What are you on?

part one

by Andrew Keirl BOptom (Hons) MCOptom FBDO

If a CET article on the topic of drugs is presented to a dispensing optician, one of two emotions is likely. These are excitement and despair. The excited reader will have to wait until Part two of this article is published when illegal drugs are discussed. For the reader who at this point is holding his hands up in despair and thinking “What has this got to do with me?” don’t shoot the messenger! Ocular pharmacology has always been included in the training of dispensing opticians as part of anatomy and physiology and ocular disease and is of course included in the General Optical Council (GOC) Core Competencies for registration as a dispensing optician. In 2010 the topic of ocular pharmacology was brought to the fore when changes to the Medicines Act were announced. These changes meant that both dispensing opticians and contact lens opticians can legally order and use a limited range of ocular drugs. With reference to the GOC Core Competencies for registration as a dispensing optician, dispensing opticians should be able to:

1. Recall the common drugs used in optometric practice
2. Understand how appropriate ocular drugs can be used to aid refraction
3. Understand how appropriate ocular diagnostic drugs can be used to aid ocular examination and investigation
4. Show an appreciation of the clinical treatment of a range of systemic diseases with ocular manifestations and adverse ocular reactions to medication

Part one of this article will discuss regulations that allow the use and supply of certain drugs by optometrists and dispensing opticians and review the commonly used mydriatic and cycloplegic drugs. Part two will discuss staining agents, anti-infective drugs, the ocular effects of common systemic medications and illegal drugs.

What is a drug?
Medical pharmacology is the science of chemicals (drugs) that interact with the human body and alter the function of a living system. These interactions are divided into two classes, namely pharmacodynamics (the effects of the drug on the body) and pharmacokinetics (the way the body affects the drug with time for example, absorption, distribution, metabolism and excretion). A drug can be defined as a chemical substance used in the treatment, cure, prevention or diagnosis of disease, or one used to otherwise enhance

[Competencies covered:]
Dispensing opticians: Professional conduct, Refractive management
Ocular abnormalities
Contact lens optician: Professional conduct, Contact lenses
Ocular examination
Optometrists: Professional conduct, Assessment of visual function
Ocular examination

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This article has been approved for 1 CET point by the GOC. It is open to all FBDO members, including associate member optometrists. The multiple-choice questions (MCQs) for this month’s CET are available on page 12 and online. Insert your answers to the six MCQs on the inserted sheet or online at www.abdo.org.uk. After log-in, go to ‘CET Online’. Please ensure that your email address and GOC number are up-to-date. The pass mark is 60 per cent. The answers will appear in the December issue of Dispensing Optics. The closing date is 14 November 2013.
Drugs acting at receptors can be classified into three main types. These are agonists, partial agonists and antagonists. Drugs that bind to and activate receptors thereby producing a response. Partial agonists bind to but only weakly activate receptors. Antagonists are drugs that bind to but do not activate receptors. They can also block the effects of an agonist which may be an endogenous substance.

Drugs may be administered enterally or parenterally. Examples of enteral routes of administration include oral, sublingual and rectal. Examples of parenteral routes of administration include intravenous, intramuscular, subcutaneous, inhalation, epidural and intra-ocular. The term topical is often used to describe the administration of eye drops.

The legal classification for the supply and administration of drugs is as follows:
- Pharmacy only (P)
- General sales (GSL) eg, shop, supermarket, garage forecourt etc.
- Prescription only medicine (POM)
- Controlled drug (CD)

Common ocular drugs

Drugs used in optometric practice usually fall into one of two groups which reflect the reason for using the drug. These groups are termed diagnostic and therapeutic. Diagnostic drugs are used to assist in the examination of a patient, for example refraction, ophthalmoscopy and tonometry, while therapeutic agents are used to treat a specific problem, for example, bacterial conjunctivitis. Common drugs used in optometric practice include:

- Mydriatics and cycloplegics
  - Tropicamide 0.5% and 1.0%
  - Cyclopentolate hydrochloride 0.5% and 1.0%
  - Phenylephrine hydrochloride 2.5% and 10%

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- Tropicamide 0.5% and 1.0%
- Cyclopentolate hydrochloride 0.5% and 1.0%
- Phenylephrine hydrochloride 2.5% and 10%

Antagonists
- Chloramphenicol 0.5%
- Fusidic acid 1%

Topical anaesthetics
- Amethocaine hydrochloride
- Lignocaine hydrochloride
- Oxyprenaline hydrochloride
- Proxymetacaine hydrochloride
- Proxymetacaine hydrochloride combined with fluorescein sodium

Staining agents
- Fluorescein sodium
- Lissamine green
- Rose bengal

In addition, artificial tears, ocular lubricants and contact lens care products can be described as drugs.

