

How do contraceptives work?

By John Guillebaud [Emeritus Professor of Family Planning]

When do you consider life to start? Is it at fertilisation? Does it start later: before, during or even after implantation? Most Christian doctors have a personal opinion; though this varies, they are united in being unwilling to prescribe a contraceptive drug or device that acts after implantation, but many are unsure about the time between fertilization and that point. It is also an important issue for many couples when deciding on their own method. I have argued elsewhere¹ that theists, whether providers or users of contraceptives, should be comfortable with the view that conception is a process initiated by fertilization but not completed till implantation. Hence contraceptive mechanisms up to the time of implantation are not abortifacient. But I am happy to “agree to differ” with those who do not accept this.

We need to be armed with the facts. Yet, partly because non-Christian - or non-theist - colleagues and researchers rarely our concerns, accurate scientific information can be hard to obtain. Two classic review articles are worth considering.^{2,3} The take-home message is that human chorionic gonadotrophin (hCG) is first measurable in the maternal circulation *shortly after the time of implantation*.⁴ Hence, research showing no hCG or other known embryo-specific substances in the maternal blood during contraceptive use, only tells us that it does not operate after implantation. At least on some occasions, it might operate after fertilisation, by prevention of implantation or direct destruction of the blastocyst. Clearly, any method linked with the presence of serum hCG would be off-limits to someone requiring a contraceptive that only operated before fertilisation.

Intrauterine contraceptive devices (IUCDs)

The following table summarises the interesting results of a study.⁵

Population	Sample size	Percentage of sample with hCG increase
Control (sexually active without contraception)	22	32
Inert IUCDs	40	20
Copper IUCDs	41	4
Levonorgestrel-IUS (<i>Mirena</i>)	19	0

On this evidence, both copper and inert devices sometimes operate well after fertilisation. The findings regarding the *Levonorgestrel-intrauterine system (levonorgestrel-IUS)* are compatible with absent fertilisation, either through the levonorgestrel effect on cervico-uterine mucus blocking sperm migration or anovulation in a proportion of cycles. Yet unfavourable cervical mucus is not always observed and we know that ovulation still occurs in most cycles.⁶ Is the levonorgestrel effect on sperm migration within the uterine fluid always enough to stop the sperm reaching any egg in the tubes? Although there are no direct data, the very rare cases of ectopic pregnancy in women using this method provide indirect evidence that fertilisation can occur.

Several studies have demonstrated that hCG is not the earliest signal of pregnancy. Although not testable in clinical laboratories, Early Pregnancy Factor (EPF) is part of the materno-embryonic immunomodulatory interaction. It appears two to six days earlier than hCG and

can occur two to seven days after ovulation in women who have conceived.⁷ In fact, EPF is detectable in maternal serum in some cases within 24-48 hours of fertilisation.⁸ However, the vast majority of research using EPF has been for detecting very early pregnancy in subfertile women, not for aiding our understanding of the exact modes of action of various contraceptives. More research is needed in this area. So, as there is no routinely testable biological marker of the time between fertilisation and implantation, we must remain unsure also that the Levonorgestrel intrauterine systems (IUSs) absolutely never operate post-fertilisation.

Systemically applied hormonal methods

With the notable exception of the desogestrel-containing progestogen-only pills (POPs) such as *Cerazette*[®], POPs probably do sometimes act post-fertilisation.⁹ Except *if the woman is breastfeeding* (see below), non-desogestrel POPs permit ovulation in many cycles. Reduced sperm-penetrability of cervico-uterine mucus is unlikely to explain all the failures to conceive in the presence of ovulation. As with intrauterine devices, the occurrence of ectopic pregnancies provides further evidence, though not proof, of this. Importantly, *any* POP in combination with the so-called Lactational Amenorrhoea Method (LAM) equates to an anovular method, not acting after fertilization. LAM - in which there is full breastfeeding plus amenorrhoea plus baby not yet more than 6 months of age - already has 98% efficacy, so the combination is essentially 100% effective, and by pre-fertilisation mechanisms.

What about the combined oral contraceptive (COC)?

