012, 71(11):1771-82.[[PubMed 22851469](#)]

Bhimraj A, Morgan RL, Shumaker AH, et al. Infectious Diseases Society of America guidelines on the treatment and management of patients with COVID-19. <http://www.idsociety.org/COVID19guidelines>. Updated April 21, 2020. Accessed April 22, 2020.

Birru Talabi M, Clowse MEB. Antirheumatic medications in pregnancy and breastfeeding [published online March 19, 2020]. *Curr Opin Rheumatol*.

Cansu DU, Korkmaz C. Hypoglycaemia induced by hydroxychloroquine in a non-diabetic patient treated for RA. *Rheumatology (Oxford)*. 2008; 47(3):378-379.[[PubMed 18222983](#) ]

Cappellini MD, Fiorelli G. Glucose-6-phosphate dehydrogenase deficiency. *Lancet*. 2008;371(9606):64-74. doi: 10.1016/S0140-6736(08)60073-2. Review.[[PubMed 18177777](#)]

Carsons SE, Vivino FB, Parke A, et al. Treatment guidelines for rheumatologic manifestations of Sjögren's syndrome: use of biologic agents, management of fatigue, and inflammatory musculoskeletal pain. *Arthritis Care Res (Hoboken)*. 2017;69(4):517-527. doi: 10.1002/acr.22968.[[PubMed 27390247](#)]

Centers for Disease Control and Prevention (CDC). How to choose a drug to prevent malaria. <https://www.cdc.gov/malaria/travelers/drugs.html>. Updated November 15, 2018. Accessed August 15, 2019.

Centers for Disease Control and Prevention (CDC). Guidelines for treatment of malaria in the United States. <http://www.cdc.gov/malaria/resources/pdf/treatmenttable.pdf>. Updated April 1, 2019. Accessed August 15, 2019.

Centers for Disease Control and Prevention (CDC). CDC Health Information for International Travel 2016. New York, NY: Oxford University Press; 2016. <http://wwwnc.cdc.gov/travel/page/yellowbook-home>.

Centers for Disease Control and Prevention (CDC). Information for clinicians on therapeutic options for COVID-19 patients. Updated March 21, 2020. Accessed March 23, 2020. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/therapeutic-options.html>

Centers for Disease Control and Prevention (CDC). Treatment of Malaria (Guidelines for Clinicians). <http://www.cdc.gov/malaria/resources/pdf/clinicalguidance.pdf>

Chen Z, Hu J, Zhang Z, et al. Efficacy of hydroxychloroquine in patients with COVID-19: results of a randomized clinical trial. Available at <https://www.medrxiv.org/content/10.1101/2020.03.22.20040758v2>. Published March 31, 2020.

Chiotos K, Hayes M, Kimberlin DW, et al. Multicenter initial guidance on use of antivirals for children with COVID-19/SARS-CoV-2 [published online April 22, 2020]. *J Pediatric Infect Dis Soc.* 2020. [\[PubMed 32318706\]](#)

Chong WS, Tan HH, Tan SH. Cutaneous sarcoidosis in Asians: a report of 25 patients from Singapore. *Clin Exp Dermatol.* 2005;30(2):120-124. doi: 10.1111/j.1365-2230.2005.01729.x. [\[PubMed 15725234\]](#)

Cimaz R, Brucato A, Meregalli E, Muscará M, Sergi P. Electroretinograms of children born to mothers treated with hydroxychloroquine during pregnancy and breast-feeding: comment on the article by Costedoat-Chalumeau et al. *Arthritis Rheum.* 2004;50(9):3056-3057; author reply 3057-3058. [\[PubMed 15457485\]](#)

Cissoko HRJ, Zahr N, Darrouzain F, Jonville-Bera AP, Autret-Leca E. Breast milk concentrations of hydroxychloroquine. *Fundam Clin Pharmacol.* 2010;24(suppl 1):420. Abstract 420-106. doi.org/10.1111/j.1472-8206.2010.00819.x.

Clarke J. Initial management of discoid lupus and subacute cutaneous lupus. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 15, 2019.

