

Antispasmodics

Antimuscarinic agents - hyoscyamine, dicyclomine and hyoscine butylbromide - that relax gastrointestinal smooth muscle to relieve the cramping pain of irritable bowel syndrome, split sharply by whether the molecule can cross into the brain.

Online guide: <https://www.medguideglobal.com/pharmacology/gastrointestinal/antispasmodics>

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Quick revision

One Liner: All three drugs block muscarinic receptors on gut smooth muscle to relieve spasm and cramping pain, but hyoscine butylbromide is a quaternary ammonium compound that cannot cross the blood-brain barrier, while hyoscyamine and dicyclomine are tertiary amines that can - the reason CNS side effects are a labelled concern for two of the three and not the third.

1. Dicyclomine has a distinct, separately labelled danger in infants: serious respiratory symptoms including apnea, plus seizures and syncope, have been reported, and it is contraindicated under 6 months of age. [2]
2. Hyoscine butylbromide (Buscopan) is a quaternary ammonium compound whose structure largely excludes it from the brain, which is why it carries minimal central anticholinergic side effects compared with the other two -- not a guarantee of zero central effect, but a substantially reduced one. [3]
3. Dicyclomine acts by two mechanisms at once: a specific antimuscarinic effect at acetylcholine receptors plus a direct, non-specific relaxant effect on smooth muscle itself. [2]
4. Contraindications differ by drug and formulation. Hyoscyamine and dicyclomine labels include unstable cardiovascular status in acute haemorrhage; glaucoma, myasthenia gravis and bowel obstruction also require careful product-specific checking. [1][2][3]
5. Dizziness (about 40%), dry mouth (about 33%) and blurred vision (about 27%) are the most frequent dicyclomine adverse reactions in trials. [2]
6. Persisting or worsening severe abdominal pain, especially with fever, vomiting, blood in the stool or fainting, is an urgent reason to seek medical care rather than take another antispasmodic dose - the drug can mask, but does not treat, a surgical abdomen. [3]
7. None of these three is licensed to fix the underlying cause of IBS; all provide symptomatic relief of cramping and spasm only. [4]

Overview

1. Gastrointestinal antispasmodics are antimuscarinic drugs used for the cramping, spasm-driven abdominal pain of irritable bowel syndrome and related functional bowel disorders. They act on the same receptor family as the antimuscarinic bronchodilators and the older first-generation antihistamines, but here the target is smooth muscle in the gut wall rather than the airway or the vestibular system. [4]
2. The clinically important split within this small class is not indication - all three drugs covered here are used for IBS-type cramping - but chemistry. Hyoscyamine and dicyclomine are tertiary amines, which cross the blood-brain barrier and can therefore produce central anticholinergic effects: confusion, drowsiness, and rarely psychosis or hallucinations. Hyoscine butylbromide is a quaternary ammonium compound; the added positive charge keeps it out of the brain almost entirely, so its side-effect profile is peripheral only. [1][2][3]
3. Dicyclomine carries the sharpest labelled warning in the group, and it is paediatric rather than psychiatric: serious respiratory symptoms, including apnea, along with seizures and syncope, have been reported in infants, and the drug is contraindicated under six months of age and in nursing mothers. Hyoscyamine's label instead emphasises cardiac caution - any tachycardia should be investigated before an anticholinergic is given, since the drug will itself raise heart

rate and could mask a more serious arrhythmia. [2][1]

4. Because antispasmodics only relieve smooth-muscle spasm, they are not a substitute for diagnosing the cause of abdominal pain. Persisting or worsening severe pain, especially alongside fever, vomiting, a change in bowel habit, abdominal tenderness, low blood pressure, fainting or blood in the stool, is treated as a reason to seek medical assessment promptly rather than as a symptom this class is meant to manage. [3]

Classification and drug examples

Intro: Grouped here by the chemistry that determines whether the drug reaches the brain, since that single property predicts most of the difference in side effects across the class.

