Carbamazepine

**CAS Number**: 298-46-4
**Molecular Weight**: 236.26 g/mol
**Molecular Formula**: C₁₅H₁₂N₂O
**Systematic (IUPAC)**: 2-azatricyclo[9.4.0.0^{3,8}]pentadeca-1(11),3(8),4,6,9,12,14-heptaene-2-carboxamide

**Type**: small molecule

**Description**: An anticonvulsant used to control grand mal and psychomotor or focal seizures. Its mode of action is not fully understood, but some of its actions resemble those of phenytoin; although there is little
chemical resemblance between the two compounds, their three-dimensional structure is similar. [ 

**Categories**
- Anticonvulsants
- Analgesics
- Antimanic Agents
- Analgesics, Non-Narcotic

**Taxonomy**
- **Kingdom**: Organic
- **Classes**: Dibenzazepines and Derivatives

**Substructures**:  
- Alkanes and Alkenes
- Dibenzazepines and Derivatives
- Phenylpropenes
- Benzene and Derivatives
- Ureas and Derivatives
- Carbamates and Derivatives
- Heterocyclic compounds
- Aromatic compounds
- Azepines
- Benzazepines
- Anilines

**Pharmacology**

**Indication**: For the treatment of epilepsy and pain associated with true trigeminal neuralgia.

**Pharmacodynamics**: Carbamazepine, an anticonvulsant structurally similar to tricyclic antidepressants, is used to treat partial seizures, tonic-clonic seizures, pain of neurologic origin such as trigeminal neuralgia, and psychiatric disorders including
manic-depressive illness and aggression due to dementia.

**Mechanism of action**: Carbamazepine inhibits sustained repetitive firing by blocking use-dependent sodium channels. Pain relief is believed to be associated with blockade of synaptic transmission in the trigeminal nucleus and seizure control with reduction of post-tetanic potentiation of synaptic transmission in the spinal cord. Carbamazepine also possesses anticholinergic, central antidiuretic, antiarrhythmic, muscle relaxant, antidepressant (possibly through blockade of norepinephrine release), sedative, and neuromuscular-blocking properties.

**Protein binding**: Carbamazepine in blood is 76% bound to plasma proteins.

**Metabolism** : Hepatic

**Half life**: 25-65 hours

**Toxicity**: Mild ingestions cause vomiting, drowsiness, ataxia, slurred speech, nystagmus, dystonic reactions, and hallucinations. Severe intoxications may produce coma, seizures, respiratory depression, and hypotension

**Affected organisms**: Humans and other mammals

**Drug Class And Mechanisms**
Carbamazepine is an anti-seizure medication. Recurrent seizures (epilepsy) are divided into two main categories according to how much of the brain is involved, partial and generalized epilepsy (which includes petit mal, grand mal, and myoclonic epilepsy). Seizures are called "simple" if there is no loss of consciousness and "complex" if there is. Medicines that inhibit seizures are called anti-convulsants. Carbamazepine works as an
anti-convulsant for partial and grand mal seizures by reducing or blocking certain responses in the brain. It is also used for treating trigeminal neuralgia. One dosage form, Equetro, has been approved for treating bipolar disorder.

**Dosing**
Carbamazepine may be taken with or without food. Carbamazepine is excreted by the kidney and metabolized by the liver and dosages may need to be lowered in patients with liver or kidney dysfunction. Drug blood levels of carbamazepine can be followed.

**Drug interactions**
Carbamazepine interacts with multiple drugs and caution should be used in combining other medicines with it. Lower levels of carbamazepine are seen when administrated with phenobarbital, phenytoin(Dilantin), or primidone (Mysoline). Warfarin (Coumadin), phenytoin(Dilantin), theophylline, and valproic acid (Depakote, Depakote ER, Depakene, Depacon) are more rapidly metabolized with carbamazepine, while carbamazepine levels are elevated when taken with erythromycin, cimetidine (Tagamet), propoxyphene (Darvon), and calcium channel blockers. Carbamazepine also increases the metabolism (destruction) of the hormones in birth control pills and can reduce the effectiveness of birth control pills. Unexpected pregnancies have occurred in patients taking both carbamazepine and birth control pills.