Most eye drops used for diagnostic purposes are in the form of single dose, preservative-free products known as Minims (Bausch & Lomb). As all Minims are preservative-free, preservative-related adverse reactions are avoided. Minims are designed and licensed for single use thereby reducing the risk of cross-contamination. Each individual Minim is either heat sterilised or aseptically manufactured. In addition, each individual Minim is double wrapped with a sterile dropper inside a sterile over-wrap (Figure 1). To minimise the risk of dispensing errors, each drug in the Minims range is supplied in colour-differentiated packaging with the packing embossed in Braille (Figure 2).

Medicines legislation in practice

Under the Medicines Act 1968 medicines classified as Pharmacy (P) medicines may be sold or supplied only through registered pharmacies by or under the supervision of a pharmacist (section 52). Prescription only (POM) medicines are subject to an additional requirement as they may only be sold or supplied through pharmacies against a doctor’s or Dentist’s prescription (section 58). General Sale List (GSL) medicines may be sold more widely through other retail outlets (sections 51 and 53).

Exemptions from the general rules are permitted for optometrists and now in certain cases, for dispensing opticians and contact lens opticians. These are provided for in the Prescription Only Medicine (Human Use Order) 1997 SI No 1830 (The “POM Order”), the Medicines (Pharmacy and General Sale-Exemption) Order 1980 SI No 1924, The Medicines (Sale or Supply) (Miscellaneous Provisions) Regulations 1980 SI No 1923, The Medicines (Exemptions and Miscellaneous Amendments) Order 2009 SI No 3062 and The Medicines for Human Use (Miscellaneous Amendments) (No.2) Regulations 2009 SI No 3063.

Provided it is in the course of their professional practice, registered optometrists may sell or supply all medicinal products on a POM and all P medicines. Dispensing opticians, like any other retailer have always been able to sell all medicinal products on a GSL. Legislation that came into force on 21 December 2009 permits the sale and supply of chloramphenicol (under its P licence), by registered dispensing opticians and contact lens opticians. The restrictions of the pharmacy (P) classification are:
1. Solely for use in acute bacterial conjunctivitis
2. Maximum pack size of 10 ml of 0.5% drops or 4gms of 1% ointment

Continued overleaf
3. Only to adults or children over two years of age
4. For use for a maximum of 5 days

Provided it is in the course of their professional practice and in an emergency, registered optometrists may sell or supply POMs which are not for parenteral administration and which:

1. Are eye drops and contain not more than 0.5 per cent chloramphenicol
2. Are eye ointments and contain not more than 1 per cent chloramphenicol
3. Contain the following substances: cyclopentolate hydrochloride, fusidic acid, tropicamide

The POMs to which this exemption applies may also be sold or supplied by a person lawfully conducting a retail pharmacy business on the presentation of an order signed by a registered optometrist.

The Opticians Act 1989 provides that where it appears to a registered optician (optometrist and dispensing optician) that a person consulting him/her is suffering from an injury or disease of the eye, the optician shall refer that person to a registered medical practitioner, except in specified circumstances including an emergency or where otherwise it is impractical or inexpedient to do so or there is no justification for such a referral. There is no legal definition of what is “an emergency” for the purposes of the Medicines Act exemptions or the specific criteria governing referral under the Opticians Act. It is therefore for the optician to make a professional judgement as to whether there is in fact an emergency and what measures need to be taken in the best interests of the patient, bearing in mind the Opticians Act, GOS regulations and Medicines legislation.