1. Name: Tertiary amine antimuscarinics (CNS-penetrant)

1. Note: Cross the blood-brain barrier; carry both peripheral antimuscarinic effects and a labelled risk of central effects such as confusion, drowsiness or, rarely, psychosis.

1. Name: Hyoscyamine

1. Levsin

2. Levsin SL

1. Route: Oral or sublingual

1. Note: A belladonna alkaloid; also used for peptic ulcer disease, spastic colitis and neurogenic bladder disturbance beyond IBS. [1]

2. Name: Dicyclomine

1. Bentyl

2. dicycloverine

2. Route: Oral

2. Note: Acts by a combined antimuscarinic and direct smooth-muscle relaxant mechanism; carries a distinct infant-apnea warning not shared by the other two drugs in this class. [2] [1][2]

2. Name: Quaternary ammonium antimuscarinics (non-CNS-penetrant)

2. Note: Carry a permanent positive charge that keeps the molecule almost entirely out of the brain, so labelled adverse effects are peripheral rather than central.

Name: Hyoscine butylbromide

Buscopan

Route: Oral, or intramuscular/intravenous in hospital use

Note: Marketed in the UK, EU and Australia rather than the United States; used both for IBS-type cramping and for genito-urinary tract spasm. [3] [3]

Mechanism of action

Summary: All three drugs are competitive antagonists at muscarinic acetylcholine receptors on gastrointestinal smooth muscle, reducing the contractions that produce cramping pain. Dicyclomine adds a second, non-specific direct relaxant action on the muscle itself. The clinically decisive difference is not at the receptor but at the blood-brain barrier: hyoscyamine and dicyclomine are tertiary amines that cross it, while hyoscine butylbromide's quaternary ammonium structure keeps it almost entirely peripheral.

Target: Muscarinic acetylcholine receptors on gastrointestinal (and, for hyoscyamine and hyoscine butylbromide, genito-urinary) smooth muscle

Cidal Static: Not applicable - a receptor-blocking spasmolytic action, not an antimicrobial one

Kill Kinetics: Not applicable

1. Step: 1

1. Title: Acetylcholine is blocked at the muscarinic receptor

1. Detail: Each drug competitively antagonises acetylcholine at postganglionic cholinergic nerve endings, reducing the parasympathetic drive that produces smooth-muscle contraction. [1]

2. Step: 2

2. Title: Gastrointestinal smooth muscle relaxes

2. Detail: Reduced cholinergic tone lowers motility and tone in the gut wall, easing the spasm that produces cramping abdominal pain in IBS. [4]

3. Step: 3

3. Title: Dicyclomine adds a direct muscle-relaxant effect

3. Detail: Beyond antimuscarinic blockade, dicyclomine has a labelled direct action on smooth muscle itself, distinguishing its mechanism from a pure receptor antagonist. [2]

4. Step: 4

4. Title: Molecular charge decides whether the brain is reached

4. Detail: Hyoscyamine and dicyclomine are uncharged tertiary amines at physiological pH and cross the blood-brain barrier; hyoscine butylbromide carries a permanent quaternary ammonium charge that very largely excludes it from the central nervous system. [3]

5. Step: 5

5. Title: Non-selective receptor blockade explains the rest of the side-effect profile

5. Detail: Because muscarinic receptors are not confined to the gut, blockade elsewhere in the body produces the class's shared peripheral effects: dry mouth, blurred vision, urinary hesitancy and tachycardia. [1][2]

Major clinical uses

1. Drug: Hyoscyamine

1. Organism: Not applicable

1. Indication: Irritable bowel syndrome, spastic colitis, peptic ulcer disease adjunct, neurogenic bladder, acute rhinitis symptom relief

1. Line: symptomatic antispasmodic

1. Note: The listed indications span gastrointestinal, urinary and secretory uses; infant treatment needs separate specialist assessment and is not covered by this guide. [1]

