



Insect Repellents

In every pregnancy, a woman starts out with a 3-5% chance of having a baby with a birth defect. This is called her background risk. This sheet talks about whether exposure to insect repellents might increase the risk for birth defects over that background risk. This information should not take the place of medical care and advice from your health care provider.

What are insect repellents?

Insect repellents are lotions, sprays, or oils that are put on skin or clothing to lower the chance of bites from mosquitos, ticks, spiders, or flies. Insects can carry serious diseases such as malaria, Lyme disease, and West Nile or Zika virus. Getting these diseases is not good for you or your baby, so it is important to prevent insect bites. Some insect repellents are more effective than others.

- DEET has been used for many years and is known to be effective against mosquitos and ticks. A 25% preparation provides up to 10 hours of protection (lower concentrations may only provide 2 hours of protection). For more information, see the MotherToBaby fact sheet on DEET at <https://mothertobaby.org/fact-sheets/deet-nn-ethyl-m-toluamide-pregnancy/pdf/>.
- Picaridin has been used in Europe for many years. A 20% preparation provides protection against mosquitoes for 4-8 hours.
- IR3535 has been used in Europe for many years. In some studies a 15% preparation protected against mosquitoes for 4-6 hours; other studies showed less protection. It may work best against midges and biting flies.
- PMD is a synthetic form of an agent from oil of lemon eucalyptus. Some studies suggest a 30% preparation protects against some insects for about 6 hours.
- 2-undecanone (methyl nonyl ketone) is found in plants such as rue (*Ruta graveolens*), bananas, cloves, and ginger. It has been used in the perfumery and flavoring industries and in some animal and insect repellants. It has also been used as a dog and cat repellent/training aid. An 8% preparation is thought to provide protection against mosquitoes for 3-5 hours.
- Citronella candles, wristbands, or skin moisturizers that do not contain approved insect repellents, and geraniol, lemongrass, or rosemary oils are much less effective and generally not recommended in areas where there are insect-borne diseases. One study suggested citronella diffusers with the approved insect repellent ingredients (see above) might be more effective compared to citronella candles.

What is the best way for me to use insect repellents?

All insect repellents should be applied as recommended. They should only be used for the times when they are needed. Wash them off with soap and water when you are no longer exposed to insects. Apply insect repellents only to exposed skin or clothing. Repellent should never be put under clothing. Do not apply repellents to cuts or irritated skin. When applying to your face, spray repellent into your hands and then apply sparingly, avoiding eyes and mouth. If you are using sunscreen as well, first apply the sunscreen and then the insect repellent.

Can insect repellents cause any side effects in me?

It's important to use insect repellents as directed. When used as directed, side effects are thought to be greatly reduced. Some possible side effects are:

- DEET can cause skin irritation in people who are sensitive to or who have been overexposed to DEET. There have been rare reports of DEET affecting the central nervous system (maybe causing confusion or seizures).
- Picaridin can cause some irritation of the skin and eyes.

- PMD is made from lemon eucalyptus and can cause temporary eye injury.

Are insect repellents absorbed into my bloodstream if I'm using them on my skin?

The amount absorbed into your blood varies by the product, strength, and the area of skin to which it is applied. In general, applying products to skin results in low levels in your blood.

Less than 10% of the total amount of DEET applied on skin enters the blood stream. DEET has been shown to cross the placenta late in pregnancy. It is not known whether applying picaridin, PMD, IR3535, or 2-undecanone to your skin would result in measurable amounts in your blood. Wash your hands thoroughly with soap and water after applying, to reduce the risk of getting any into your mouth.

Can using insect repellents during early pregnancy cause birth defects?

Many insect repellents have not been studied in human pregnancy. One study suggested that hypospadias (a birth defect where the opening of the penis is on the underside rather than the tip) was more common in boy babies born to women who used insect repellents early in pregnancy. This study did not prove that insect repellents cause birth defects, and more research is needed.