All POMs and P medicines to which Medicines Act exemptions apply may be sold to a registered optometrist by way of wholesale dealing. Also, under the Medicines (Sale or Supply) (Miscellaneous Provisions) Regulations 1980, a registered optometrist may obtain the following medicinal products by way of wholesale dealing:

1. P medicines for administration in the course of his business.
2. POM medicines for administration (as opposed to sale or supply) containing the following substances:
   - Amethocaine hydrochloride
   - Lignocaine hydrochloride
   - Oxybuprocaine hydrochloride
   - Proxymetacaine hydrochloride

The legislation that came into force on 21 December 2009 allows registered dispensing opticians to order the following products (all POMs) for use in their practices:

- Amethocaine hydrochloride
- Chloramphenicol
- Cyclopentolate hydrochloride
- Fusidic acid
- Lignocaine hydrochloride
- Oxybuprocaine hydrochloride
- Proxymetacaine hydrochloride
- Tropicamide

Speciality registered contact lens opticians may now use the following topical anaesthetics (all POMs) in the course of their professional practice:

- Lignocaine hydrochloride
- Oxybuprocaine hydrochloride
- Proxymetacaine hydrochloride

**Mydriatics**

Mydriatics (Figure 3) are drugs which dilate the pupil to allow a more thorough examination of the fundus, lens periphery and vitreous. In the UK they are mostly used on elderly patients, as their pupils are usually smaller and lens opacities can make viewing the retina through an undilated pupil difficult. It is also important to add that abnormal retinal conditions in the elderly are not uncommon. However, their use may be essential in any age group, especially where the macula or peripheral areas of the retina need to be observed or if a patient presents with symptoms of sudden onset flashing lights and/or floaters. It is interesting to note that in countries such as the USA and Australia, dilated fundus examinations are much more of a routine procedure. It is also interesting to note that as part of the GOS in Scotland, a dilated fundus examination should be performed on any patient aged 60 or over as part of a primary eye examination.

Because of the presence of the two opponent muscles, the pupil sphinter and dilator muscles, there are two different modes of action of mydriatics. The pupil dilator muscle is innervated by the sympathetic nervous system and sympathomimetic drugs such as phenylephrine hydrochloride act on the sympathetic nervous system and will cause a contraction of the dilator muscle resulting in mydriasis. The parasympathetic system (which innervates the pupil sphinter muscle) is largely unaffected by such drugs and thus the pupillary light reflex remains active. Sympathomimetic drugs also have little effect on accommodation. Conversely, the pupil sphinter muscle, which is innervated by the parasympathetic system, can be paralysed by the same class of drugs that cause cycloplegia, the antimuscarinic agents. With this type of drug the pupillary light reflex is reduced or abolished along with a marked effect on accommodation. Tropicamide is usually the...
Figure 4: The effects on the pupillary light reflex of phenylephrine hydrochloride 2.5% (right eye) and tropicamide 1.0% (left eye).

Figure 5: Accommodation following the instillation of phenylephrine hydrochloride 2.5% (right eye).

Figure 6: Accommodation following the instillation of tropicamide 1.0% (left eye).

that optometrists consider the necessity of checking the depth of the anterior chamber for possible signs and symptoms of angle closure when using drugs that dilate the pupil. It is also important to note that the National Screening Committee for diabetic retinopathy does not consider this necessary when using Tropicamide alone. Patients who are potentially at risk from an attack of closed angle glaucoma tend to be moderate to high hypermetropes, female and over 60 years of age. In the author’s opinion, most clinicians would agree that the benefits of viewing a patient’s retina through a dilated pupil, particularly in the presence of lens opacities outweigh the risks of causing an attack of closed angle glaucoma.

Phenylephrine hydrochloride acts on the sympathetic nervous system and is the only sympathomimetic mydriatic in regular use. It is available in single use units (Minims) in concentrations of 2.5% and 10%. Phenylephrine is an alpha agonist and as well as producing mydriasis causes vasoconstriction in the conjunctiva. Sympathomimetics produce less effect on accommodation than antimuscarinics, cause a widening of the palpebral aperture (due to the stimulation of Muller’s muscle) and allow the pupillary light reflex to remain active. The 22 year old subject shown in Figures 4, 5 and 6 has had one drop of phenylephrine hydrochloride 2.5% instilled into her right eye and one drop of tropicamide 1.0% instilled into her left eye. Figure 4 illustrates that the pupillary light reflex has not been affected in the subject’s right eye whereas the left pupil is unable to constrict. The sharp-eyed reader may also notice a slight retraction of the right upper eyelid. After 30 minutes the amplitude of accommodation in the subject’s right eye was effectively normal at 9 dioptres (Figure 5) whereas she was struggling to accommodate by 2 dioptres in her left eye (Figure 6).