Cosnes A, Amaudric F, Gherardi R, et al. Dermatomyositis without muscle weakness. Long-term follow-up of 12 patients without systemic corticosteroids. *Arch Dermatol.* 1995;131(12):1381-1385. doi: 10.1001/archderm.131.12.1381. [\[PubMed 7492125\]](#)

Costedoat-Chalumeau N, Amoura Z, Aymard G, et al, "Evidence of Transplacental Passage of Hydroxychloroquine in Humans," *Arthritis Rheum*, 2002, 46(4):1123-4. [\[PubMed 11953993\]](#)

Costedoat-Chalumeau N, Amoura Z, Duhaut P, et al. Safety of hydroxychloroquine in pregnant patients with connective tissue diseases: a study of one hundred thirty-three cases compared with a control group. *Arthritis Rheum.* 2003;48(11):3207-3211. doi:10.1002/art.11304. [\[PubMed 14613284\]](#)

Demarchi J, Papisidero S, Medina MA, et al. Primary Sjögren's syndrome: extraglandular manifestations and hydroxychloroquine therapy. *Clin Rheumatol*. 2017;36(11):2455-2460. doi: 10.1007/s10067-017-3822-3. [\[PubMed 28913747\]](#)

Diav-Citrin O, Blyakhman S, Shechtman S, Ornoy A. Pregnancy outcome following in utero exposure to hydroxychloroquine: a prospective comparative observational study. *Reprod Toxicol*. 2013;39:58-62. doi:10.1016/j.reprotox.2013.04.005. [\[PubMed 23602891\]](#)

Dosso A, Rungger-Brändle E. *In vivo* confocal microscopy in hydroxychloroquine-induced keratopathy. *Graefes Arch Clin Exp Ophthalmol*. 2007; 245(2):318-320. [\[PubMed 16738856\]](#)

"Drugs for Parasitic Infections," *Med Lett Drugs Ther*, 1993, 35(911):111-22. [\[PubMed 8246830\]](#)

Emery H, "Clinical Aspects of Systemic Lupus Erythematosus in Childhood," *Pediatr Clin North Am*, 1986, 33(5):1177-90. [\[PubMed 3763254\]](#)

FDA Safety Alert. MedWatch. Fact sheet for health care providers emergency use authorization (EUA) of hydroxychloroquine sulfate supplied from the strategic national stockpile for treatment of COVID-19 in certain hospitalized patients. <https://www.fda.gov/media/136537/download>. Accessed April 1, 2020.

Flint J, Panchal S, Hurrell A, et al. BSR and BHPR guideline on prescribing drugs in pregnancy and breastfeeding-Part I: standard and biologic disease modifying anti-rheumatic drugs and corticosteroids. *Rheumatology (Oxford)*. 2016;55(9):1693-1697. [\[PubMed 26750124\]](#)

Fox RI. Mechanism of action of hydroxychloroquine as an antirheumatic drug. *Semin Arthritis Rheum*. 1993;23(2)(suppl 1):S82-S91. [\[PubMed 8278823\]](#)

Fox RI, Dixon R, Guarrasi V, Krubel S. Treatment of primary Sjögren's syndrome with hydroxychloroquine: a retrospective, open-label study. *Lupus*. 1996;5(suppl 1):S31-S36. [\[PubMed 8803908\]](#)

Gautret P, Lagier JC, Parola P, et al. Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. *International Journal of Antimicrobial Agents*. In Press March 17, 2020. doi:10.1016/j.ijantimicag.2020.105949

Giannini EH and Cawkwell GD, "Drug Treatment in Children With Juvenile Rheumatoid Arthritis. Past, Present, and Future," *Pediatr Clin North Am*, 1995, 42(5):1099-125. [\[PubMed 7567188\]](#)

Giudicessi JR, Noseworthy PA, Friedman PA, Ackerman MJ. Urgent guidance for navigating and circumventing the QTc prolonging and torsadogenic potential of possible pharmacotherapies for COVID-19. Mayo Foundation for Medical Education and Research. Preprint. Posted online March 25, 2020. *Mayo Clin Proc*.

[https://mayoclinicproceedings.org/pb/assets/raw/Health%20Advance/journals/jmcp/jmcp\\_covid19.pdf](https://mayoclinicproceedings.org/pb/assets/raw/Health%20Advance/journals/jmcp/jmcp_covid19.pdf)

Glader B. Diagnosis and management of glucose-6-phosphate dehydrogenase deficiency. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed November 20, 2017. [\[PubMed 7567188\]](#)

Götestam Skorpen C, Hoeltzenbein M, Tincani A, et al. The EULAR points to consider for use of antirheumatic drugs before pregnancy, and during pregnancy and lactation. *Ann Rheum Dis*. 2016;75(5):795-810. [\[PubMed 26888948\]](#)

