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Nalidixic acid

Nalidixic acid (tradenames **Nevigramon**, **NegGram**, **Wintomylon** and **WIN 18,320**) is the first of the synthetic quinolone antibiotics.

In a technical sense, it is a naphthyridone, not a quinolone: its ring structure is a 1,8-naphthyridine nucleus that contains two nitrogen atoms, unlike quinoline, which has a single nitrogen atom.^[1]

Synthetic quinolone antibiotics were discovered by George Leshner and coworkers as a byproduct of chloroquine manufacture in the 1960s;^[2] nalidixic acid itself was used clinically from 1967.

Nalidixic acid is effective primarily against Gram-negative bacteria, with minor anti-Gram-positive activity. In lower concentrations, it acts in a bacteriostatic manner; that is, it inhibits growth and reproduction. In higher concentrations, it is bactericidal, meaning that it kills bacteria instead of merely inhibiting their growth.

It has historically been used for treating urinary tract infections, caused, for example, by *Escherichia coli*, *Proteus*, *Shigella*, *Enterobacter*, and *Klebsiella*. It is no longer clinically used for this indication in the USA as less toxic and more effective agents are available. The marketing authorization for nalidixic acid has been suspended throughout the EU.^[3]

It is also a tool in studies as a regulation of bacterial division. It selectively and reversibly blocks DNA replication in susceptible bacteria. Nalidixic acid and related antibiotics inhibit a subunit of DNA gyrase and topoisomerase IV and induce formation of cleavage complexes.^[4] It also inhibits the nicking-closing activity on the subunit of DNA gyrase that releases the positive binding stress on the supercoiled DNA.

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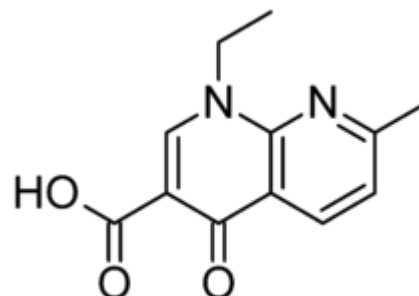
Overdose

Spectrum of bacterial susceptibility and resistance

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References

Nalidixic acid



Clinical data

Trade names	NegGram, Wintomylon, others
AHFS/Drugs.com	Consumer Drug Information (https://www.drugs.com/cdi/nalidixic_acid.html)
Routes of administration	Oral
ATC code	J01MB02 (WHO (https://www.who.cc/no/atc_ddd_index/?code=J01MB02))

Legal status

Legal status	US: Not FDA approved
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Pharmacokinetic data

Protein binding	90%
Metabolism	Partially Hepatic
Elimination half-life	6-7 hours, significantly longer in renal impairment

Identifiers

IUPAC name

External links

Adverse effects

Hives, rash, intense itching, or fainting soon after a dose may be a sign of anaphylaxis. Common adverse effects include rash, itchy skin, blurred or double vision, halos around lights, changes in color vision, nausea, vomiting, and diarrhea. Nalidixic acid may also cause convulsions and hyperglycemia,^[5] photosensitivity reactions,^[6] and sometimes haemolytic anaemia,^{[7][8]} thrombocytopenia^[9] or leukopenia. Particularly in infants and young children, has been reported occasionally increased intracranial pressure.^{[10][11][12]}

Overdose

In case of overdose the patient experiences headache, visual disturbances, balance disorders, mental confusion, metabolic acidosis and seizures.^[13]

Spectrum of bacterial susceptibility and resistance

Aeromonas hydrophila, *Clostridium* and *Haemophilus* are generally susceptible to nalidixic acid, while other bacteria such as *Bifidobacteria*, *Lactobacillus*, *Pseudomonas* and *Staphylococcus* are resistant.^[14] *Salmonella enterica* serovar Typhimurium strain ATCC14028 acquires nalidixic acid resistance when *gyrB* gene is mutated (strain IR715).^[15]

See also

- Amfonelic acid
- Oxolinic acid

References

- Emmerson AM, Jones AM (May 2003). "The quinolones: decades of development and use" (http://jac.oxfordjournals.org/content/51/suppl_1/13.full.pdf) (PDF). *The Journal of Antimicrobial Chemotherapy*. 51 Suppl 1 (Suppl 1): 13–20. doi:10.1093/jac/dkg208 (<https://doi.org/10.1093%2Fjac%2Fdkg208>). PMID 12702699 (<https://pubmed.ncbi.nlm.nih.gov/12702699>).