**Why is this medication prescribed?**
Carbamazepine is used alone or in combination with other medications to control certain types of seizures. It is also used to treat trigeminal neuralgia (a condition that causes facial nerve pain). Carbamazepine extended-
release capsules (Equetro brand only) are used to treat episodes of mania (frenzied, abnormally excited or irritated mood) or mixed episodes (symptoms of mania and depression that happen at the same time) in patients with bipolar I disorder (manic-depressive disorder; a disease that causes episodes of depression, episodes of mania, and other abnormal moods). Carbamazepine is in a class of medications called anticonvulsants. It works by reducing abnormal electrical activity in the brain.

**How should this medicine be used?**
Carbamazepine comes as a tablet, a chewable tablet, an extended-release (long-acting) tablet, an extended-release capsule, and a suspension (liquid) to take by mouth. The regular tablet, chewable tablet, and liquid are usually taken two to four times a day with meals. The extended-release tablet is usually taken twice a day with meals. The extended-release capsule is usually taken twice a day with or without meals. To help you remember to take carbamazepine, take it at around the same times every day. Follow the directions on your prescription label carefully, and ask your doctor or pharmacist to explain any part you do not understand.

Take carbamazepine exactly as directed. Do not take more or less of it or take it more often than prescribed by your doctor.

Swallow the extended-release tablets whole; do not split, chew, or crush them. The extended-release capsules may be opened and the beads inside sprinkled over food, such as a teaspoon of applesauce or similar food. Do not crush or chew the extended-release capsules or the beads inside them.
Shake the liquid well before each use to mix the medication evenly.

Your doctor will start you on a low dose of carbamazepine and gradually increase your dose. Carbamazepine may help control your condition, but will not cure it. It may take a few weeks or longer before you feel the full benefit of carbamazepine. Continue to take carbamazepine even if you feel well. Do not stop taking carbamazepine without talking to your doctor, even if you experience side effects such as unusual changes in behavior or mood. If you have a seizure disorder and you suddenly stop taking carbamazepine, your seizures may become worse. Your doctor will probably decrease your dose gradually.

**Other uses for this medicine**

Carbamazepine is also sometimes used to treat mental illnesses, depression, posttraumatic stress disorder, drug and alcohol withdrawal, restless legs syndrome, diabetes insipidus, certain pain syndromes, and a disease in children called chorea. Talk to your doctor about the possible risks of using this medication for your condition.

This medication may be prescribed for other uses; ask your doctor or pharmacist for more information.

**What special precautions should I follow?**

Before taking carbamazepine, tell your doctor and pharmacist if you are allergic to carbamazepine, amitriptyline (Elavil), amoxapine (Asendin), clomipramine (Anafranil), desipramine (Norpramin), doxepin (Adapin, Sinequan), imipramine (Tofranil), nortriptyline (Aventyl, Pamelor), other medications for seizures such as phenobarbital (Luminal, Solfoton) or phenytoin (Dilantin),
protriptyline (Vivactil), trimipramine (Surmontil), or any other medications.

you should know that carbamazepine is the active ingredient in several products that have different names and may be prescribed to treat different conditions. Check the list of brand names at the beginning of this document carefully. All of the products listed contain carbamazepine and you should not take more than one of them at the same time.

do not take carbamazepine if you are taking monoamine oxidase (MAO) inhibitors, including isocarboxazid (Marplan), phenelzine (Nardil), selegiline (Eldepryl), and tranylcypromine (Parnate), or have stopped taking them within the past 2 weeks.