Gottenberg JE, Ravaud P, Puéchal X, et al. Effects of hydroxychloroquine on symptomatic improvement in primary Sjögren syndrome: the JOQUER randomized clinical trial. *JAMA*. 2014;312(3):249-258. doi: 10.1001/jama.2014.7682. [\[PubMed 25027140\]](#)

Gould FK, Denning DW, Elliott TS, et al, "Guidelines for the Diagnosis and Antibiotic Treatment of Endocarditis in Adults: A Report of the Working Party of the British Society for Antimicrobial Chemotherapy," *J Antimicrob Chemother*, 2012, 67(2):269-89. [\[PubMed 22086858\]](#)

Hahn BH, McMahon MA, Wilkinson A, et al, "American College of Rheumatology Guidelines For Screening, Treatment, and Management of Lupus Nephritis," *Arthritis Care Res (Hoboken)*, 2012, 64(6):797-808. [\[PubMed 22556106\]](#)

Ito S. Drug therapy for breast-feeding women. *N Engl J Med*. 2000;343(2):118-126. [\[PubMed 10891521\]](#)

Izmirly PM, Costedoat-Chalumeau N, Pisoni CN, et al, "Maternal Use of Hydroxychloroquine Is Associated With a Reduced Risk of Recurrent Anti-SSA/Ro-Antibody-Associated Cardiac Manifestations of Neonatal Lupus," *Circulation*, 2012, 126(1):76-82. [\[PubMed 22626746\]](#)

Jallouli M, Galicier L, Zahr N, et al; Plaquenil Lupus Systemic Study Group. Determinants of hydroxychloroquine blood concentration variations in systemic lupus erythematosus. *Arthritis Rheumatol*. 2015;67(8):2176-2184. doi:10.1002/art.39194 [\[PubMed 25989906\]](#)

James WD, Dawson N, Rodman OG. The treatment of dermatomyositis with hydroxychloroquine. *J Rheumatol*. 1985;12(6):1214-1216. [\[PubMed 4093940\]](#)

Jones E, Callen JP. Hydroxychloroquine is effective therapy for control of cutaneous sarcoidal granulomas. *J Am Acad Dermatol*. 1990;23(3, pt 1):487-489. doi: 10.1016/0190-9622(90)70246-e. [\[PubMed 2212149\]](#)

Jones SK, "Ocular Toxicity and Hydroxychloroquine: Guidelines for Screening," *Br J Derm*, 1999, 140(1):3-7. [\[PubMed 10215761\]](#)

Kavanaugh A, Cush JJ, Ahmed MS, et al. Proceedings from the American College of Rheumatology Reproductive Health Summit: the management of fertility, pregnancy, and lactation in women with autoimmune and systemic inflammatory diseases. *Arthritis Care Res (Hoboken)*. 2015;67(3):313-325. [\[PubMed 25385050\]](#)

Kim AY, Gandhi RT. Coronavirus disease 2019 (COVID-19): management in hospitalized adults. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed April 28, 2020.

Kruize AA, Hené RJ, Kallenberg CG, et al. Hydroxychloroquine treatment for primary Sjögren's syndrome: a two year double blind crossover trial. *Ann Rheum Dis*. 1993;52(5):360-364. doi: 10.1136/ard.52.5.360. [\[PubMed 8323383\]](#)

Kuhn A, Aberer E, Bata-Csörgő Z, et al. S2k guideline for treatment of cutaneous lupus erythematosus - guided by the European Dermatology Forum (EDF) in cooperation with the European Academy of

Dermatology and Venereology (EADV). *J Eur Acad Dermatol Venereol*. 2017;31(3):389-404. doi: 10.1111/jdv.14053. [\[PubMed 27859683\]](#)

Kumar P, Banik S. Pharmacotherapy options in rheumatoid arthritis. *Clin Med Insights Arthritis Musculoskelet Disord*. 2013;6:35-43. doi: 10.4137/CMAMD.S5558. [\[PubMed 23997576\]](#)

Lam NC, Ghetu MV, Bieniek ML. Systemic lupus erythematosus: primary care approach to diagnosis and management. *Am Fam Physician*. 2016;94(4):284-294. [\[PubMed 27548593\]](#)

Levy RA, Vilela VS, Cataldo MJ, et al, "Hydroxychloroquine (HCQ) in Lupus Pregnancy: Double-Blind and Placebo-Controlled Study," *Lupus*, 2001, 10(6):401-4. [\[PubMed 11434574\]](#)

