

In 2006, we performed an unbiased search of Pubmed for papers published on either synergistic or antagonistic interactions between antibiotics in vitro. We required the presence of any variant on the term antibiotic* (where the * is a wildcard), and variants on either antagonis* or synergis* in the title. We further required the term “in vitro” appear in any field, to exclude clinical studies. Variants on our requirements will yield different numbers of papers. We then manually curated the interactions described in the papers yielded by this search.

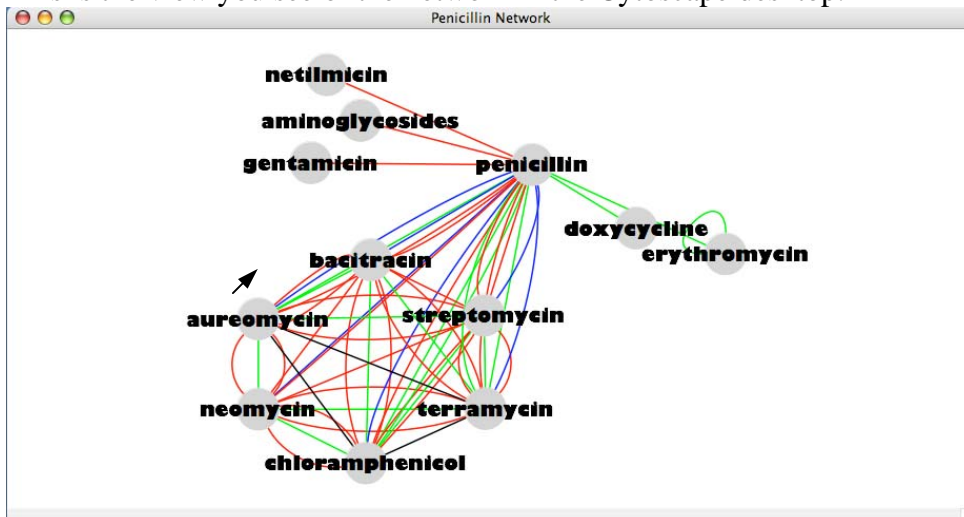
We compiled these interactions into network form (Cytoscape) with each drug represented as a node, and interactions encoded by different colored edges; for example, drug A and drug B interacting synergistically would be connected with a red edge. Links to the relevant paper is attached to each link.

To interact with the network, download the Cytoscape network file from <http://kishony.med.harvard.edu/DrugNetwork.html>. If you do not have Cytoscape on your computer, you can download it free of charge from <http://www.cytoscape.org/>. In order to view the edge links, select the “Edge Attribute Browser” in the Data Panel. Choose the “Select Attributes” button, and check the box marking the “Pubmed Abstract Link.” This should add a column in the data panel, where links to the papers reporting any selected edges will be displayed. Clicking on any of these links will open the Pubmed abstract in the default browser.

Example: Penicillin’s interaction with gentamycin.

In the interests of clarity, I’ve created the subnetwork of penicillin and its interactions. Comments added are in blue.

This is the view you see of the network in the Cytoscape desktop.



We can select individual edges in this network, in order to identify the Pubmed abstract of the source paper.

The screenshot shows a window titled "Penicillin Network". The main area contains a network diagram with nodes representing various antibiotics: netilmicin, aminoglycosides, gentamicin, penicillin, doxycycline, erythromycin, bacitracin, streptomycin, aureomycin, neomycin, terramycin, and chloramphenicol. Colored lines (edges) connect these nodes, representing synergistic relationships. A yellow circle highlights the "gentamicin" node, and a blue arrow points to the edge connecting it to "penicillin" with the text "Click edge to select".

Below the network is a "Data Panel" with a table:

ID	Pubmed Abstract Link
penicillin (synergistic) gentamicin	http://www.ncbi.nlm.nih.gov/entrez/query...

Below the table are three buttons: "Node Attribute Browser", "Edge Attribute Browser" (which is highlighted), and "Network Attribute Browser". A blue arrow points to the link in the table with the text "Click to open abstract".

This is the "Select Attributes" button

Once the edge is selected, click on the link in the Pubmed Abstract Link column. The Pubmed abstract will open in the default browser.

The screenshot shows a web browser displaying a PubMed search result. The address bar shows the URL: <http://www.ncbi.nlm.nih.gov/pubmed/122522?dopt=Abstract>. The page header includes the NCBI and PubMed logos, along with navigation links like "All Databases", "PubMed", "Nucleotide", "Protein", "Genome", "Structure", "OMIM", "PMC", "Journals", and "Books".

The search results section shows:

1: [Antimicrob Agents Chemother.](#) 1978 Mar;13(3):430-4.

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Penicillin-netilmicin synergism against *Streptococcus faecalis*.

[Korzeniowski OM](#), [Wennersten C](#), [Moellering RC Jr](#), [Sande MA](#).

The combination of penicillin plus netilmicin was synergistic in vitro against 28 strains of *Streptococcus faecalis* and compared favorably with penicillin in combination with gentamicin. Similarly, penicillin plus netilmicin was as effective as penicillin plus gentamicin in the therapy of 67 rabbits with enterococcal endocarditis produced with a streptomycin-susceptible (S) or a streptomycin-resistant (R) strain of *S. faecalis*. After 5 days of infection, control rabbits had bacterial titers of 10(10) colony-forming units (CFU)/g of vegetation. Those treated with penicillin plus netilmicin had mean titers of 10(5.2) and 10(5.1) CFU/g for S and R strains, respectively, and those treated with penicillin plus gentamicin had mean valve titers of 10(5.8) CFU/g for both strains. After 10 days of therapy, mean valve titers with penicillin plus netilmicin were 10(3.8) and 10(4.7) CFU/g, and with penicillin plus gentamicin they were 10(4.5) and 10(5.4) CFU/g for S and R strains, respectively. Thus, if netilmicin proves to be less toxic than other aminoglycoside antibiotics, it may have potential usefulness in the therapy of enterococcal endocarditis.

Publication Types:

- [Research Support, Non-U.S. Gov't](#)

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