Obviously a *forgetful* COC user, particularly if taking the lowest dose UK products with the currently-marketed pill-free interval (PFI) of 7 days between packs, might risk ovulation and yet not conceive. That regimen is now outdated¹⁰⁻¹², since hormonal and ultrasound data show that such a long PFI permits the suppressed ovary to regain ovulatory potential. It is the lengthening of the PFI, which after all is a *contraceptive-free* interval, that causes nearly all pill-failure pregnancies and ‘near-misses’ (the mechanism of the latter being our concern here). With or in fact *even without* lengthening of the pill-free time beyond 7 days, if ovulation occurred without conception it still does not follow that the COC necessarily acted post-fertilisation:

- 1 First, the sperm might have been blocked by the progestogen within COC’s well-known effect on the mucus, as with POPs. Moreover
- 2 Most authorities express the view that if the COC effect is too weak to prevent ovulation then it will also be too weak to suppress endogenous hormones sufficiently to imperil an embryo. Indeed
- 3 Recently the view has grown that in *ovulatory* cycles, if LH is present in sufficient amounts to trigger ovulation then it will also produce a surge of hormones from the corpus luteum, hence sufficient luteinising effect in the endometrium to allow implantation. Therefore if fertilisation has taken place the endometrium (despite the presence of COC hormones) will be sufficiently prepared to enable successful implantation.
- 4 Obstetricians often describe the embryo as a “perfect parasite”. It will modify the intrauterine environment in its own favour very quickly, regardless of the COC.

The above points 1-4 apply also to desogestrel and indeed all POPs, see below, and are reassuring. On top of that, even if pills truly have the capacity to block implantation, this does not mean that they ever have to use this back-up mechanism. If ovulation never occurs in a pill-user none of the above discussion on the (unproven) possibility of post-ovulatory effects of pills even applies! If, a couple hold the view that blocking implantation is a form of abortion

- despite my arguments elsewhere against that being a necessary view for theists¹ - and are worried that their own pill-taking might ever entail that mechanism, they should take steps to ensure no escape ovulations ever occur. This means taking the COC not by the 'outdated' 21/7 regimen but instead use what I term the 21st century way[8ab], taking it continuously 365/365. This so strengthens the anovulation mechanism as to allow up to 7 pills to be inadvertently omitted at any time with impunity! The tailored regimen, with the option of taking a 4-day break to improve unacceptable bleeding, is often ideal¹⁰⁻¹².

Other methods

Implants (Nexplanon[®]), see below, and the injectables are brilliantly effective anovulants. Depot medroxyprogesterone acetate as *Depo-Provera*[®] im or *Sayana Press*[®] sc must be injected accurately up to every 13 weeks. For someone with the concern here regarding modes of action, there is the good option of having their injection every ten weeks. This gives added confidence that ovulation is always blocked, with the to-them unacceptable back-up anti-implantation mechanism never being utilised.

Summary

Assuming perfect compliance to regimens, with the above adjustments, I feel one could be confident that, even after say 20 years' perfect use of the COC, *Cerazette*, *Implanon* or *Depo-Provera*, there would not have been a single occasion when a post-fertilisation mechanism would have been utilised. *Moreover, having done everything possible in the light of the best available scientific data, might not a believer legitimately ask her omnipotent Lord to ensure that this would be so for her?*

After prayerful consideration, my own personal view is, anyway, that implantation is the biological event that separates family planning from abortion. Still, I conclude by listing methods that are entirely secure for those who hold the absolutist ethical position that blocking implantation is a form of abortion:

- **Male and female sterilisation.**
- **The combined oral contraceptive pill (COC)**, provided the pill-free interval (PFI) is taken by one of the continuous options with no 7-day contraceptive-free intervals.¹⁰⁻¹²
- **The desogestrel POP**, since it is a continuously-taken POP that is as effective as the COC at blocking ovulation plus blocks sperm by the mucus effect. Moreover, it is taken 365 days a year and so does not have the 21/7 COC's weakness of regular 7-day breaks from its actions; and additionally points 1-4 above re the improbability of post-ovulation contraceptive effects apply to POPs with a single progestogen hormone as much or more so than with the two exogenous hormones of the COC.
- **Any POP during full breastfeeding**, including of course a desogestrel one, since this is supplementing LAM.
- **Nexplanon[®]**, which is a subdermal implant whose hormone content and actions are very similar to and even stronger than *Cerazette*. It should be replaced no later than the licensed three years.
- **Depo-Provera[®] and Sayana Press[®]** are two versions of another anovulant method. If the up to 13-week injection interval is never exceeded, it is not thought that they would ever use a post-fertilisation mechanism. Those wanting even greater confidence on that point could be offered injections every 10 weeks.

- **Full breast-feeding combined with *any* POP or Depo-Provera.** With the old-type POP, there would only be a slight risk of breakthrough ovulation (and hence the back-up anti-implantation mechanism being used) during weaning. As soon as the baby was not obtaining 100 percent of its nutrition from breast-feeding, the woman should change to another method in this list or use additional barrier contraception effectively.
- **Male and female barrier methods** and all **spermicides**, though the latter used alone have a high failure rate.
- **All fertility awareness methods.**
- **Coitus interruptus.**

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