tell your doctor and pharmacist what other prescription and nonprescription medications, vitamins, and nutritional supplements you are taking or plan to take. Be sure to mention any of the following: acetaminophen (Tylenol); acetazolamide (Diamox); alprazolam (Xanax); anticoagulants ('blood thinners') such as warfarin (Coumadin); antidepressants such as amitriptyline (Elavil), bupropion (Wellbutrin, Zyban), buspirone (BuSpar), citalopram (Celexa), clomipramine (Anafranil), desipramine (Norpramin), fluoxetine (Prozac, Sarafem), fluvoxamine (Luvox), mirtazapine (Remeron), nortriptyline (Pamelor); antifungals such as itraconazole (Sporanox) and ketoconazole (Nizoral); cimetidine (Tagamet); cisplatin (Platinol); clarithromycin (Biaxin); clonazepam (Klonopin); clozapine (Clozaril); cyclosporine (Neoral, Sandimmune); dalfopristin and quinupristin (Synercid); danazol (Danocrine); delavirdine (Rescriptor); diltiazem (Cardizem, Dilacor, Tiazac); doxorubicin (Adriamycin, Rubex); doxycycline (Vibramycin); erythromycin
(E.E.S., E-Mycin, Erythrocin); felodipine (Plendil); haloperidol (Haldol); HIV protease inhibitors including atazanavir (Reyataz), indinavir (Crixivan), lopinavir (in Kaletra), nelfinavir (Viracept), ritonavir (Norvir, in Kaletra), and saquinavir (Fortovase, Invirase); isoniazid (INH, Nydrazid); levothyroxine (Levoxyl, Synthroid); lithium (Lithobid); loratadine (Claritin); lorazepam (Ativan); certain medications to treat malaria such as chloroquine (Aralen) and mefloquine (Lariam); medications for anxiety or mental illness; other medications for seizures such as ethosuximide (Zarontin), felbamate (Felbatol), lamotrigine (Lamictal), methsuximide (Celontin), oxcarbazepine (Trileptal), phenobarbital (Luminal, Solfoton), phenytoxin (Dilantin), primidone (Mysoline), tiagabine (Gabitril), topiramate (Topamax), and valproic acid (Depakene, Depakote); methadone (Dolophine); nefazodone; niacinamide (nicotinamide, Vitamin B3); propoxyphene (Darvon); praziquantel (Biltricide); quinine; rifampin (Rifadin, Rimactane); sedatives; sleeping pills; terfenadine (Seldane) (not available in the US); theophylline (Theobid, Theo-Dur); tramadol (Ultram); tranquilizers; troleandomycin (TAO); verapamil (Calan, Covera, Isoptin, Verelan); and zileuton (Zyflo). Many other medications may also interact with carbamazepine, so be sure to tell your doctor about all the medications you are taking, even those that do not appear on this list. Your doctor may need to change the doses of your medications or monitor you carefully for side effects. if you are taking any other liquid medications, do not take them at the same time as carbamazepine liquid.
tell your doctor what herbal products you are taking, especially St. John's wort.
tell your doctor if you have or have ever had glaucoma; psychosis; or heart, kidney, thyroid, or liver disease.
you should know that carbamazepine may decrease the effectiveness of hormonal contraceptives (birth control pills, patches, rings, injections, implants, or intrauterine devices). Use another form of birth control while taking carbamazepine. Tell your doctor if you have unexpected vaginal bleeding or think you may be pregnant while you are taking carbamazepine.
tell your doctor if you are pregnant or plan to become pregnant. Carbamazepine may harm the fetus. If you become pregnant while taking carbamazepine, call your doctor immediately.
do not breast-feed while you are taking carbamazepine.
if you are having surgery, including dental surgery, tell the doctor or dentist that you are taking carbamazepine.
you should know that carbamazepine may make you drowsy. Do not drive a car or operate machinery until you know how this medication affects you.
remember that alcohol can add to the drowsiness caused by this medication.
you should know that your mental health may change in unexpected ways and you may become suicidal (thinking about harming or killing yourself or planning or trying to do so) while you are taking carbamazepine for the treatment of epilepsy, mental illness, or other conditions. A small number of adults and children 5 years of age and older (about 1 in 500 people) who took antiepileptics such as carbamazepine to treat various conditions during clinical studies became suicidal during their treatment. Some of these people developed suicidal thoughts and behavior as early as one week after
they started taking the medication. There is a risk that you may experience changes in your mental health if you take an antiepileptic medication such as carbamazepine, but there may also be a risk that you will experience changes in your mental health if your condition is not treated. You and your doctor will decide whether the risks of taking an antiepileptic medication are greater than the risks of not taking the medication. You, your family, or your caregiver should call your doctor right away if you experience any of the following symptoms: panic attacks; agitation or restlessness; new or worsening irritability, anxiety, or depression; acting on dangerous impulses; difficulty falling or staying asleep; aggressive, angry, or violent behavior; mania (frenzied, abnormally excited mood); talking or thinking about wanting to hurt yourself or end your life; withdrawing from friends and family; preoccupation with death and dying; giving away prized possessions; or any other unusual changes in behavior or mood. Be sure that your family or caregiver knows which symptoms may be serious so they can call the doctor if you are unable to seek treatment on your own.

**What special dietary instructions should I follow?**
Talk to your doctor about drinking grapefruit juice while taking this medicine.