1-Ethyl-7-methyl-4-oxo-[1,8]naphthyridine-3-carboxylic acid	
CAS Number	389-08-2 (https://commonchemistry.cas.org/detail?cas_rn=389-08-2) ✓
PubChem CID	4421 (https://pubchem.ncbi.nlm.nih.gov/compound/4421)
DrugBank	DB00779 (https://www.drugbank.ca/drugs/DB00779) ✓
ChemSpider	4268 (https://www.chemspider.com/Chemical-Structure.4268.html) ✓
UNII	3B91HWA56M (https://precision.fda.gov/unii/search/srs/unii/3B91HWA56M)
KEGG	D00183 (https://www.kegg.jp/entry/D00183) ✓
ChEBI	CHEBI:100147 (https://www.ebi.ac.uk/chebi/search.do?chebiid=CHEBI:100147) ✓
ChEMBL	ChEMBL5 (https://www.ebi.ac.uk/chembl/db/index.php/compound/inspect/ChEMBL5) ✓
CompTox Dashboard (EPA)	DTXSID3020912 (https://comptox).

2. Leshner GY, Froelich EJ, Gruett MD, Bailey JH, and Brundage RP (September 1962). "1,8-Naphthyridine Derivatives. A New Class of Chemotherapeutic Agents". *Journal of Medicinal Chemistry*. **5** (5): 1063–1065. doi:10.1021/jm01240a021 (<https://doi.org/10.1021%2Fjm01240a021>).
3. "Disabling and potentially permanent side effects lead to suspension or restrictions of quinolone and fluoroquinolone antibiotics" (<https://www.ema.europa.eu/en/medicines/human/referrals/quinolone-fluoroquinolone-containing-medicinal-products>). *European Medicines Agency*. 11 March 2019.
4. Pommier, Y.; Leo, E.; Zhang, H.; Marchand, C. (2010). "DNA topoisomerases and their poisoning by anticancer and antibacterial drugs" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7316379>). *Chem. Biol.* **17** (5): 421–433. doi:10.1016/j.chembiol.2010.04.012 (<https://doi.org/10.1016%2Fj.chembiol.2010.04.012>). PMC 7316379 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7316379>). PMID 20534341 (<https://pubmed.ncbi.nlm.nih.gov/20534341>).
5. Fraser AG, Harrower AD (Dec 1977). "Convulsions and hyperglycaemia associated with nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1632822>). *British Medical Journal*. **2** (6101): 1518. doi:10.1136/bmj.2.6101.1518 (<https://doi.org/10.1136%2Fbmj.2.6101.1518>). PMC 1632822 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1632822>). PMID 589309 (<https://pubmed.ncbi.nlm.nih.gov/589309>).
6. Ramsay CA (Aug 1973). "Photosensitivity from nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1645105>). *Proceedings of the Royal Society of Medicine*. **66** (8): 747. doi:10.1177/003591577306600805 (<https://doi.org/10.1177%2F003591577306600805>). PMC 1645105 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1645105>). PMID 4733958 (<https://pubmed.ncbi.nlm.nih.gov/4733958>).
7. Gilbertson C, Jones DR (Nov 1972). "Haemolytic anaemia with nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1786728>). *British Medical Journal*. **4** (5838): 493. doi:10.1136/bmj.4.5838.493-a (<https://doi.org/10.1136%2Fbmj.4.5838.493-a>). PMC 1786728 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1786728>). PMID 4653901 (<https://pubmed.ncbi.nlm.nih.gov/4653901>).
8. Tafani O, Mazzoli M, Landini G, Alterini B (Oct 1982). "Fatal acute immune haemolytic anaemia caused by nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1499997>). *British Medical Journal*. **285** (6346): 936–7. doi:10.1136/bmj.285.6346.936-a (<https://doi.org/10.1136%2Fbmj.285.6346.936-a>). PMC 1499997 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1499997>). PMID 6811074 (<https://pubmed.ncbi.nlm.nih.gov/6811074>).

