



## Go forth and multiply

Britain is experiencing a dramatic slump in fertility. Sperm counts are falling; IVF clinics have queues round the block; and our chances of conceiving are being wrecked by drink, cigarettes and junk food. But all is not lost. Ian Sample weighs up the latest scientific evidence on how to get in shape for parenthood

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Human fertility is in crisis. Our lifestyles have unwittingly rounded on our ability to reproduce, and even with inevitable advances in medicine, experts foresee a dramatic slump in fertility. The crisis has many fronts. Sperm counts are in freefall, while sexually transmitted diseases and obesity - both of which seriously harm our ability to reproduce - are rising sharply. Our environment, stress and the vices we embrace all chip away at our natural fertility. And the trend towards starting families later in life continues, landing more couples in fertility clinics than ever before.

But all is not lost. Few aspects of the human body have been studied as intimately as reproduction, and while much is set by the genetic hand we are dealt at birth, research suggests that changes to our lifestyles can dramatically improve our chances of prolonging our fertility.

Here we bring together the latest scientific research on fertility, and how our life choices affect it.

### Stop smoking

The impact of smoking on fertility is staggering. Last year, a British Medical Association report, "Smoking and reproductive life", listed warning upon warning about the detrimental effects of smoking for couples trying to have children. It reduces the chances of conceiving by 10 to 40% per cycle, and is responsible for some 5,000 miscarriages every year. Men who smoke have lower sperm counts and more malformed sperm than non-smokers. And genetic defects in the sperm can be carried over into children.

A landmark study published last year added weight to many of the warnings raised in the BMA report. Dutch scientists who followed 8,457 women aged 20 to 40 found that smoking speeds up a woman's reproductive clock, in some cases by 10 years. "If a smoker is 10 years older, from a fertility perspective, it means a 25-year-old woman has already hit that 35-year-old point at which fertility begins to spiral downwards," says Allan Pacey, a fertility specialist at Sheffield University.

The good news is there is evidence to suggest that smoking-induced damage to fertility may be reversible. While doctors will advise that you can never quit too soon, you can certainly stop too late. "To improve the situation, women have to be nicotine-free before the egg starts developing and maturing," says Dr Laurence Shaw, deputy director of the Bridge Clinic in London. "If the egg matures while you're still smoking, the chances of successful implantation are much lower. Giving up when your pregnancy test is positive will do nothing to improve your risk of miscarriage," he adds.

Unlike many smoking-related diseases, the effect on fertility is down to nicotine, so nicotine patches can cause all the same problems.

For men, smoking-related sperm damage accumulates over the 90 days it takes for them to form fully, so quitting for three months will ensure no sperm are at risk.

## Avoid STIs

Sexually transmitted diseases are soaring in Britain, with cases at least doubling in the past 10 years. Often, infections have few, if any, symptoms, so the damage they cause goes unnoticed until a couple try for children.

Chlamydia in particular is on the rise. In 10% of cases, it causes enough damage to the fallopian tubes to render a woman infertile, yet has no visible symptoms. "Women aged 16 to 24 are most prone to chlamydia, but they tend not to have children at that age, so the first they know about it can be years later," says Professor Bill Ledger, head of reproductive and developmental medicine at Sheffield University. Many physicians think that even rapid treatment with drugs might not help prevent damage from chlamydia.

Cases of gonorrhoea are also rising, with 24,000 reported in England and Wales last year. The infection can cause infertility in men and women - it blocks the fallopian tubes and, in men, the vas deferens, which carries sperm.

"Disease is a big factor in infertility, and the message is simple," says Ledger. "Use a condom."

## Keep a healthy bodyweight

Evolution is a practical beast and at times it takes decisions out of our hands. If you are underweight, the body senses famine and the reproductive system - at risk of churning out babies doomed to die from malnutrition - is one of the first things to shut down.

Underweight men and women - those with a body mass index (BMI) of less than 20 - have substantially lower fertility, but overweight women tend to be more fertile than overweight men. Even a slightly overweight man, with a BMI of 25, will have a 22% lower sperm count. For women, fertility drops dramatically - by about half - above a BMI of 30.

Weight-induced infertility is common among elite female athletes, especially marathon runners, with exceptionally low BMIs. To maximise fertility, keep to a consistent, healthy weight. Research by Professor Sarah Berga at Emory University in Atlanta found that shedding pounds by regular exercise is more effective at prolonging fertility than dieting.