Table 1: Tropicamide hydrochloride

<table>
<thead>
<tr>
<th>Legal classification</th>
<th>POM: For use and supply by all optometrists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available preparations</td>
<td>Mydriacyl: eyedrops, 0.5% &amp; 1.0% tropicamide hydrochloride (Alcon). Single Use (Preservative-free) Minims: Tropicamide: 0.5% &amp; 1.0% tropicamide hydrochloride eyedrops (B &amp; L)</td>
</tr>
<tr>
<td>Drug type</td>
<td>Mydriatic and Cycloplegic</td>
</tr>
<tr>
<td>Classification</td>
<td>Anti-muscarinic</td>
</tr>
<tr>
<td>Indications</td>
<td>Mydriasis (short duration) and cycloplegic refraction (in patients in late teens or older)</td>
</tr>
<tr>
<td>Contraindications</td>
<td>Hypersensitivity to tropicamide or any component of the preparation. Contraindicated in patients with confirmed or suspected narrow-angle glaucoma as in rare cases an acute attack may be precipitated</td>
</tr>
<tr>
<td>Cautions</td>
<td>Tropicamide should be used with caution in very young children (particularly neonates). The 0.5% strength is recommended if this drug is to be used with a young child. Darkly pigmented irises are more resistant to pupillary dilation and caution should be exercised to avoid overdosage. Patients should not drive for at least 2 hours following the instillation of tropicamide</td>
</tr>
<tr>
<td>Interactions</td>
<td>The effect of anti-muscarinic agents may be enhanced by the concomitant administration of other drugs with anti-muscarinic properties such as amantadine, some anti-histamines, butyrophenones, phenothiazines and tricyclic anti-depressants</td>
</tr>
<tr>
<td>Ocular side effects</td>
<td>Transient stinging. Transient blurring. Photophobia. Raised intra-ocular pressure</td>
</tr>
<tr>
<td>General side effects</td>
<td>CNS disturbances. Dry mouth.</td>
</tr>
<tr>
<td>Storage</td>
<td>Store below 25ºC. Mydriacyl stored 2-8 ºC. Protect from light</td>
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</tbody>
</table>

Figure 4: Figure 5: Figure 6:
Detailed information regarding phenylephrine hydrochloride is given in Table 2.

For maximum pupil dilation, tropicamide 1.0% can be used in conjunction with phenylephrine hydrochloride 2.5% thereby targeting both the pupil dilator and the pupil sphincter muscle. This practice is known as a synergistic combination and is commonly used with elderly and diabetic patients who are often difficult to dilate. However, the British National Formulary states that the use of phenylephrine should be avoided in patients with long-standing diabetes.

Cycloplegic refraction

The term cycloplegic refraction usually refers to an objective refraction being performed with the aid of a pharmaceutical agent designed to prevent or reduce accommodation, thus making latent refractive errors manifest. Cycloplegics are drugs that paralyse the ciliary muscle by blocking the muscarinic receptors normally stimulated by the release of acetylcholine from the nerve endings of the parasympathetic nervous system. Since the parasympathetic nervous system also innervates the pupil sphincter muscle, cycloplegia will be accompanied by mydriasis (pupil dilation) which indicates paralysis of the pupil sphincter. Many antimuscarinic agents have been used in the past but only three are now used regularly. These are atropine sulphate, cyclopentolate hydrochloride and tropicamide. Changes in medicines legislation came into force in April 2005 (SI 2005 766) which resulted in atropine sulphate being made available only to optometrists who have successfully completed extended training and achieved level 2 exemption. Both tropicamide and cyclopentolate hydrochloride (Figure 7) have level 1 exemption and can be used by all optometrists. Tropicamide in a 1% solution can be used to give satisfactory cycloplegia in older children and adults but it is generally accepted that it produces inadequate cycloplegia for use with younger children. We are therefore left with cyclopentolate hydrochloride as the cycloplegic of “choice”. This preparation is available in single dose Minims form in two concentrations, 0.5% and 1.0%. One drop of 1.0% solution in each eye is usually all that is necessary to produce adequate cycloplegia in most patients. For

