

# Drugs that Predispose People to Heat Illnesses

## ***Anticholinergics***

Anticholinergic drugs block the transmission of the neurotransmitter acetylcholine in the central and peripheral nervous system responsible for the autonomic control of the smooth muscles primarily in the gastrointestinal (GI) tract, the genitourinary tract, and the lungs. They are used to treat:

- vertigo and motion sickness
- peptic ulcers, diarrhea, diverticulitis, ulcerative colitis, nausea and vomiting (GI problems)
- cystitis, urethritis, and prostatitis (GU problems)
- asthma, chronic bronchitis, COPD (respiratory problems)
- slow heart rate due to a hypersensitive vagus nerve.

*Anticholinergics inhibit sweating—and therefore cooling—and predispose people to both heat exhaustion and heat stroke.*

**Examples:** atropine, belladonna alkaloids, benztropine mesylate, clidinium, cyclopentolate, darifenacin, dicyclomine, fesoterodine, flavoxate, glycopyrrolate, homatropine hydrobromide, hyoscyamine, ipratropium, orphenadrine, oxybutynin, propantheline, scopolamine, methscopolamine, solifenacin, tiotropium, tolterodine, trihexyphenidyl, trospium

## ***Antihistamines***

Antihistamines block histamine receptor sites in mast cells and basophils, smooth muscle, the lining of lymph and blood vessels, and histamine-releasing neurons in the brain. There are two subcategories of antihistamines: H1 and H2; both are used to treat allergies. H2 antihistamines, because they bind to histamine receptors in the gut, are also used to treat peptic ulcers and acid reflux and H1 antihistamines, because they cross the blood-brain barrier and bind to histamine receptors in the hypothalamus, may be used to treat insomnia in adults and motion sickness. *Similar to anticholinergic drugs, antihistamines inhibit sweating and predispose people to both heat exhaustion and heat stroke.*

**H-1 Examples:** fexofenadine, cetirizine, lorpheniramine, diphenhydramine, carbinoxamine, promethazine, loratadine, desloratadine, levocetirizine, brompheniramine, hydroxyzine, clemastine, chlorpheniramine, triprolidine

**H-2 Examples:** nizatidine, ranitidine, famotidine, cimetidine

### **Opioids**

Opioids—including their semi-synthetic and synthetic derivatives—are used to manage both acute and, to a lesser extent, chronic pain; strong opioids are highly addictive. Codeine, a weak opioid, is commonly used in over-the-counter (OTC) pain medications and cough suppressants. Loperamide, an opioid that cannot cross the blood-brain barrier acts on the large intestine to suppress diarrhea. *All opioids decrease blood flow to the skin and predispose people to heat stroke.*

**Examples:** codeine, fentanyl, hydrocodone, hydrocodone, hydromorphone, meperidine, methadone, morphine, oxycodone

### **Pseudoephedrine**

Pseudoephedrine is a stimulant that acts on the smooth muscle lining the blood vessels and bronchi causing them to constrict; it is used to treat sinus and nasal congestion and promote drainage of the sinuses and the Eustachian tubes. *Because it's a vasoconstrictor, pseudoephedrine decreases blood flow to the skin and predisposes people to heat exhaustion and heat stroke.*

### **Diuretics**

Prescription diuretics are first-line drugs used to treat high blood pressure. *Along with caffeine, prescription diuretics promote dehydration via excessive urination and, through that route, predispose people to heat exhaustion, heat stroke, and—because they deplete the body of sodium—hyponatremia.*

**Examples:** furosemide, bumetanide, torsemide, ethacrynic acid, hydrochlorothiazide, chlorthalidone, metolazone, spironolactone, eplerenone, triamterene, amiloride, acetazolamide (for AMS)

### **Selective Serotonin Reuptake Inhibitors (SSRIs)**

SSRIs are a class of drugs primarily used to treat depression and anxiety disorders but may also be used to treat post traumatic stress disorders (PTSD). The exact therapeutic mechanism is unknown and the side effects of SSRIs may outweigh their benefit. *All SSRIs can cause dehydration, which, in turn, can lead to more serious heat illnesses.*

**Examples:** citalopram, escitalopram, fluoxetine, faroxetine, sertraline

### ***Ibuprofen & Naproxen***

Both ibuprofen & naproxen belong to a family of drugs called non-steroidal anti-inflammatory drugs (NSAID) that are commonly carried in first aid kits to treat pain or reduce a fever. *While neither drug predisposes people to a heat illness, CAUTION is advised as they can cause kidney damage in the presence of dehydration.*