## De-stress

The effect of stress on fertility is proving to be hard to pin down. For certain, stress affects ovulation and menstruation, and in extreme cases leads to temporary infertility by blocking ovulation completely. A 2003 study by Professor Berga found that high levels of the stress hormone cortisol block the brain's signal that tells a woman's body to ovulate. She went on to prove that a 10-week course of cognitive behavioural therapy tailored to reducing anxiety levels was enough to restart ovulation in women who were previously infertile. Berga also found that exercise was not always an effective way of reducing stress levels. Going for a run, for example, could increase stress considerably, compounding the problem of stress-induced infertility.

According to Ledger, stress can seriously affect many couples' ability to have children simply by ruining their sex lives. "Most couples who consider themselves stressed are probably working so hard that when they get home, they go to bed and fall asleep. They're too tired to do anything else," he says.

## Don't binge-drink

Women who drink more than the recommended 14 units of alcohol a week take longer to get pregnant than moderate drinkers. Binge drinking also impairs sperm production. A British Medical Journal study by Tina Kold Jensen from the National University Hospital in Denmark looked at couples aged 20 to 35 years who were trying to conceive for the first time. Even after accounting for smoking, STIs, sperm counts and female weight, women drinking five units or less a week were twice as likely to conceive within six months than women drinking 10 units or more.

As with smoking, many specialists believe the effects of alcohol on fertility can be reversed. "We tell our patients to cut back on alcohol intake to improve their chances," says Dr Alice Domar, who runs a fertility clinic at Harvard

University's Beth Israel Deaconess Medical Centre.

Ledger adds that couples shouldn't overlook the obvious effect heavy drinking has on their sex lives. "People who drink a lot tend to have less sex, because they often cannot manage it," he says. "And if you're not having frequent sex, you're not going to get pregnant."

### **Watch your caffeine intake**

In excess, caffeine raises the risk of miscarriage, although how much is too much is still unclear. A study by the US National Institute of Child Health and Human Development in the *New England Journal of Medicine* found that women who drank five or more cups of coffee a day were more than twice as likely to miscarry as those who drank less. Research also hints at a risk of caffeine magnifying the negative effects of alcohol.

### **Change job**

Some professions are more damaging to your reproductive health than others. Case studies reveal fertility problems in a range of jobs where people work closely with solvents, pesticides, preservatives and other chemicals. Infertility among carpenters has been attributed to wood preservatives released during woodcutting, while more common problems arise in people working with lead, such as roofers, plumbers and stained-glass window makers. High lead levels impair egg and sperm quality. Again, the effects are not believed to be permanent.

### **Keep cool**

Heat is bad for sperm production, a fact made evident by the otherwise mysterious descent of a man's testicles to such a vulnerable position. The Goldilocks temperature is 3-4C below body temperature; any warmer will quickly affect sperm count, slashing it by around 40% per 1C rise. Scientists suspect excessive heat may explain low sperm counts in men who use wheelchairs, those with sedentary jobs, and regular drivers, such as cabbies and long distance truckers. Monitoring with discreetly placed thermometers has shown that scrotal temperature rises by up to 2.2C within two hours of setting off in a vehicle.

In 2004, researchers at the State University of New York warned young men to limit the time they used laptops on their laps after tests showed that the heat of the battery might impair sperm production. "Having cool showers instead of hot baths, and maybe even wearing airy boxer shorts, may help," says Ledger.

Scientists have also measured swings in sperm counts that vary with the seasons. Sperm counts are around 30% lower in the summer months, and though heat may play a role, the seasonal rise and fall may be a legacy of our seasonally breeding ancestors.

### **Don't do drugs**

Men who smoke marijuana tend to have lower sperm counts, less seminal fluid and sperm that swim abnormally. Studies suggest that THC, the active ingredient of cannabis, messes up the timing in sperm. Usually sperm begin to swim furiously as they approach the egg, but in cannabis users, the sperm make a dash for the line too soon. "The sperm will experience burnout before they reach the egg," said Dr Lani Burkman, who conducted the research at the University of Buffalo in New York.

It isn't just illegal drugs that can impair fertility. Painkillers and other temporary drugs can interrupt ovulation, although if this is the case, doctors should be able to find alternatives. Research by Dr Cathy Nelson-Piercy at St Thomas's Hospital in London found that so-called non-steroidal anti-inflammatory drugs can interfere with ovulation. The study is supported by evidence from a Californian trial reported in the *British Medical Journal* that found women using non-steroidal anti-inflammatory drugs, and even the common painkiller aspirin, had an 80% greater risk of miscarrying. The risk was at its highest if the drugs were taken around the time of conception, suggesting it interferes with the implantation of the embryo.