<table>
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<td>P: For use by all optometrists</td>
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<table>
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<tr>
<th>Available preparations</th>
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</thead>
<tbody>
<tr>
<td>Single Use (Preservative-free) Minims: Phenylephrine: eyedrops, 2.5% &amp; 10% phenylephrine hydrochloride (B &amp; L)</td>
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<table>
<thead>
<tr>
<th>Drug type</th>
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</thead>
<tbody>
<tr>
<td>Mydriatic</td>
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<table>
<thead>
<tr>
<th>Classification</th>
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<tbody>
<tr>
<td>Sympathomimetic</td>
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<tr>
<th>Indications</th>
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<tbody>
<tr>
<td>Phenylephrine is a directly acting sympathomimetic agent used topically as a mydriatic for diagnostic or therapeutic procedures</td>
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<tr>
<th>Contraindications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypersensitivity to phenylephrine or any other component of the preparation. Contraindicated in patients with cardiac disease, hypertension, aneurysms, asthma, thyrotoxicosis, long-standing insulin-dependent diabetes mellitus and tachycardia; patients on monoamine oxidase inhibitors (MAOIs), tricyclic anti-depressants and anti-hypertensive agents (including beta-blockers); patients with closed angle glaucoma and patients with a narrow angle (prone to glaucoma precipitated by mydriatics)</td>
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<table>
<thead>
<tr>
<th>Cautions</th>
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<tbody>
<tr>
<td>To reduce the risk of precipitating an attack of narrow angle glaucoma, evaluate the anterior chamber angle before use. Corneal clouding may occur if phenylephrine 10% is instilled when the corneal epithelium has been denuded or damaged. For children and the elderly the 10% strength should be avoided</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Interactions</th>
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</thead>
<tbody>
<tr>
<td>Anti-hypertensive Agents: Topical phenylephrine should not be used as it may reverse the action of many anti-hypertensive agents with possible fatal consequences. Phenylephrine also interacts with monoamine oxidase inhibitors, tricyclic anti-depressants, cardiac glycosides or quinidine (increased risk of cardiovascular events)</td>
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<table>
<thead>
<tr>
<th>Ocular side effects</th>
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<table>
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<tr>
<th>General side effects</th>
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<table>
<thead>
<tr>
<th>General side effects - notes</th>
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<tbody>
<tr>
<td>Serious cardiovascular reactions including coronary artery spasm, ventricular arrhythmias and myocardial infarctions have occurred following topical use of 10% phenylephrine. These sometimes fatal reactions have usually occurred in patients with pre-existing cardiovascular disease</td>
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<tr>
<th>Storage</th>
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<tbody>
<tr>
<td>Store below 25ºC. Protect from light</td>
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Table 2: Phenylephrine hydrochloride
patients with dark irides a second drop may be needed if nothing seems to be happening after 15 minutes. It does not produce absolute cycloplopia, but the residual accommodative tonus is less than 1.50 dioptres. No “tonus allowance” needs to be made, so the “full cyclo” can be prescribed. However, opinions often vary and many practitioners will routinely prescribe 0.75-1.00 D less than the “full cyclo”. The 0.5% solution is needed for children less than 3 months old, though few patients of this young age would be encountered in the general ophthalmic services. Tropicamide 1% has been found to be a useful, if short acting, cycloplegic for patients in their late teens. In older patients, the short duration is a virtue and this is the often ideal agent to use.

Most “cyclos” are performed on children whose subjective responses are not entirely reliable. Some practitioners advocate cycloplegic examination of all new child patients. This has the advantage of providing more reliable baseline data on the refractive error but at the expense of time and some trauma for the patient. In general optometric practice, most practitioners tend to use cycloplegics when:

• There is undiagnosed manifest esotropia
• An esotropia has been noticed by the parent or guardian
• There is unstable or uncompensated esophoria
• There are significant risk factors for esotropia and amblyopia for example, family history, significant refractive error, premature birth etc
• A satisfactory level of acuity is not obtained in one or both eyes
• When retinoscopy suggests that accommodation is fluctuating significantly
• When retinoscopy findings differ significantly from the subjective result
• When there is a suspicion of an anomaly of accommodation for example, accommodation insufficiency, accommodative fatigue or spasm of accommodation
• When stereoscopic acuity is unsatisfactory and/or absent
• Latent hypermetropia or pseudomyopia is suspected

Cycloplegics sting and this can make cycloplegic refraction a somewhat unpleasant experience for all concerned especially those on the receiving end. This can be ameliorated somewhat by the use of proxymetacaine 0.5%, a topical anaesthetic. This stings rather less than the other topical anaesthetics when used on the eye, and will remove the sting of the subsequent cycloplegic entirely. A further advantage is the absorption of the cycloplegic may be enhanced. Proxymetacaine is available in Minims, but it needs to be stored in the refrigerator, which is not possible at all practices. A possible drawback would be if the patient did not like the first drop, and decided to resist the instillation of the second. However this is rarely a problem, and the phrase, “this drop will feel a bit cold” seems to work well.

