

## Tetracycline Toxicities

Tetracyclines are a group of broad spectrum antibiotics named after their structure which contains a four hydrocarbon ring derivative. Drugs in this group include tetracycline, doxycycline, demeclocycline, and minocycline. Doxycycline is fecally eliminated and can therefore be used in patients with renal impairment. Demeclocycline is a specific tetracycline that is widely used in the treatment of hyponatremia caused by syndrome of inappropriate antidiuretic hormone when fluid restriction alone is not adequate. The use of demeclocycline in SIADH actually utilizes a side effect of the drug, which is an anti diuretic hormone antagonist. In individuals without SIADH, it can induce nephrogenic diabetes insipidus. These antibiotics are protein synthesis inhibitors that bind to the 30S prokaryotic ribosomal subunit in the mRNA translation complex. By doing so, these drugs prevent the binding aminoacyl tRNA to the mRNA ribosome complex. Because these drugs are relatively water soluble, they demonstrate limited CNS penetration. In addition, orally administered tetracyclines may chelate divalent cations like  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ , and  $\text{Fe}^{2+}$ , and impair absorption. Therefore, oral administration of these drugs should be separated from the consumption of foods or supplements with high amounts of divalent cations like milk, antacids, or iron by at least one or two hours. Tetracyclines remain the treatment of choice for infections caused by Chlamydia, Rickettsia, and spirochetal infections like Borrelia burgdorferi. They are also sometimes used in a triple therapy regimen for Helicobacter pylori and used in the treatment of Mycoplasma pneumonia. Side effects from tetracyclines are not common but an important one to note is photosensitivity. Tetracyclines can increase the risk of sunburn after exposure to sunlight. These may also cause GI distress. Tetracyclines are also considered teratogens due to the strong association with teeth discoloration in the fetus and as they develop in infancy. These drugs are also associated with the inhibition of bone growth in children when given therapeutically high doses. Historically, tetracyclines have been avoided in children due to these risks. More recent evidence, however, suggests that doxycycline specifically is safe for use in children for short courses without risk of tooth staining.



PLAY PICMONIC

### Inhibition of Bone Growth in Children

#### Child in Bone-suit

In addition to teeth discoloration, tetracyclines have been demonstrated to be associated with inhibition of bone growth in children when given in therapeutically high doses.

### Teratogen

#### Tarantula-gem

Teratogens are agents that cause a defect or malformation in the development of the embryo or fetus. Tetracyclines are considered teratogens due to teeth discoloration that may occur as well as the potential to inhibit bone growth.

### Discoloration of Teeth

#### Discolored Teeth

Tetracyclines are considered teratogens due to the strong association with teeth discoloration in the fetus and developing infant. It may result in permanent staining of teeth characterized by dark yellow gray teeth with a darker horizontal band across the bottom and top rows. Historically, tetracyclines have been avoided in children due to these risks. More recent evidence, however, suggests that doxycycline specifically is safe for use in

children for short courses without risk of tooth staining.

### **Photosensitivity**

#### **Photo-camera Causing Sensitive-crying**

An important side effect of tetracyclines is photosensitivity as they can increase the risk of sunburn after exposure to light. This side effect is of particular importance for patients that use this class of medication for long term malaria prophylaxis as it can cause permanent sensitivity and sun damage.

### **GI Distress**

#### **GI-guy with Flare-gun**

Tetracyclines can cause relatively mild GI distress in patients including nausea and diarrhea. GI symptoms can be improved by taking the antibiotic with plenty of water. Tetracycline itself should not be taken with food as this can decrease antibiotic absorption, however other members of this class like doxycycline can be taken with food. Lastly, if a pill ever becomes lodged in the esophagus, tetracyclines can cause pill-induced esophagitis.