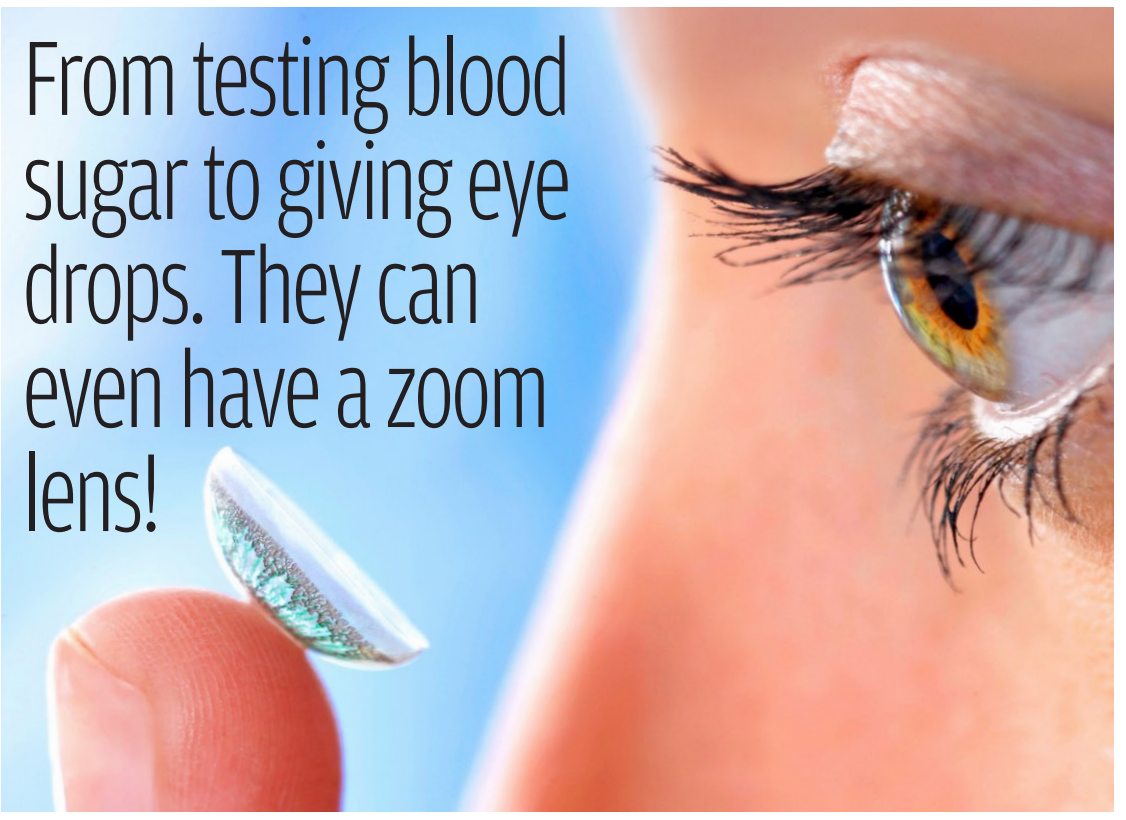
Hi-tech contacts that do LOTS more than help you see

SCIENTISTS are working on a range of smart contact lenses that can do everything from stopping your eyesight getting worse to checking your blood sugar levels. Here, RACHEL ELLIS looks at some of the latest things the humble contact can now do...



PREVENT SHORT SIGHT IN CHILDREN

FOR short-sighted children who don't want to wear glasses, there may be a rather ingenious solution: overnight hard contact lenses, which correct the eyes as the child sleeps so they don't need glasses or lenses during the day.

Short-sightedness causes distant objects to appear blurred while close objects can be seen clearly.

It occurs because the eye grows beyond its normal length, so it's more egg-shaped instead of being like a ping-pong ball.

The silicone lenses alter the shape of the eye, a process known as orthokeratology. They press on the cornea, the clear part at the front, which becomes misshapen with short-sightedness, reducing its curvature.

And while not a cure, if used while the eye is growing, overnight lenses may prevent or slow down short-sightedness.

Research suggests that the progression of short-sightedness is, on average, eight times slower in children who wore the overnight lenses compared with those using standard contact lenses.

James Wolffsohn, a professor of optometry at Aston University, Birmingham, and spokesman for the British Contact Lens Association, explains: 'By putting a rigid lens on the eye before going to sleep, the pressure of that lens and the closed eyelid will massage the cornea, making it flatter to correct for the eye shape.

'You wake up with perfect vision, allowing the lenses to be removed during the day. The effect is rapid, providing good vision within a few days. With regular use, the effect can last for two to three days without re-applying the lenses.'

Overnight lenses can be used from the age of five (when children are deemed to be 'responsible' and won't take them out). They can stop wearing them once their eyes stop growing.

The overnight lenses, which are usually changed every six months, are available privately from some opticians and cost around £200 to fit and then £40 a month for check-ups and cleaning solutions.

Children may be able to claim an NHS allowance of up to £56.40.

Overnight lenses can also be worn by adults with short-sightedness, but this is purely to correct vision to avoid glasses the next day and can't prevent the condition as their eyes are fully formed.

BLOCK HARMFUL SUN RAYS

UV PROTECTION, which is added to half of soft contact lenses, helps protect the eyes from the harmful effects of the sun.

The advantage they have over sunglasses is that they protect the whole eye; with sunglasses, UV rays can get around the sides (ideally, you would wear UV blocking contacts with sunglasses).