- DEET: There have been a few case reports describing adverse pregnancy outcomes after the mother's use of DEET during pregnancy. However, most animal and human studies suggest that exposure to DEET would not greatly increase the risk for birth defects.
- Picaridin: Animal studies have shown no birth defects or problems with growth in animals exposed to picaridin during pregnancy. There are no studies in human pregnancy.
- PMD: PMD made from lemon eucalyptus has been studied in animals and did not cause problems in offspring exposed during pregnancy. There are no studies in human pregnancy.
- IR 3535: IR3535 has not been studied in animals or human pregnancy.
- 2-undecanone: One animal study found a greater chance for pregnancy loss when exposed to 2-undecanone; however, these animals were given 2-undecanone by injection which is a stronger exposure than would occur from applying to intact skin. 2-undecanone has not been studied in human pregnancy.
- Natural plant oils such as soybean, lemongrass, citronella, peppermint, lavender, geranium, or geraniol have not been studied in animal or human pregnancy.

The Centers for Disease Control (CDC), The American College of Obstetricians and Gynecologists (ACOG), and other major health organizations recommend the use of insect repellents to protect pregnant women and their unborn babies from mosquito-transmitted infections.

Can using insect repellents later in my pregnancy cause any problems?

When used as recommended DEET does not appear to cause harmful effects when used later in pregnancy. There was a study of 449 women who used recommended doses of DEET daily during the second half of pregnancy. There was no increase in birth defects or effects on development in the children followed for the first year of life.

Other agents such as picaridin, PMD, and 2-undecanone have not been studied in human pregnancy. However, since they are reported to have low toxicity, absorption into the blood would likely to be low and they would be unlikely to cause a problem in the second half of pregnancy if used correctly.

Should I stop using insect repellents during my pregnancy?

It is important to consider that the benefits of using insect repellents during pregnancy may outweigh any possible risk. Insect repellents such as DEET and picaridin can help protect against mosquito bites that spread diseases such as Zika virus, malaria, Lyme disease and West Nile virus. Illness caused by any of these agents during pregnancy can have harmful effects on a developing baby.

Other ways to reduce your chances for getting bitten by an insect include:

- Wearing a hat, long sleeves and pants. Consider using clothing coated with insect repellent.
- Staying in places with air conditioning or that use window and door screens to keep insects outside. If this is not possible, sleep under mosquito netting.
- Removing any standing water around your house.

Can I use insect repellents while breastfeeding?

Illness from insects can have serious health effects for the nursing mother and infant. While there is little data

on the use of insect repellents during breastfeeding, it is important to consider the benefit of using them to prevent illness. When applying insect repellents during breastfeeding follow the same instructions as during pregnancy. Do not apply insect repellents to the nipple area so the baby cannot get any in the mouth while breastfeeding. Wash hands after applying.

Is there a problem if the baby's father uses insect repellents while I am trying to become pregnant?

There is no evidence that using any insect repellents will cause problems with fertility or birth defects in the future offspring of men. However, not all repellents have been studied for these outcomes. In general, exposures that fathers have are unlikely to increase risks to a pregnancy. For more information, see the MotherToBaby fact sheet Paternal Exposures and Pregnancy at <https://mothertobaby.org/fact-sheets/paternal-exposures-pregnancy/pdf/>.

References:

- Barr DB, et al. 2010. Pesticide concentrations in maternal and umbilical cord sera and their relation to birth outcomes in a population of pregnant women and newborns in New Jersey. *Sci Total Environ.* 408(4):790-795.
- Byrne S. 2016. Consumer Reports. Mosquito Repellents That Best Protect Against Zika. Available at: <http://www.consumerreports.org/insect-repellents/mosquito-repellents-that-best-protect-against-zika/>
- Diaz JH. 2016. Chemical and plant-based insect repellents: Efficacy, safety, and toxicity. *Wilderness & Environmental Medicine.* 27(1):153-63.
- Dugas J, et al. Use of biocides and insect repellents and risk of hypospadias. *Occup Environ Med.* 67:196-200.
- Lupi E, et al. 2013. The efficacy of repellents against Aedes, Anopheles, Culex and Ixodes spp.—a literature review. *Travel Med Infect Dis.* 11(6):374-411.

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