Children are rarely tremendously keen on having drops put in. It is therefore important to explain what is going to happen in a calm way, avoiding words like “sting” and “pain”. While actual lying is to be avoided if possible, children are fairly suggestible. The patient should be told that the drops “might feel a bit funny (or cold)”. This works surprisingly well. Body language needs to reinforce the verbal message, as children are rather good at reading it. Sitting on mother’s lap feels a safe place to be for most small children. The child might move fairly suddenly, and it would not be good practice to stick a Minim in their eye. If they are co-operating, ask the patient to look down, raise the upper lid gently with your thumb and keep the neck of the Minim against the thumb while you instil the drop. If the patient moves, so does your thumb and so will the Minim. If the child will not open their eyes, a variation of an old contact lens trick can be useful. While trying to raise the upper lid with your thumb, out of the blue say “Now, open your mouth as wide as you

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<th>Table 3. Cyclopentolate Hydrochloride</th>
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<td>POM: For use and supply by all optometrists.</td>
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<tr>
<td><strong>Available preparations</strong></td>
</tr>
<tr>
<td>Mydrilate: eye drops, 0.5% &amp; 1.0% cyclopentolate hydrochloride (Inmpharm).</td>
</tr>
<tr>
<td>Single Use (Preservative-free) Minims: Cyclopentolate: eyedrops, 0.5% &amp; 1.0% cyclopentolate hydrochloride (B &amp; L)</td>
</tr>
<tr>
<td><strong>Drug type</strong></td>
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<tr>
<td>Mydriatic and cycloplegic</td>
</tr>
<tr>
<td><strong>Classification</strong></td>
</tr>
<tr>
<td>Antimuscarinic</td>
</tr>
<tr>
<td><strong>Indications</strong></td>
</tr>
<tr>
<td>Drug of choice for cycloplegic refraction. Also used for dilating the pupil in anterior uveitis and for the alleviation of ciliary spasm following corneal abrasion.</td>
</tr>
<tr>
<td><strong>Contraindications</strong></td>
</tr>
<tr>
<td>Hypersensitivity to cyclopentolate or any component of the preparation.</td>
</tr>
<tr>
<td>Contraindicated in patients with confirmed or suspected narrow-angle glaucoma as an acute attack may be precipitated.</td>
</tr>
<tr>
<td><strong>Cautions</strong></td>
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<tr>
<td>Use with caution in very young children and other patients at particular risk, such as debilitated or aged patients. Darkly pigmented irises are more resistant to pupillary dilation and caution should be exercised to avoid overdose.</td>
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<td>CNS disturbances, Dry mouth, Flushing, Tachycardia, Urinary symptoms, Gastro-intestinal symptoms</td>
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<td><strong>Storage</strong></td>
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<td>Store below 25°C. Protect from light. Mydrilate should be stored between 2 and 8°C</td>
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can!” It’s almost impossible to open your mouth wide and close your eyes tight at the same time. If the child closes their eyelids and steadfastly refuses to open them, the trick is to put about three drops of the drug on the upper lashes at the lid margin. They will have to open their eyes eventually.

As with most drugs, there is potential for undesirable side effects to occur when using cycloplegics. The listed side effects of cyclopentolate hydrochloride include local irritation, allergic reactions, increased intraocular pressure, CNS disturbances and blurred vision. Young children often become sleepy after the use of cyclopentolate hydrochloride. Having mentioned these possible side effects it must be stressed that the benefits of a cycloplegic refraction vastly outweigh potential problems. Detailed information regarding cyclopentolate hydrochloride is given in Table 3.

**Instillation of eye drops**

Eye drops are generally instilled into the pocket formed by gently pulling down the lower eyelid (Figure 8). For most drugs one drop is usually sufficient and the eye should be closed for as long as possible after application. Instillation of more than one drop should be discouraged because it may increase the risk of systemic side effects. Systemic side effects may arise from the absorption of a drug into the general circulation from conjunctival vessels or from the nasal mucosa after the excess has passed through the lacrimal drainage system. However, systemic absorption of eye drops can be reduced by compressing the lacrimal sac at the medial canthus, during and for 2-3 minutes after instillation of the drop (Figure 9). In the case of concomitant use of another topical eye preparation, allow 5-10 minutes between the applications of each drug as dilution and overflow may occur if one drop immediately follows another.