**What should I do if I forget a dose?**
Take the missed dose as soon as you remember it. However, if it is almost time for the next dose, skip the missed dose and continue your regular dosing schedule. Do not take a double dose to make up for a missed one.

**What side effects can this medication cause?**
Carbamazepine may cause side effects. Tell your doctor if any of these symptoms are severe or do not go away:
- drowsiness
- dizziness
- unsteadiness
- nausea
- vomiting
- headache
- anxiety
- memory problems
- diarrhea
- constipation
- heartburn
- dry mouth
- back pain
- confusion
- loss of contact with reality
- chest pain
- yellowing of the skin or eyes
- vision problems

**What storage conditions are needed for this medicine?**
Keep this medication in the container it came in, tightly closed, and out of reach of children. Store it at room temperature, away from excess heat and moisture (not in the bathroom). Throw away any medication that is outdated or no longer needed. Talk to your pharmacist about the proper disposal of your medication.

**Symptoms of overdose may include:**
- unconsciousness
- seizures
- restlessness
- muscle twitching
abnormal movements
shaking of a part of your body that you cannot control
unsteadiness
drowsiness
dizziness
blurred vision
irregular or slowed breathing
rapid or pounding heartbeat
nausea
vomiting
difficulty urinating

**What other information should I know?**
Before having any laboratory test, tell your doctor and the laboratory personnel that you are taking carbamazepine.
Carbamazepine can interfere with the results of home pregnancy tests. Talk to your doctor if you think you might be pregnant while you are taking carbamazepine.
Do not try to test for pregnancy at home.
The extended-release tablet does not dissolve in the stomach after swallowing. It slowly releases the medicine as it passes through your digestive system. You may notice the tablet coating in your stool.
Do not let anyone else take your medication. Ask your pharmacist any questions you have about refilling your prescription.
It is important for you to keep a written list of all of the prescription and nonprescription (over-the-counter) medicines you are taking, as well as any products such as vitamins, minerals, or other dietary supplements. You should bring this list with you each time you visit a doctor or if you are admitted to a hospital. It is also
important information to carry with you in case of emergencies.

apollo | asia Division
APOLLO Pharmaceuticals
API Manufacturers INDIA [P] Ltd.|asia Division
Mr. Vipin Saxena|CEO
Cellular:+91-98-21050033
Cellular:+91-98-20150033
Direct  :+91-22-65785588
FAX   :+91-22-42950001

Wireline Purchase HELPDESK:
+91-22-65050001
+91-22-65650001

Wireline Sales HELPDESK:
+91-22-65500009
+91-22-65050009

Wireless 24x7 HELPDESK:
+9191-46-951951
+9191-46-950950

Blackberry Pin :
32E6500D | 32E65010 | 28415C58

Email:
apollo@Hotmail.Co.in
Sales@apollopharma.in
Export@apollopharma.in
purchase@apollopharma.in

www.apolloworld.in
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www.apollopharmaceuticals.Net
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Skype NAME: VipinrSaxena
Rocketmail: VipinrSaxena
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BlackBerry: 28415C58

Regd. Office :-
1104, Maker Chamber V,
Nariman Point
Mumbai, INDIA
Pin: 400021

Industrial Office
D-62, OIC India
Oshiwara Industrial Centre,
New Link Road,
Goregoan West,
Mumbai, INDIA
Pin: 400104

Manufacturing Unit Address:
Plot No. 117A,
Village: Chamble
Near MonaTona Limited Wada,
Maharashtra,
PIN: 421312 | INDIA

Email:
apollo@Hotmail.Co.in
Sales@apollopharma.in
Export@apollopharma.in
purchase@apollopharma.in

Carbamazepine

CAS Number: 298-46-4
Molecular Weight: 236.26 g/mol
Molecular Formula: C_{12}H_{14}N_{2}O
Systematic (IUPAC): 2-azatricycl[9.4.0.0^{3,8}]
\hspace{1em}pentadeca-1(11),3(8),4,6,9,12,14-heptaene-2-carboxamide
Carbamazepine

CAS Number : 298-46-4
Molecular Weight : 236.26 g/mole
Molecular Formula : C_{18}H_{14}N_{2}O
Systematic (IUPAC) : 2-azatricyclo[9.4.0.0^3,8]pentadeca-1(11),3(8),4,6,9,12,14-heptaene-2-carboxamide