A study from Aston University, Birmingham, found that UV-blocking contacts had a number of significant health benefits.

The research, published in 2012, compared 20 people who wore UV contact lenses with 20 who wore standard contact lenses for at least five years.

A key finding was that the UV-lens wearers had more dense pigment at the back of the eye.

This is significant as the pigment protects the macula, which is responsible for central vision.

People with low pigment density are more likely to develop age-related macular degeneration (AMD) — loss of central vision.

The UV-lens wearers were also more likely to have delayed presbyopia, where reading becomes more difficult with age, possibly because the contacts prevent damage to the lens. UV contacts may also protect against cataracts, which is when the lens becomes cloudy, also linked to sun damage.

ACT AS BUILT-IN BINOCULARS

SCIENTISTS from Switzerland are developing contacts with a built-in magnification for patients with AMD.

The hard lenses magnify what you see by up to 2.8 times and work in conjunction with 'smart' glasses, which are activated by the wearer's winks.

Wink the right eye to turn on the zoom, wink the left eye and the zoom is deactivated, bringing it back to normal.

The researchers, who recently presented their findings at the American Association for the Advancement of Science's annual meeting, say the effect is like looking through binoculars.

'We think these lenses hold a lot of promise for low vision and age-related macular degeneration,' says Swiss researcher Eric Tremblay.

CHECK EYEBALL PRESSURE

MEASURING pressure in the eye is a routine part of eye checks for everyone over 40.

This is to check for glaucoma, an often symptomless and potentially blinding condition linked to raised pressure in the eye. It's caused by a build-up of fluid that damages the optic nerve.

Usually pressure is checked using an air-puff test, where a machine puffs air into the eye and measures the resulting flattening of the eyeball.

However, just like blood pressure, eye pressure can change if the patient is worried in the consultation — known as so-called white coat syndrome.

Swiss company Sensimed has devised contact lenses that continuously monitor the pressure at the back of the eye. The soft lenses, known as Triggerfish, contain a sensor that gathers 288 pressure readings over 24 hours.

It's thought that continuous monitoring may identify glaucoma patients most at risk of the disease rapidly progressing — these are people with consistently raised pressure or who have dramatic changes in pressure.

As Michael Bowen, director of research at the College of Optometrists, explains: 'Glaucoma is a leading cause of sight loss and has no symptoms.

'These lenses could be useful for patients identified as being at high risk of glaucoma, such as those with a family history, because they build up an accurate picture of pressure in the eye.'

ADMINISTER EYE DROPS

ANYONE who has ever used eye drops knows that it is virtually impossible to ensure all the drops stay in the eye. Researchers from the University of California estimate that only 5 per cent of eye drop medication for glaucoma reaches the affected area, so doses prescribed are far greater than actually needed.

To overcome this, researchers have developed contact lenses embedded with microscopic diamonds loaded with the glaucoma medication timolol maleate.

When the medication comes into contact with an enzyme in tears, this triggers the slow release of the drug into the eye.

Mr Bowen says these lenses could be of great benefit to patients with glaucoma, allergies or eye infections.

'Eye drops are commonly prescribed, but it can be difficult to know if you've taken the right dose because they can spill out of the eye,' he says.

MONITOR BLOOD SUGAR LEVELS

FINGER-PRICK tests to check blood sugar (glucose) levels are a daily ritual for many people with diabetes.

Now scientists from Google and Alcon, part of the pharmaceutical company Novartis, are working on a hassle-free method of checking glucose levels with a contact lens that can measure glucose in tears.

It uses a miniaturised glucose sensor — so small it looks like bits of glitter — embedded between two layers of soft lens material and a tiny wireless antenna, thinner than a human hair, which connects remotely to a smart phone or computer.

Researchers are also working on integrating tiny LED lights into the lenses, which could light up to indicate that glucose levels have crossed certain thresholds, indicating the patient should have another dose of insulin.

PS: WHY LENSES CAUSE INFECTIONS

PEOPLE who wear contacts are more prone to eye infections than non-wearers. Now scientists think they know why: wearing contact lenses may interfere with the delicate balance of bacteria that live naturally on the eye's surface.

A study, presented at the annual meeting of the American Society for Microbiology last month, found that wearing contact lenses appears to transfer bacteria from the skin to the eye.

The scientists based their findings on an analysis of the complete microbial 'zoo' living on the eye and the nearby skin of each participant.

More than 5,000 different bugs were found in the eye of contact lens wearers, some of which were potentially harmful and many that were similar to those found in skin below the eye.

Daily disposable lenses are considered lower risk for serious eye infections than monthly wear or rigid gas permeable lenses because they do not need to be cleaned. However the overall risk of a serious infection is still very small, says Mr Bowen.

MASTER YOUR METABOLISM

THIS week: Stay hydrated.

IF YOU lose just 3 per cent of your body's water, your metabolic rate slows down by 2 per cent, which for the average woman of 10 st would mean burning about 25 fewer calories a day.

The more you weigh, the greater the effect.

'Muscles help control the metabolic rate and they are 70 per cent water,' says Dr Emma Derbyshire, a senior lecturer in physiology at Manchester Metropolitan University. 'The theory is that if you are dehydrated they simply don't work as effectively any more.'

One way to tell if you're dehydrated is by checking the colour of your urine: it should be a pale, lemon colour; at 1 to 2 per cent dehydration, it will be the colour of straw.

How quickly it takes for you to reach this level of dehydration depends on what you are doing, but it could be as little as a few hours, according to Dr Derbyshire, who is a member of the Natural Hydration Council scientific panel.