	epa.gov/dashboards/chemical/details/DTXSID3020912
ECHA InfoCard	100.006.241 (https://echa.europa.eu/substance-information/-/substanceinfo/100.006.241)
Chemical and physical data	
Formula	C ₁₂ H ₁₂ N ₂ O ₃
Molar mass	232.239 g·mol ^{−1}
3D model (JSmol)	Interactive image (https://chemapps.stolaf.edu/jmol/jmol.php?model=O=C2c1c(nc(cc1)C)N(/C=C/2C(=O)O)CC)
SMILES	<chem>O=C2c1c(nc(cc1)C)N(/C=C/2C(=O)O)CC</chem>
InChI	InChI=1S/C12H12N2O3/c1-3-14-6-9(12(16)17)10(15)8-5-4-7(2)13-11(8)14/h4-6H,3H2,1-2H3,(H,16,17) ✓ Key:MHWLWQUZZRMNGJ-UHFFFAOYSA-N ✓
	(verify)

9. Meyboom RH (Oct 1984). "Thrombocytopenia induced by nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1443179>). *British Medical Journal*. **289** (6450): 962. doi:10.1136/bmj.289.6450.962 (<https://doi.org/10.1136%2Fbmj.289.6450.962>). PMC 1443179 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1443179>). PMID 6435742 (<https://pubmed.ncbi.nlm.nih.gov/6435742>).
10. Boréus LO, Sundström B (Jun 1967). "Intracranial hypertension in a child during treatment with nalidixic acid" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1841777>). *British Medical Journal*. **2** (5554): 744–5. doi:10.1136/bmj.2.5554.744 (<https://doi.org/10.1136%2Fbmj.2.5554.744>). PMC 1841777 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1841777>). PMID 6025983 (<https://pubmed.ncbi.nlm.nih.gov/6025983>).
11. Kremer L, Walton M, Wardle EN (Nov 1967). "Nalidixic acid and intracranial hypertension" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1748506>). *British Medical Journal*. **4** (5577): 488. doi:10.1136/bmj.4.5577.488-a (<https://doi.org/10.1136%2Fbmj.4.5577.488-a>). PMC 1748506 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1748506>). PMID 6055749 (<https://pubmed.ncbi.nlm.nih.gov/6055749>).
12. Deonna T, Guignard JP (Sep 1974). "Acute intracranial hypertension after nalidixic acid administration" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1649016>). *Archives of Disease in Childhood*. **49** (9): 743. doi:10.1136/adc.49.9.743 (<https://doi.org/10.1136%2Fadc.49.9.743>). PMC 1649016 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1649016>). PMID 4419059 (<https://pubmed.ncbi.nlm.nih.gov/4419059>).
13. Eizadi-Mood N (Mar 2006). "Nalidixic acid overdose and metabolic acidosis" (<https://doi.org/10.1017%2Fs14818035001349x>). *Canadian Journal of Emergency Medicine*. **8** (2): 78. doi:10.1017/s148180350001349x (<https://doi.org/10.1017%2Fs148180350001349x>). PMID 17175866 (<https://pubmed.ncbi.nlm.nih.gov/17175866>).
14. "Nalidixic acid spectrum of bacterial susceptibility and Resistance" (<https://web.archive.org/web/20160110130057/http://www.toku-e.com/Upload/Products/PDS/20120522005430.pdf>) (PDF). Toku-E. 2011-09-14. Archived from the original (<http://www.toku-e.com/Upload/Products/PDS/20120522005430.pdf>) (PDF) on 2016-01-10. Retrieved 2012-05-14.
15. "Ethanolamine utilization in *Salmonella typhimurium*: nucleotide sequence, protein expression, and mutational analysis of the *cchA cchB eutE eutJ eutG eutH* gene cluster" (<https://jb.asm.org/content/jb/177/5/1357.full.pdf>) (PDF).

External links

- MedlinePlus DrugInfo *medmaster-a682042* (<https://medlineplus.gov/druginfo/medmaster/a682042.html>)

- ["Nalidixic acid" \(http://www.healthdigest.org/topics/category/1464-nalidixic-acid-dosage-interaction-s-side-effects-how-to-use\)](http://www.healthdigest.org/topics/category/1464-nalidixic-acid-dosage-interaction-s-side-effects-how-to-use). HealthDigest.org.
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