Luzzatto L, Nannelli C, Notaro R. Glucose-6-Phosphate Dehydrogenase Deficiency. *Hematol Oncol Clin North Am*. 2016;30(2):373-93. doi:10.1016/j.hoc.2015.11.006. Review. [\[PubMed 27040960\]](#)

Marmor MF, Kellner U, Lai TY, Melles RB, Mieler WF; American Academy of Ophthalmology. Recommendations on screening for chloroquine and hydroxychloroquine retinopathy (2016 revision). *Ophthalmology*. 2016;123(6):1386-1394. doi: 10.1016/j.ophtha.2016.01.058. [\[PubMed 26992838\]](#)

Mavragani CP, Moutsopoulos NM, Moutsopoulos HM. The management of Sjögren's syndrome. *Nat Clin Pract Rheumatol*. 2006;2(5):252-261. doi: 10.1038/ncprheum0165. [\[PubMed 16932698\]](#)

McChesney EW, Conway WD, Banks WF, et al. Studies of the metabolism of some compounds of the 4-amino-7-chloroquinolone series. *J Pharmacol Exp Ther*. 1966;151(3): 482-493. [\[PubMed 4957157\]](#)

McLaughlin GE. Coated plaquenil tablets: potential risk for children? *JAMA*. 1991;266(20):2832. [\[PubMed 1942444\]](#)

Melles RB, Marmor MF. The risk of toxic retinopathy in patients on long-term hydroxychloroquine therapy [published correction appears in *JAMA Ophthalmol*. 2014;132(12):1493]. *JAMA Ophthalmol*. 2014;132(12):1453-1460. [\[PubMed 25275721\]](#)

Miller ML. Initial treatment of dermatomyositis and polymyositis in adults. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed October 9, 2019.

Million M, Walter G, Thuny F, Habib G, Raoult D. Evolution from acute Q fever to endocarditis is associated with underlying valvulopathy and age and can be prevented by prolonged antibiotic treatment. *Clin Infect Dis*. 2013;57(6):836-844. doi: 10.1093/cid/cit419. [\[PubMed 23794723\]](#)

Modi S, Rosen T. Micropapular cutaneous sarcoidosis: case series successfully managed with hydroxychloroquine sulfate. *Cutis*. 2008;81(4):351-354. [\[PubMed 18491485\]](#)

Mohammad S, Clowse MEB, Eudy AM, Criscione-Schreiber LG. Hydroxychloroquine is Not Associated with Hemolytic Anemia in Glucose-6-Phosphate Dehydrogenase (G6PD) Deficient Patients. [published online ahead of print May 26, 2107]. *Arthritis Care Res (Hoboken)*. 2017. doi:10.1002/acr.23296. [\[PubMed 28556555\]](#)

Molina JM, Delaugerre C, Goff JL, et al. No evidence of rapid antiviral clearance or clinical benefit with the combination of hydroxychloroquine and azithromycin in patients with severe COVID-19 infection [published online, March 30, 2020]. *Med Mal Infect*. doi:10.1016/j.medmal.2020.03.006 [\[PubMed 32240719\]](#)

Motta M, Tincani A, Faden D, Zinzini E, Chirico G. Antimalarial agents in pregnancy. *Lancet*. 2002;359(9305):524-525.[\[PubMed 11853823\]](#)

Motta M, Tincani A, Faden D, et al. Follow-up of infants exposed to hydroxychloroquine given to mothers during pregnancy and lactation. *J Perinatol*. 2005;25(2):86-89.[\[PubMed 15496869\]](#)

Nation RL, Hackett LP, Dusci LJ, Ilett KF. Excretion of hydroxychloroquine in human milk. *Br J Clin Pharmacol*. 1984;17(3):368-369.

O'Dell JR, Mikuls TR, Taylor TH, et al; CSP 551 RACAT Investigators. Therapies for active rheumatoid arthritis after methotrexate failure. *N Engl J Med*. 2013;369(4):307-318. doi: 10.1056/NEJMoa1303006.[\[PubMed 23755969\]](#)

Olson NY, Lindsley CB. Adjunctive use of hydroxychloroquine in childhood dermatomyositis. *J Rheumatol*. 1989;16(12):1545-1547.[\[PubMed 2483176\]](#)

Osadchy A, Ratnapalan T, and Koren G, "Ocular Toxicity in Children Exposed *in utero* to Antimalarial Drugs: Review of the Literature," *J Rheumatol*, 2011, 38(12):2504-8.[\[PubMed 22002012\]](#)

