

NuvaRing

The NuvaRing is a self-administered hormonal contraceptive device in the form of a flexible plastic ring that is inserted into the vagina. It releases the hormones etonogestrel and ethinylestradiol, which are synthetic forms of the female reproductive hormones progesterone and estrogen, respectively. The pharmaceutical company Organon first made NuvaRing in the Netherlands in 1980s. The Netherlands first approved it for use in February of 2001, and the United States did the same in October of that year. To insert the NuvaRing, a user pinches the ring together to compress it and inserts it into the vaginal canal, where its exact placement does not matter. The NuvaRing stays in the vagina for three weeks, after which the user removes it for one week. During the week following removal, the user experiences bleeding similar to a menstrual period. The NuvaRing was one of the first monthly vaginal rings used for contraception, and it provides a self-administered method of birth control, which can be more accessible for some users than taking a birth control pill every day.

In the 1960s, researchers in the US and Europe began investigating methods of administering medications and steroids through the vagina with a plastic ring. That research was primarily for non-contraceptive purposes, such as hormone therapy for people experiencing menopause. Steroids include reproductive hormones, like estrogen and progesterone. Estrogen and progesterone are sex hormones that help govern reproduction and anatomy in females. Researchers in the 1960s designed the vaginal ring because the skin on the walls of the vagina absorbs steroids quickly, and the design of a flexible plastic ring made it easy for patients to insert the device themselves. Daniel Mishell, Jr., an obstetrician and gynecologist who conducted research on contraceptives and reproductive endocrinology in the 1970s in the US, studied vaginal rings releasing hormones. He performed many clinical studies to observe the ability of vaginal rings to release hormones for the purpose of contributing to a new contraceptive technology. During the 1980s and 1990s, several companies attempted to develop hormone-releasing rings for different purposes. For example, one company in Sweden created a ring in 1994 to release estradiol, another form of the hormone estrogen, for people with estrogen deficiencies. When the NuvaRing was released, it was the one of the first hormonal vaginal rings meant for general contraception.

Before the release of the NuvaRing, there were limited effective contraceptive options that were long-acting and easily self-administered. In the US in 2002, the most common contraceptive methods were the male condom, the birth control pill, and the withdrawal method, where, during sexual intercourse, the male withdraws before orgasm to avoid impregnating the other partner. Some other existing methods were permanent methods, such as sterilization surgeries, and long-acting reversible contraceptives placed inside the body such as intrauterine devices, or IUDs, and injections, such as the Depo-Provera shot. Sterilization and long-acting reversible contraceptives both require a physician to administer the device or treatment. The NuvaRing differed from existing contraception in that a user could administer the ring at home while other contraceptives required the users to visit a physician to insert the devices or undergo surgery. In the 1990s, Organon conducted clinical trials in developing the NuvaRing and applied for approval from the US Food and Drug Administration. Although the Netherlands had already approved the NuvaRing in 2001, Organon first marketed and sold the device in the US in 2002.

The NuvaRing consists of the plastics ethylene vinylacetate and magnesium stearate, which make the ring soft and flexible. The ring contains 11.7 milligrams of etonogestrel and 2.7 milligrams of ethinylestradiol, and it releases on average 0.120 milligrams of etonogestrel and 0.015 milligrams of ethinylestradiol per day. The diameter of the ring is fifty-four millimeters, or approximately two inches, and the diameter of its circular cross-section is four millimeters. The NuvaRing initially

came with an applicator similar to the applicator of a tampon, with a tube that the user inserts into the vagina and a plunger that pushes the ring into the vagina. In 2020, Merck, the parent company of Organon, discontinued the applicator, so users insert the ring with their fingers.

A first-time NuvaRing user should insert the ring on their first day of menstrual bleeding. If the user inserts it at another time in their cycle, they should use another form of birth control for the first seven days after insertion to ensure that they will not become pregnant. The user should remove the ring three weeks after insertion on the same day of the week and time that they inserted it. The user can easily remove the ring by pulling it out of the vagina with a finger. The user should spend a week without wearing the ring, during which they will experience bleeding like a typical menstrual period. The body does not have an actual menstrual period, but rather experiences bleeding due to the drop in hormone levels induced by removing the ring. If the user has been using the NuvaRing without error and has sexual intercourse during that week, they should not be able to become pregnant. The user should then insert the NuvaRing again seven days after they removed it, even if their bleeding has not stopped.