2. Drug: Dicyclomine

2. Organism: Not applicable

2. Indication: Functional bowel syndrome / irritable bowel syndrome in adults

2. Line: symptomatic antispasmodic

2. Note: Labelled specifically for adult functional bowel disease; contraindicated in infants under 6 months, the population in which its most serious labelled risk occurs. [2]

3. Drug: Hyoscine butylbromide

3. Organism: Not applicable

3. Indication: Spasm of the gastrointestinal or genito-urinary tract; symptomatic relief of irritable bowel syndrome

3. Line: symptomatic antispasmodic

3. Note: Also used intramuscularly or intravenously in hospital settings, including to reduce smooth-muscle spasm during some endoscopic and radiological procedures. [3]

4. Drug: Hyoscine butylbromide

4. Organism: Not applicable

4. Indication: Period pain (dysmenorrhoea) related to uterine smooth-muscle cramping

4. Line: symptomatic antispasmodic

4. Note: Reflects the same non-selective antimuscarinic action on smooth muscle beyond the gut, an indication the CNS-penetrant tertiary amines in this class are not labelled for in the sources used here. [3]

Pharmacokinetics

1. Drug: Hyoscyamine

1. Route: Oral or sublingual
1. Absorption: Well absorbed orally; a small, uncharged tertiary amine that readily reaches the central nervous system
1. Csf Penetration: Crosses into the CNS
1. Metabolism: Hepatic
1. Elimination: Renal
1. Dose Adjust: Lower starting doses and renal-function monitoring recommended in elderly patients [1]
2. Drug: Dicyclomine
2. Route: Oral
2. Absorption: Well absorbed orally; also an uncharged tertiary amine, so central penetration is expected on the same structural basis as hyoscyamine
2. Csf Penetration: Crosses into the CNS
2. Metabolism: Hepatic
2. Elimination: Renal and biliary
2. Dose Adjust: Dosing reduced for children aged 2 to 12; contraindicated under 6 months [2]
3. Drug: Hyoscine butylbromide
3. Route: Oral, intramuscular or intravenous
3. Absorption: Low and variable oral bioavailability, consistent with a permanently charged quaternary ammonium molecule
3. Csf Penetration: Excluded from the CNS by its permanent positive charge
3. Metabolism: Hepatic and gut-wall
3. Elimination: Renal and biliary
3. Dose Adjust: Not recommended in pregnancy or breastfeeding; no dedicated paediatric dosing established in the SmPC referenced here [3]
1. This page gives no dose regimens by design. Doses depend on indication, age, renal and hepatic function and response, and belong in a current prescribing reference used by the treating clinician.
2. The pharmacokinetic fact that carries the most clinical weight in this class is not a number but a property: whether the molecule is charged. Hyoscine butylbromide's quaternary ammonium structure is the entire pharmacological reason it avoids the central side effects that hyoscyamine and dicyclomine can produce. [3]

Adverse effects

1. Effect: Dry mouth
1. Detail: The most consistently reported peripheral antimuscarinic effect across all three drugs; reported in roughly a third of dicyclomine-treated patients in trials. [2]
2. Effect: Blurred vision
2. Detail: Reported in roughly a quarter of dicyclomine-treated patients; a predictable consequence of muscarinic blockade in the eye across the class. [2]
3. Effect: Dizziness and drowsiness
3. Detail: The single most frequent dicyclomine adverse reaction in trials, at roughly 40%; hyoscyamine's label similarly notes drowsiness and, in elderly patients particularly, confusion. [2][1]
4. Effect: Tachycardia
4. Detail: A predictable effect of vagal blockade; described as uncommon with hyoscine butylbromide and requiring pre-treatment cardiac assessment with hyoscyamine. [3][1]
1. Effect: Infant apnea and respiratory depression
1. Detail: Dicyclomine has been associated in infants with serious respiratory symptoms, including dyspnea, shortness of breath, apnea and asphyxia, as well as seizures and syncope.
1. Action: Dicyclomine is contraindicated in infants under 6 months of age and in nursing mothers; any infant respiratory symptom during exposure is an emergency. [2]

2. Effect: Central anticholinergic toxicity

2. Detail: Confusion, hallucinations, memory loss and, rarely, psychosis or delirium have been reported with both hyoscyamine and dicyclomine, typically resolving within 12 to 48 hours of stopping the drug.