Østensen M, Brown ND, Chiang PK, et al, "Hydroxychloroquine in Human Breast Milk," *Eur J Clin Pharmacol*, 1985, 28(3):357.[\[PubMed 4007043\]](#)

Page RL 2nd, O'Bryant CL, Cheng D, et al; American Heart Association Clinical Pharmacology and Heart Failure and Transplantation Committees of the Council on Clinical Cardiology; Council on Cardiovascular Surgery and Anesthesia; Council on Cardiovascular and Stroke Nursing; and Council on Quality of Care and Outcomes Research. Drugs That May Cause or Exacerbate Heart Failure: A Scientific Statement From the American Heart Association [published correction appears in *Circulation*. 2016;134(12):e261]. *Circulation*. 2016;134(6):e32-e69.[\[PubMed 27400984\]](#)

Peng W, Liu R, Zhang L, Fu Q, Mei D, Du X. Breast milk concentration of hydroxychloroquine in Chinese lactating women with connective tissue diseases. *Eur J Clin Pharmacol*. 2019;75(11):1547-1553. doi:10.1007/s00228-019-02723-z.[\[PubMed 31375884\]](#)

Perinel S, Launay M, Botelho-Nevers É, et al. Towards optimization of hydroxychloroquine dosing in intensive care unit COVID-19 patients [published online, April 7, 2020]. *Clin Infect Dis*. doi:10.1093/cid/ciaa394[\[PubMed 32255489\]](#)

Petri M, Elkhailifa M, Li J, Magder LS, Goldman DW. Hydroxychloroquine blood levels predict hydroxychloroquine retinopathy [published online September 18, 2019]. *Arthritis Rheumatol*. doi: 10.1002/art.41121.[\[PubMed 31532077\]](#)

Petri M. Pregnancy and systemic lupus erythematosus [published online October 8, 2019]. *Best Pract Res Clin Obstet Gynaecol*. 2019;S1521-S6934(19)30133-6.[\[PubMed 31677989\]](#)

Plaquenil (hydroxychloroquine) [prescribing information]. St. Michael, Barbados: Concordia Pharmaceuticals Inc; September 2019.

Plaquenil (hydroxychloroquine) [prescribing information]. Pulaski, TN: AvKARE Inc; July 2016.

Plaquenil (hydroxychloroquine) [product monograph]. Laval, Quebec, Canada: Sanofi-aventis Canada Inc; August 2019.

Prystowsky S, Sanchez M. Cutaneous sarcoidosis: Management. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 15, 2019.

Raoult D. Treatment and prevention of Q fever. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed February 6, 2020.

Rath T, Rubbert A. Drug combinations with methotrexate to treat rheumatoid arthritis. *Clin Exp Rheumatol*. 2010;28(5)(suppl 61):S52-S57. [[PubMed 21044434](#)]

Sammaritano LR, Bermas BL, Chakravarty EE, et al. 2020 American College of Rheumatology guideline for the management of reproductive health in rheumatic and musculoskeletal diseases. *Arthritis Rheumatol*. 2020;72(4):529-556. doi:10.1002/art.41191. [[PubMed 32090480](#)]

Sanders JM, Monogue ML, Jodlowski TZ, Cutrell JB. Pharmacologic treatments for coronavirus disease 2019 (COVID-19): a review [published online April 13, 2020]. *JAMA*. doi:10.1001/jama.2020.6019 [[PubMed 32282022](#)]

Sequeira W, Aggarwal R. Sarcoid arthropathy. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed July 8, 2019.

Simpson TF, Kovacs RJ, Stecker EC; American College of Cardiology. Ventricular arrhythmia risk due to hydroxychloroquine-azithromycin treatment for COVID-19. Updated March 29, 2020. Accessed March 30, 2020. <https://www.acc.org/latest-in-cardiology/articles/2020/03/27/14/00/ventricular-arrhythmia-risk-due-to-hydroxychloroquine-azithromycin-treatment-for-covid-19>

Singal AK, Kormos-Hallberg C, Lee C, et al. Low-dose hydroxychloroquine is as effective as phlebotomy in treatment of patients with porphyria cutanea tarda. *Clin Gastroenterol Hepatol*. 2012;10(12):1402-1409. doi: 10.1016/j.cgh.2012.08.038. [[PubMed 22985607](#)]

Singal AK, Anderson KE. Porphyria cutanea tarda and hepatoerythropoietic porphyria: Management and prognosis. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 15, 2019.