The NuvaRing works by releasing etonogestrel and ethinylestradiol over time, which the epithelium of the vagina absorbs and releases into circulation around the body. Those forms of estrogen and progesterone in hormonal contraceptives typically prevent pregnancy by inhibiting ovulation, the process of an ovary releasing an egg cell. The menstrual cycle typically has fluctuations of hormones that signal the ovary to release an egg cell, so when the NuvaRing constantly introduces hormones to the body, it interrupts those signals and inhibits ovulation. Additionally, the hormones may also achieve a contraceptive effect by thickening the cervical mucus, which makes it more difficult for sperm to enter the cervix. If the sperm cells cannot enter the cervix, they cannot reach and fertilize an egg cell.

Under optimal conditions the NuvaRing is ninety-nine percent effective at preventing pregnancy. However, it is most likely ninety-one percent effective due to user error regarding the timing of placement and replacement of the ring. Because the vaginal canal will absorb the NuvaRing's hormones regardless of its position in the vagina, the position does not impact the NuvaRing's efficacy. In some cases, the NuvaRing can accidentally fall out of the vagina, which can impact efficacy. Common side effects of the NuvaRing use include irritation of the vagina or cervix, headache, mood changes, vaginal discomfort, and vaginal discharge. Additionally, combined hormonal contraceptives with synthetic estrogen and progesterone like the NuvaRing have a risk of causing blood clots, as the presence of those hormones can cause the blood to be more likely to clot.

From 2008 to 2013, nearly 2,000 parties filed lawsuits against Organon for adverse events related to NuvaRing, many of which were related to increased risk of blood clotting. Many users or their families filing lawsuits were younger than thirty-five and did not have previous cardiovascular issues, yet they had experienced venous thromboembolisms after starting to use the NuvaRing, and some users died because of those health events. A venous thromboembolism occurs when a blood clot forms in a vein. Serious manifestations of venous thromboembolism include deep vein thrombosis, in which a blood clot forms in a deep vein, or a pulmonary embolism, in which a blood clot migrates to the lungs. Complications of venous thromboembolisms include pain, swelling, shortness of breath, and death.

NuvaRing users filing lawsuits often claimed that the NuvaRing package and prescribing information did not include sufficient information about the risk of venous thromboembolism, or they felt that the information about risks was misleading. The original NuvaRing label from 2002 did not express the risk of venous thromboembolism, but rather emphasized that NuvaRing is not suitable for users over the age of thirty-five who smoke cigarettes and that the general risk for venous thromboembolism was higher for users of the age of forty. In 2013, Merck, the company which had acquired Organon in 2009, updated the prescribing and safety information to include the results of two epidemiologic studies. One of the studies, by Stephen Sidney and colleagues, focused on hormonal contraceptive users in the US, and the other, by Jürgen Dinger and colleagues, focused on hormonal contraceptive users in both the US and Europe. During the two studies, Sidney was working with the health research organization Kaiser Permanente Northern California in Oakland, California, and Dinger was working with the Zentrum für Epidemiologie und Gesundheitsforschung Berlin (Berlin Center for Epidemiology and Health Research) in Berlin, Germany. The authors of

both studies concluded that the risk of venous thromboembolism with the NuvaRing was comparable to the risk with other hormonal contraceptives containing synthetic progesterone and estrogen. Merck denied any wrongdoing in the lawsuits and issued a statement in 2014 stating that they stand behind the safety of NuvaRing. In 2014, Merck agreed to settle 3,800 filed and unfiled claims for one hundred million dollars.

From 2002 to 2014, there were over forty-four million prescriptions filled for NuvaRing, and, as of 2014, the contraceptive was available in more than fifty countries. According to a 2019 report from the United Nations, of the nine hundred twenty-two million women of reproductive age who use contraceptives, NuvaRing users make up less than 0.8 percent. In the United States, NuvaRing users make up less than 1.6 percent of contraceptive users. Since the production of the NuvaRing, other vaginal contraceptive rings containing different hormone formulations came into the market, such as Annovera, which contains segesterone acetate and ethinylestradiol. The NuvaRing provides a method of contraception that is easily administered and reversed by the user, and prevents unwanted pregnancy for one month, which can be convenient for a birth control user who does not want an implanted birth control method and does not want to take a medication every day.

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