### ***Antipsychotics***

Antipsychotics block receptor sites in the brain's dopamine pathways and are used to treat schizophrenia and bipolar disorders, and combined with antidepressants to treat depression in the short term. Unfortunately, *they can inhibit the body's ability to regulate temperature and predispose people to heat stroke.*

**Examples:** aripiprazole, asenapine, cariprazine, clozapine, lurasidone, olanzapine, quetiapine, risperidone, ziprasidone, paliperidone, brexpiprazole, pimavanserin, iloperidone

### ***Beta Blockers***

Beta receptors are found in the smooth muscle cells of arteries, bronchi, kidneys, and the heart. When stimulated by epinephrine and other stress hormones, they cause a sympathetic stress response that, among other things, increases heart rate and blood pressure. Beta blockers weaken the stress response and are primarily used to manage abnormal heart rhythms and prevent a second heart attack. (They may also be used to treat high blood pressure but are not as effective as diuretics.) *They reduce blood flow to the skin and and predispose people to heat stroke.*

**Examples:** acebutolol, atenolol, betaxolol, bisoprolol, carteolol, carvedilol, labetalol, metoprolol, nadolol, nebivolol, penbutolol, pindolol, ropanolol, sotalol, timolol

### ***Calcium Channel Blockers***

Calcium channel blockers disrupt the movement of calcium through cell membranes and are used to treat high blood pressure. They help increase the elasticity of large blood vessels allowing them to stretch and expand. In this way they also reduce chest pain caused by angina pectoris. They are more effective than beta blockers but have more side effects. *Similar to beta blockers, they also reduce blood flow to the skin and predispose people to heat stroke.*

**Examples:** amlodipine, diltiazem, felodipine, isradipine, nifedipine, nicardipine, nimodipine, nisoldipine, verapamil

### ***Ephedrine, Amphetamines, & Cocaine***

Ephedrine, amphetamines, and cocaine are central nervous system stimulants. Ephedrine is used as a stimulant, appetite suppressant (currently banned in the United States), concentration aid, and decongestant; it works by increasing the activity of norepinephrine. Amphetamines are used to treat attention deficit hyperactivity disorder (ADHD) and narcolepsy. Cocaine is made from the leaves of the coca shrub with no current medicinal use; it is primarily used as a recreational drug...as are many amphetamines. *Ephedrine, amphetamines, and cocaine increase internal body temperature, constrict blood vessels, and predispose people to heat exhaustion and heat stroke.*

### ***Tricyclic Antidepressants***

Tricyclic Antidepressants (TCAs), as the name implies, are primarily used in the treatment of mood disorders; they are also used to treat chronic neuropathic pain and as migraine prophylaxis (but will not treat a migraine attack). *TCAs also decrease sweating and inhibit the body's ability to regulate temperature and predispose people to heat exhaustion and heat stroke.*

**Examples:** amitriptyline, desipramine, doxepine, Imipramine, nortriptyline, amoxapine, clomipramine, maprotiline, trimipramine, protriptyline

### ***ACE Inhibitors***

ACE inhibitors are primarily used to treat heart and kidney problems. They block the production of enzymes that cause vasoconstriction and permit blood vessels to relax (dilate) reducing both blood and kidney pressure. *ACE inhibitors may cause increased sweating in some patients, which may quickly lead to dehydration in a heat challenge, and by that route predispose people to heat exhaustion and heat stroke.*

**Examples:** benazepril, captopril, enalapril, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril,trandolapril

## **Lithium**

Lithium is a mood stabilizer used to treat bipolar disorders and is primarily cleared via urine. While lithium does not predispose people to any heat illness, if a client taking lithium loses a lot of fluid quickly through sweating—which, depending on the individual can easily occur in a moderate or severe heat challenge—their lithium level may quickly rise to toxic levels. *Prevention and treatment focus on maintaining normal hydration levels.*

- Mild intoxication signs & symptoms: nausea, vomiting, lethargy, tremor, and fatigue (Serum lithium concentration between 1.5-2.5 mEq/L).
- Moderate intoxication signs & symptoms: confusion, agitation, delirium, tachycardia, and hypertonia (serum lithium concentration between 2.5-3.5 mEq/L).
- Severe intoxication signs & symptoms: Coma, seizures, hyperthermia, and hypotension (serum lithium concentration less than 3.5 mEq/L).