

Background

- ★ The copper **intrauterine device** (IUD) was first introduced as a form of emergency contraception in the 70s.¹
- ★ It is considered more effective even today than the hormonal emergency contraception pills available.
- ★ Structurally, these devices resemble copper wrapped around a plastic core.¹
- ★ Inserted into the uterus via the cervix by a healthcare professional.
- ★ The exact mechanism of action is not well known. The general answer is that it works through a variety of mechanisms.
- ★ Like all IUDs it has been examined extensively for effectiveness and side effects through studies like the European Active Surveillance Study for Intrauterine Devices.²
- ★ Least commonly used in the US as only one variant is approved and costs upward of \$700 dollars. Elsewhere, more are available and are cheaper as well. (Wikipedia)

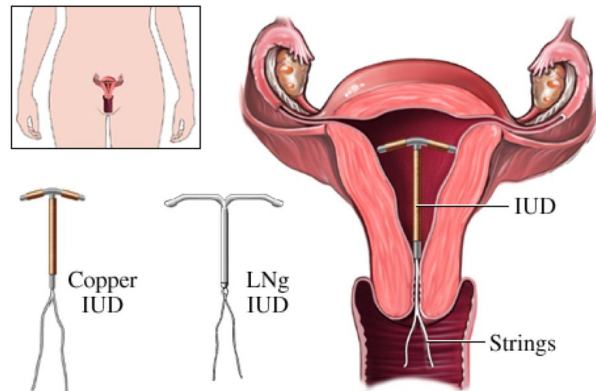


Figure 1. The IUD rests in the uterus as shown above. The threads allow for users to make sure the IUD has not shifted or expelled over time.³

References

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3. "Emergency Contraception: Copper T IUD as Emergency Contraceptive." Princeton University. The Trustees of Princeton University, 30 June 2016. Web. 24 Jan. 2017.
4. Tetrault, A. M.; Richman, S. M.; Fei, X.; Taylor, H. S. Decreased Endometrial HOXA10 Expression Associated with Use of the Copper Intrauterine Device. *Fertility and Sterility* 2009, 92 (6), 1820–1824.
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6. The ESHRE Capri Workshop Group; Intrauterine devices and intrauterine systems. *Hum Reprod Update* 2008; 14 (3): 197-208.

Societal Impact: Choice & Safety

- ★ A variety of modern birth control methods are used to give **control over fertility** or to **reduce side-effects** associated with menstruation.
- ★ The second most common form of family planning is the IUD with 13.6% of contraceptive users choosing this method.⁶
- ★ Safer and reversible alternative to sterilization by sealing or cutting the fallopian tubes which carry the egg.⁶
- ★ IUD's are **long-lasting** (3 to up to 12 years) and **reversible**, giving users the choice to remove it easily without decreasing fertility. (Wikipedia)
- ★ Progestin IUD's release *levonorgestrel (LNG)*, a manufactured hormone, which thickens the cervical mucus to prevent sperm from reaching the egg.¹
- ★ Copper IUD's provide a **non-hormonal alternative** to those sensitive to hormones.
- ★ IUD's are **99% effective** with 2% pregnancy rate even when used as emergency contraceptive.⁶
- ★ Major barrier of usage is the potential side effects: increased bleeding, pain, and expulsion from the uterus.⁶
- ★ Increase accessibility: more research, lower prices, wider sexual health education!

Figure 1. Comparing cumulative failure rates per 1000 procedures after 1, 2, and 3 years⁶

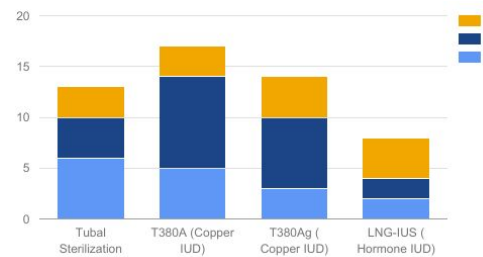
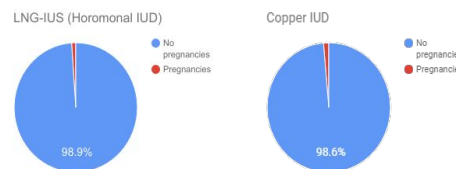


Figure 2. Comparing the pregnancy rates per ~1000 women with IUD's after a 5 year follow-up period⁶



Proposed Mechanisms of Action & Data

- ★ Studies have been done on other mammals but a variety of effects have been reported, and thus it is difficult to use them as models for what the specific effect of the IUD in a human.¹
- ★ The copper IUD is a spermicide but studies have shown that it possibly affects the ova after fertilization. After all it, it is successful as an emergency contraceptive after intercourse.¹ It is also shown to affect rate of implantation through alteration of the endometrial cell layer.⁵
- ★ Copper and iron are known to increase levels of Reactive Oxygen and Reactive Nitrogen Intermediates, which are what provoke the immune response that kills sperm. Chemically, copper itself is not toxic.⁶
- ★ In lieu with what was mentioned earlier however, the data below indicates interference by the IUD before fertilization.

Condition*	Positives/no. of cycles	%
Unexposed	0/10	0
Exposed	18/26	69
Exposed+IUD	6/23	26

*Exposure to Sexual Intercourse

This table shows the rates of detection of an early pregnancy factor in IUD and non-IUD users. Note that non IUD users have a much higher rate. This and other similar studies are an indication that IUDs affects fertilization rates in general and is not limited to action after formation of a zygote.¹

Group	No. of women with egg(s) recovered	Percent Recovery
Control	64/111	58
Lippes loop	7/15	47
Copper-T 200	8/27	30
Progestin IUD	7/14	50

This table shows the egg recovery rate of IUD users versus non IUD users. All IUDs including the copper IUDs are shown to destroy the egg before it reaches the uterus. This is an indication of action of the IUD beyond the typically proposed uterine levels.¹

Group	No. of ova	Fertilized	Unfertilized	Uncertain
Control	18	14	4	0
Lippes loop	4	1	3	0
Copper-T 200	5	0	3	2
Progestin IUD	5	1	4	0

Of the ova recovered from the fallopian tubes after intercourse, those recovered from conditions with IUDs are shown to have a much lower rate of fertilization. One proposed method is that the Cu cation has an extrauterine effect as well.¹