2. Action: New confusion or hallucinations during treatment with either tertiary-amine antispasmodic is reported to the treating clinician promptly; these effects are not expected with hyoscine butylbromide, which does not cross into the brain. [1][2]

3. Effect: Heat prostration and heat stroke

3. Detail: Reduced sweating from muscarinic blockade of eccrine glands can predispose to heat prostration or heat stroke in hot environments or with fever.

3. Action: Caution with heat exposure and strenuous activity is advised while taking hyoscyamine or dicyclomine. [1][2]

4. Effect: Masking a surgical or serious abdominal condition

4. Detail: Because the drug relieves cramping pain symptomatically, it can blunt the presentation of a more serious underlying process.

4. Action: Severe abdominal pain that persists or worsens, especially with fever, vomiting, a change in bowel habit, abdominal tenderness, low blood pressure, fainting or blood in the stool, is an urgent reason to seek medical care rather than to continue self-treating with an antispasmodic. [3]

1. Drug: Hyoscyamine

1. Effect: Published case reports describe anticholinergic poisoning in infants exposed to hyoscyamine oral drops, including irritability, tachycardia and flushing after dosing errors. This is a safety warning, not a recommendation to treat infant colic; infant care requires a qualified clinician. [5]

2. Drug: Hyoscine butylbromide

2. Effect: Rare hypersensitivity reactions have been reported post-marketing despite not being seen in clinical trials. [3]

Contraindications, precautions and interactions

1. Glaucoma (narrow-angle), given the risk of acutely raised intraocular pressure with antimuscarinic blockade. [1][2][3]

2. Myasthenia gravis, where antimuscarinic blockade opposes the cholinergic drive the condition already lacks. [1][2][3]

3. Gastrointestinal obstruction, including paralytic ileus, pyloroduodenal stenosis, achalasia and toxic megacolon or severe ulcerative colitis. [1][2][3]

4. Obstructive uropathy, such as clinically significant prostatic hypertrophy. [1][2]

5. Unstable cardiovascular status in the setting of acute haemorrhage. [1][2]

6. Dicyclomine specifically: infants under 6 months of age and nursing mothers, given the labelled infant respiratory risk. [2]

1. Any tachycardia is investigated before an anticholinergic antispasmodic is given, since the drug itself raises heart rate and could mask a more serious cardiac cause. [1]

2. Elderly patients are started on lower doses of hyoscyamine, with renal function monitored, given increased sensitivity to central and peripheral antimuscarinic effects. [1]

3. Hyoscine butylbromide is used cautiously in patients with tachyarrhythmia or a predisposition to intestinal obstruction. [3]

4. None of these drugs is recommended in pregnancy unless clearly needed (hyoscyamine, dicyclomine) or is recommended against altogether (hyoscine butylbromide), reflecting insufficient safety data across the class. [1][2][3]

1. With: Other anticholinergic drugs (e.g. some antihistamines, tricyclic antidepressants)

1. Effect: Additive antimuscarinic burden - dry mouth, blurred vision, constipation, urinary retention and confusion risk all increase. [1]

2. With: Drugs affecting gastric emptying

2. Effect: Antispasmodic-induced reduction in gastrointestinal motility can alter the absorption of other orally administered drugs. [2]

Comparison tables

Title: One mechanism, two very different side-effect profiles

Caption: The decisive variable across this class is chemical charge, not receptor target. Choice of agent belongs to the treating clinician.

