

## Inhibition of Nucleic Acid Synthesis by Antibiotics

*BioFiles 2006, 1.4, 7.*

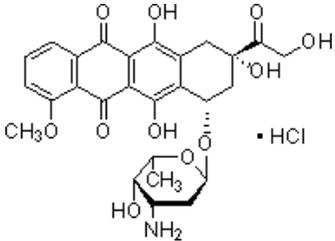
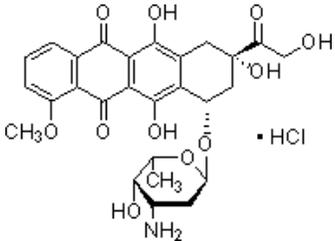
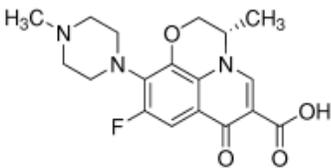
Quinolones are a key group of antibiotics that interfere with DNA synthesis by inhibiting topoisomerase, most frequently topoisomerase II (DNA gyrase), an enzyme involved in DNA replication. DNA gyrase relaxes supercoiled DNA molecules and initiates transient breakages and rejoins phosphodiester bonds in superhelical turns of closed-circular DNA. This allows the DNA strand to be replicated by DNA or RNA polymerases. The fluoroquinolones, second-generation quinolones that include **levofloxacin**, **norfloxacin**, and ciprofloxacin, are active against both Gram-negative and Gram-positive bacteria.

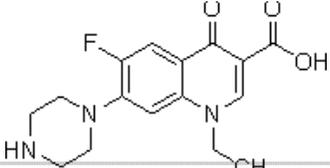
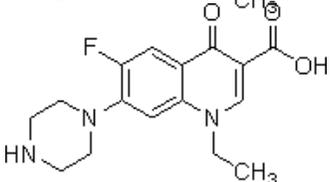
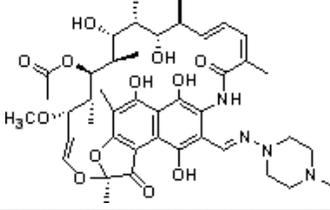
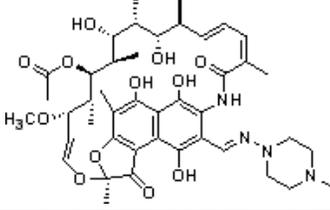
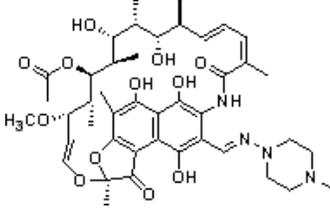
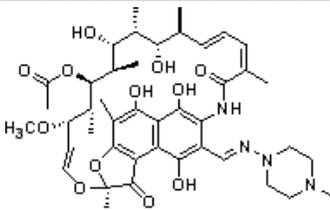
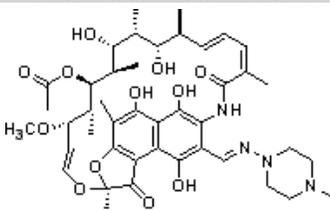
Topoisomerases are present in both prokaryotic and eukaryotic cells, but the quinolones are specific inhibitors of bacterial topoisomerase II. Inhibitors that are effective against mammalian topoisomerases, such as **irinotecan** and etoposide, are used as antineoplastic drugs to kill cancer cells.

**Rifampicin** blocks initiation of RNA synthesis by specifically inhibiting bacterial RNA polymerase. It does not interact with mammalian RNA polymerases, making it specific for Gram-positive bacteria and some Gram-negative bacteria.

Some antibiotics that interfere with RNA synthesis by inhibiting RNA polymerase, such as **doxorubicin** and **actinomycin D (dactinomycin)**, are not specific for bacteria and interfere with both bacterial and mammalian systems. These are most often used as antineoplastic and antitumor drugs, attacking rapidly growing malignant cells as well as normal cells. Because cancerous cells are growing at a faster rate than surrounding normal tissue, a higher percentage of malignant cells are attacked by cytotoxic drugs. However, antitumor drugs cannot differentiate between malignant cells and fast-dividing normal cells such as those of the intestinal epithelium or hair follicles.

### Materials

Product #	Image	Description	Molecular Formula	Add to Cart
D1515		Doxorubicin hydrochloride 98.0-102.0% (HPLC)	$C_{27}H_{29}NO_{11} \cdot HCl$	pricing
44583		Doxorubicin hydrochloride suitable for fluorescence, 98.0-102.0% (HPLC)	$C_{27}H_{29}NO_{11} \cdot HCl$	pricing
I1406		Irinotecan hydrochloride	$C_{33}H_{38}N_4O_6 \cdot HCl$	pricing
28266		Levofloxacin $\geq$ 98.0% (HPLC)	$C_{18}H_{20}FN_3O_4$	pricing

N9890		Norfloxacin ≥98% (TLC)	C <sub>16</sub> H <sub>18</sub> FN <sub>3</sub> O <sub>3</sub>	pricing
33899		Norfloxacin VETRANAL™, analytical standard	C <sub>16</sub> H <sub>18</sub> FN <sub>3</sub> O <sub>3</sub>	pricing
R3501		Rifampicin ≥97% (HPLC), powder	C <sub>43</sub> H <sub>58</sub> N <sub>4</sub> O <sub>12</sub>	pricing
R7382		Rifampicin plant cell culture tested, BioReagent, ≥97% (HPLC), crystalline	C <sub>43</sub> H <sub>58</sub> N <sub>4</sub> O <sub>12</sub>	pricing
R8883		Rifampicin powder	C <sub>43</sub> H <sub>58</sub> N <sub>4</sub> O <sub>12</sub>	pricing
46713		Rifampicin VETRANAL™, analytical standard	C <sub>43</sub> H <sub>58</sub> N <sub>4</sub> O <sub>12</sub>	pricing
83907		Rifampicin ≥97.0% (HPLC)	C <sub>43</sub> H <sub>58</sub> N <sub>4</sub> O <sub>12</sub>	pricing