Before any eye drop is instilled into a patient’s eye, care must be taken that it is the correct drug and that the product has not expired. Prior to instillation it is important to explain to the patient the reason for the use of the drug, what effects the drug may have, how long the effects may last and the normal side-effects of the drug. Patients should avoid driving or any other activity which is not advised after examination with either a mydriatic or cycloplegic and patients should be advised not to wear contact lenses after anaesthesia. A record of all drugs used on a patient should be included in the patient’s notes, including the batch number and expiry date of the drug used. An information sheet about the specific drug used should be handed to the patient when they leave the practice and practices should have Standard Operating Procedures to ensure that drugs are managed in accordance with current legislation.

**Disposal of eye drops**

With the exception of chloramphenicol, eye drops are classed as non-hazardous pharmaceutical waste. This includes all pharmacy medicines, POMs and time expired or used Minims. These need to be incinerated and should be discarded in a medicine disposal box which is normally coloured yellow (Figure 10). Practitioners have a legal duty of care to dispose of waste properly and non-hazardous pharmaceutical waste (however small the amount) must be disposed of by incineration via an authorised waste contractor. If a practice places used or time-expired Minims in the normal bin then the contractor would be in breach of his/her duty of care. Although they are allowed to accept medicines from patients, pharmacists are not allowed to accept used medicines from other professionals. And one final point, don’t put drops down the sink!

**Concluding points**

There is no legal restriction on the instillation of drops, only on their supply. If a patient has obtained an eye drop legally, this means that anyone can instil this drop for the patient. If an optometrist or registered medical practitioner decides to delegate the instillation of the drug to another member of staff the optometrist (or OMP) should be on the premises whilst this is being done so that they can intervene if necessary. The optometrist (or OMP) remains responsible for the acts and omissions of the member of staff to whom s/he has delegated this function. As optometrists (and OMPs) are the only members of the practice team who are legally responsible for the instillation of mydriatics and cycloplegics, the use of such drugs must always be undertaken under the supervision of an optometrist or registered medical practitioner.

Continued overleaf
Part two will discuss staining agents, anti-infective drugs, the ocular effects of common systemic medications and illegal drugs.

Useful resources
- British National Formulary (BNF). This invaluable document is published bi-annually and is distributed to all NHS Doctors, Dentists and pharmacies. It is also available online and as various apps.
- MIMS (Monthly Index of Medical Specialties) is published monthly and is available online.
- E-medINFO is a search tool developed by Thompson Software Solutions to help practitioners find information about specific drugs.

References

Multiple choice questions (MCQs)

What are you on? part one

1. Which drug can a dispensing optician legally supply for the treatment of acute bacterial conjunctivitis?
   a. P Chloramphenicol
   b. POM Chloramphenicol
   c. Fusidic acid
   d. Gentamicin

2. Which statement is true?
   a. Sympathomimetic drugs have little effect on accommodation
   b. Tropicamide is the cycloplegic of choice
   c. Proxymetacaine does not need to be stored in a refrigerator
   d. Pharmacists are allowed to accept used medicines from other professionals

3. Which of the following drugs is not a mydriatic?
   a. Tropicamide
   b. Chloramphenicol
   c. Cyclopentolate hydrochloride
   d. Phenylephrine hydrochloride

4. Which statement about cycloplegic agents is false?
   a. They cause mydriasis
   b. They do not affect the pupil reflex to light
   c. They block the parasympathetic nervous system
   d. They cause stinging when instilled

5. Which of these statements is true concerning tropicamide hydrochloride?
   a. For adults, either 2.5% or 10% concentrations are recommended
   b. It is contraindicated for patients with cardiac disease, hypertension or aneurysms
   c. When administered to a young child, a 0.5% concentration is preferred
   d. Tropicamide 1% is the cycloplegic drug of choice for use with an older child

6. Phenylephrine hydrochloride . . .
   a. causes photophobia
   b. is the only sympathomimetic mydriatic in regular use
   c. can be used where there is undiagnosed manifest esotropia
   d. is never used in combination with an antimuscarinic drug

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