1. Key: drug
1. Label: Drug
1. Is Row Header: true
2. Key: chemistry
2. Label: Chemistry
3. Key: cns_effects
3. Label: Crosses into CNS?
4. Key: signature
4. Label: Signature safety point
1. Drug: Hyoscyamine
1. Chemistry: Tertiary amine belladonna alkaloid
1. Cns Effects: Yes
1. Signature: Investigate tachycardia before dosing; broadest range of labelled GI/urinary uses [1]
2. Drug: Dicyclomine
2. Chemistry: Tertiary amine, dual antimuscarinic/direct-relaxant action
2. Cns Effects: Yes
2. Signature: Contraindicated under 6 months of age - labelled infant apnea risk [2]
3. Drug: Hyoscine butylbromide
3. Chemistry: Quaternary ammonium compound
3. Cns Effects: No - excluded by its permanent charge
3. Signature: Peripheral side effects only; not marketed in the United States [3]

High-yield exam pearls

1. Pearl: Molecular charge, not receptor selectivity, explains why hyoscine butylbromide is the "CNS-safe" antispasmodic.
1. Why: Its quaternary ammonium structure keeps it almost entirely out of the brain, while the tertiary amines hyoscyamine and dicyclomine both cross freely. [3]
2. Pearl: Dicyclomine's most serious labelled risk is paediatric, not psychiatric.
2. Why: Infant apnea, seizures and syncope are labelled risks specific to dicyclomine under 6 months of age - a different safety story from the central anticholinergic effects of hyoscyamine. [2]
3. Pearl: Investigate tachycardia before giving any anticholinergic antispasmodic.
3. Why: The drug itself raises heart rate through vagal blockade and could mask a more serious underlying cardiac cause if given without that check. [1]
4. Pearl: Antispasmodics treat the symptom of cramping, not the cause of the abdominal pain.
4. Why: Persisting or worsening severe pain with fever, vomiting, bleeding or fainting needs medical assessment, not another antispasmodic dose. [3]

Common exam traps

1. Trap: Assuming all antimuscarinic antispasmodics carry the same CNS side-effect risk.
1. Correction: Hyoscine butylbromide's quaternary ammonium structure excludes it from the brain almost entirely, unlike the tertiary amines hyoscyamine and dicyclomine. [3]

2. Trap: Treating dicyclomine as safe for infant colic because it is an antispasmodic.
2. Correction: It is contraindicated under 6 months of age specifically because of a labelled risk of serious respiratory symptoms, including apnea, seizures and syncope, in infants. [2]
3. Trap: Assuming hyoscine butylbromide is available in the United States because it is widely used in the UK, EU and Australia.
3. Correction: It is not FDA-approved and does not appear on DailyMed; US clinical use of this exact molecule does not occur, in contrast to hyoscyamine and dicyclomine. [3]
4. Trap: Believing antispasmodics are disease-modifying for IBS.
4. Correction: They relieve cramping and spasm symptomatically; they do not treat the underlying disorder of gut-brain interaction. [4]

Self-test questions

1. Question: Why does hyoscine butylbromide avoid the central anticholinergic side effects seen with hyoscyamine and dicyclomine?
 1. It does not bind muscarinic receptors
 2. It is a quaternary ammonium compound and is largely excluded from the central nervous system
 3. It is metabolised before reaching the brain
 4. It has no antimuscarinic activity at all
1. Explanation: Hyoscine butylbromide's permanent positive charge as a quaternary ammonium compound keeps it out of the brain, unlike the tertiary amines hyoscyamine and dicyclomine. [3]
2. Question: Dicyclomine is contraindicated in which specific population because of a labelled risk of apnea, seizures and syncope?
 1. Elderly patients over 65
 2. Infants under 6 months of age
 3. Adults with hypertension
 4. Patients with type 2 diabetes
2. Explanation: The dicyclomine label specifically warns of serious respiratory symptoms including apnea, plus seizures and syncope, in infants, and contraindicates use under 6 months of age. [2]
3. Question: Before giving an anticholinergic antispasmodic such as hyoscyamine, what should be investigated first if present?
 1. Any degree of tachycardia
 2. Mild seasonal allergies
 3. A history of childhood asthma
 4. Recent dental work
3. Explanation: The label directs that any tachycardia be investigated before giving an anticholinergic drug, since the drug itself will raise heart rate and could mask a more serious cardiac cause. [1]
4. Question: What is dicyclomine's mechanism of action, beyond antimuscarinic receptor blockade?
 1. Direct inhibition of gastric acid secretion only
 2. A direct relaxant effect on gastrointestinal smooth muscle itself
 3. Selective blockade of serotonin 5-HT₃ receptors
 4. Inhibition of prostaglandin synthesis
4. Explanation: Dicyclomine's label describes a dual mechanism: a specific antimuscarinic effect and a separate direct relaxant action on smooth muscle. [2]
5. Question: A patient taking an antispasmodic for IBS develops severe worsening abdominal pain with fever and blood in the stool. What is the appropriate response?
 1. Take an extra dose of the antispasmodic and wait
 2. Seek medical assessment promptly, since these features are not what the drug is meant to manage