### **Eat the right food**

There are no wonder foods that will extend your fertility, but that hasn't stopped researchers desperately hunting for ingredients that slow the age-related damage that inevitably builds up in sperm and eggs. Laboratory studies show that antioxidants, such as vitamins C and E and trace elements including zinc and selenium, can reduce DNA damage in sperm, but there is little evidence of significant beneficial effects in people. Despite the lack of hard evidence, many fertility specialists recommend a diet rich in foods such as fruit, nuts and vegetables.

More certain is the view on what not to eat. "Don't eat fish in Hong Kong" was the advice of one fertility expert, referring to a 2002 research paper by Chinese scientists which revealed high levels of mercury among infertile couples who ate seafood regularly. Mercury is toxic pollutant that accumulates in sea fish, and high levels have been found in fish around the world. The highest levels are found in shark, swordfish, king mackerel and marlin. It is also found at lower levels in fresh and frozen tuna.

Last year, Professor Lynn Fraser at King's College London warned a meeting of the European Society of Human Reproduction and Embryology that certain chemicals found in foods mimic the female sex hormone oestrogen, and could impair the behaviour of sperm. One chemical, genistein, which is found in soya and legumes, caused sperm to "burn out".

### **Don't take steroids**

Anabolic steroids, of the type abused by bodybuilders, are designed to pack meat on to cattle and have an extremely potent effect in humans. "We're seeing an increasing number of men who are infertile because they're on steroids," says Ledger. "In these men, their testicles shrink to the size of peas and their sperm production dries up completely. It is often reversible, but if a person has been on a high dose for a long time, it isn't," he says.

### **Avoid environmental pollutants**

Traffic pollution has been pinpointed as damaging to sperm by a team of Italian researchers who analysed sperm samples from men working on toll gates. The tests, by Dr Michele de Rosa at Naples University, revealed that although the men's sperm counts were within the normal range, they were abnormal in other ways, including their movement. Measurements of pollutants in the area showed high levels of nitrogen oxides, sulphur dioxide, carbon monoxide and lead.

Gender-bending compounds, pesticides and other pollutants - some the byproducts of the chemical industry - are also raising concern among fertility researchers. Many believe these chemicals may be the culprits behind falling sperm counts across Europe, although research shows they may affect the fertility of both sexes. The now banned insecticide DDT, which remains at detectable levels in soils because it breaks down so slowly, may impair fertility. Exposure to polyaromatic hydrocarbons, which are commonly found in fumes from burning oil, has also raised concerns following animal studies showing that it can damage foetuses. Research into phthalates - organic compounds used to make plastics softer - suggests that they can trigger abnormal sexual development and so reduce fertility, although the effect appears to be confined to developing babies rather than sexually mature adults.

### **Watch your age - and your partner's**

Fertility is intimately linked to age, and no amount of clean living will change that. The drop in fertility experienced by women as they age is beyond doubt, but recent studies have revealed a more complex variation in male fertility with age.

Fertility drops precipitously in women older than 35, reaching almost zero at 45. At the age of 40, the risk of miscarriage is double that of a 20-year-old and 40% of all pregnancies achieved by women aged 40 or over will miscarry. Recent research, in which Dr Elise de la Rochebrochard at the French National Institute for Demographic Studies studied nearly 2,000 couples, also points to a male biological clock, where sperm quality begins to drop in men beyond 40.

What is more alarming to many fertility specialists is the evidence of a slump in fertility in young men across Europe. Research from eight European countries has identified exceptionally low sperm counts in men in their early 20s. Professor Richard Sharpe at the Medical Research Council's Human Reproductive Science Unit in Edinburgh says a consensus is building in the community that as many as one in four young men have a sperm

count that would render them subfertile or infertile. Sharpe says that ongoing studies in Britain suggest a similar drop is happening here. "We still don't know why their sperm counts are so low. They are higher in men aged above 35 to 40 from the same countries," he says. The most likely explanation is that the men's sexual development is somehow impaired in the womb, leaving them with fewer sperm-producing cells.

"My advice would be: if you're a young woman, marry an older man and start trying to have children earlier than is now the norm," he says.

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