Singh JA, Saag KG, Bridges SL Jr, et al. 2015 American College of Rheumatology guideline for the treatment of rheumatoid arthritis. *Arthritis Rheumatol*. 2016;68(1):1-26. doi: 10.1002/art.39480. [[PubMed 26545940](#)]

Smolen JS, Aletaha D, McInnes IB. Rheumatoid arthritis [published correction appears in *Lancet*. 2016;388(10055):1984]. *Lancet*. 2016;388(10055):2023-2038. doi: 10.1016/S0140-6736(16)30173-8. [[PubMed 27156434](#)]

Smolen JS, Landewé R, Breedveld FC, et al. EULAR recommendations for the management of rheumatoid arthritis with synthetic and biological disease-modifying antirheumatic drugs: 2013 update. *Ann Rheum Dis*. 2014;73(3):492-509. doi: 10.1136/annrheumdis-2013-204573. [[PubMed 24161836](#)]

Tett SE. Clinical pharmacokinetics of slow-acting antirheumatic drugs. *Clin Pharmacokinet*. 1993;25(5):392-407. doi:10.2165/00003088-199325050-00005 [[PubMed 7904547](#)]

Tincani A, Faden D, Lojaco A, et al. Hydroxychloroquine in pregnant patients with rheumatic disease. *Arthritis Rheum*. 2001;44 (Suppl 9):S397.



Travassos M, Laufer MK. Antimalarial drugs: An overview. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed August 15, 2019.

Tsang-A-Sjoe MW, Bultink IE. Systemic lupus erythematosus: review of synthetic drugs. *Expert Opin Pharmacother*. 2015;16(18):2793-2806. doi: 10.1517/14656566.2015.1101448.[\[PubMed 26479437\]](#)

Tunks RD, Clowse ME, Miller SG, Brancazio LR, Barker PC. Maternal autoantibody levels in congenital heart block and potential prophylaxis with antiinflammatory agents. *Am J Obstet Gynecol*. 2013;208(1):64.e1-64.e647. doi:10.1016/j.ajog.2012.09.020.[\[PubMed 23063019\]](#)

Unübol M, Ayhan M, Guney E. Hypoglycemia induced by hydroxychloroquine in a patient treated for rheumatoid arthritis. *J Clin Rheumatol*. 2011; 17(1):46-47.[\[PubMed 21169846 \]](#)

US Department of Health and Human Services (HHS) Panel on COVID-19 Treatment Guidelines. Coronavirus disease 2019 (COVID-19) treatment guidelines. <https://covid19treatmentguidelines.nih.gov/>. Updated April 21, 2020. Accessed April 22, 2020.

Vleugels RA. Initial management of cutaneous dermatomyositis in adults. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed October 9, 2019.

Wallace DJ. Antimalarial drugs in the treatment of rheumatic disease. Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. <http://www.uptodate.com>. Accessed February 6, 2020.

World Health Organization (WHO). *Guidelines for the Treatment of Malaria*. 3rd ed. Geneva, Switzerland: World Health Organization; April 2015. [https://apps.who.int/iris/bitstream/handle/10665/162441/9789241549127\\_eng.pdf;jsessionid=5E6B69DD1F9A124C2DFEA30D5F8D6E8E?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/162441/9789241549127_eng.pdf;jsessionid=5E6B69DD1F9A124C2DFEA30D5F8D6E8E?sequence=1). Accessed August 15, 2019.

Woo TY, Callen JP, Voorhees JJ, Bickers DR, Hanno R, Hawkins C. Cutaneous lesions of dermatomyositis are improved by hydroxychloroquine. *J Am Acad Dermatol*. 1984;10(4):592-600. doi: 10.1016/s0190-9622(84)80263-7.[\[PubMed 6715608\]](#)

Yao X, Ye F, Zhang M, et al. In vitro antiviral activity and projection of optimized dosing design of hydroxychloroquine for the treatment of severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) [published online March 9, 2020]. *Clin Infect Dis*. doi:10.1093/cid/ciaa237[\[PubMed 32150618\]](#)

Youngster I, Arcavi L, Schechmaster R, Akayzen Y, et al. Medications and glucose-6-phosphate dehydrogenase deficiency: an evidence-based review. *Drug Saf*. 2010;33(9):713-726. doi:10.2165/11536520-000000000-00000.[\[PubMed 20701405\]](#)

Last Updated 4/28/20