3. Switch to a different antispasmodic in the same class
4. Continue as normal, since IBS pain always fluctuates
5. Explanation: Persisting or worsening severe abdominal pain with fever, vomiting, bleeding or fainting is an urgent reason to seek medical care, because the drug relieves spasm symptomatically and can mask a more serious underlying process. [3]

Frequently asked questions

1. Question: What is the main difference between hyoscine butylbromide and hyoscyamine or dicyclomine?
1. Answer: All three block muscarinic receptors to relieve gut spasm, but hyoscine butylbromide is a quaternary ammonium compound that is largely excluded from the brain, so central side effects - confusion, drowsiness, rarely psychosis - are minimal, unlike hyoscyamine and dicyclomine, both tertiary amines that cross more readily. [3][1][2]
2. Question: Why is dicyclomine contraindicated in young infants?
2. Answer: Its label describes serious respiratory symptoms, including apnea, as well as seizures and syncope, reported in infants, which is why it is contraindicated under 6 months of age and in nursing mothers. [2]
3. Question: Is hyoscine butylbromide available in the United States?
3. Answer: No. It is marketed in the UK, the EU and Australia (as Buscopan) but does not have FDA approval or a DailyMed listing, so US clinical use of this specific antispasmodic does not occur. [3]
4. Question: Can antispasmodics be taken for any abdominal pain?
4. Answer: No. They are intended for cramping, spasm-type pain such as that of irritable bowel syndrome. Severe or worsening pain, especially with fever, vomiting, a change in bowel habit, bleeding or fainting, needs medical assessment rather than another antispasmodic dose, because the drug can mask but not treat a more serious underlying condition. [3]
5. Question: Why does the hyoscyamine label mention checking heart rate before treatment?
5. Answer: Anticholinergic drugs raise heart rate through vagal blockade, so any existing tachycardia is investigated first - treating without checking could both worsen an arrhythmia and obscure its original cause. [1]

References

- [1] LEVSIN (hyoscyamine sulfate) tablet - prescribing information. DailyMed, U.S. National Library of Medicine . <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=32388e18-08de-455c-aad4-9c2264435f0f>
- [2] DICYCLOMINE HYDROCHLORIDE tablet - prescribing information. DailyMed, U.S. National Library of Medicine . <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=5a553bda-1e3d-4b80-913f-73dd54655033>
- [3] Buscopan (hyoscine butylbromide): medicine to treat stomach cramps and IBS. NHS . <https://www.nhs.uk/medicines/buscopan-hyoscine-butylbromide/>
- [4] Irritable Bowel Syndrome. StatPearls Publishing / NCBI Bookshelf 2025. <https://www.ncbi.nlm.nih.gov/books/NBK534810/>
- [5] Anticholinergic poisoning in colicky infants treated with hyoscyamine sulfate. American Journal of Emergency Medicine (PubMed) . <https://pubmed.ncbi.nlm.nih.gov/9270398/>

For education only. This guide does not replace professional medical advice. Do not use it to choose or change treatment.