

Comparing Personal Repellent Active Ingredients

Different personal repellent active ingredients work in different ways, each with pros, limits, and considerations. Here's a side-by-side look at five commonly used active ingredients.

INGREDIENT	WHAT IT IS	PERFORMANCE / EFFICACY	REGULATIONS / SCIENCE	KNOWN CONCERNS
DEET	Synthetic repellent developed in the 1940s for the U.S. Army. Has been in market for over 60 years. Widely considered the "gold standard" for mosquito and tick repellents.	Highly effective against mosquitoes, ticks, biting flies, chiggers, gnats, and more. Works for several hours depending on concentration. Effective in high-risk, vector-borne disease regions.	Extensively studied. Registered with the U.S. Environmental Protection Agency (EPA) and under EU Biocidal Products Regulation (BPR). Recognized by the U.S Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) as effective when used as directed.	Possible skin irritation. Animal studies have indicated potential neurotoxicity when large amounts were swallowed, although this type of exposure is not applicable to personal repellent products when used as directed. Can damage plastics or fabrics. Harmful to aquatic life.
Picaridin (KBR)	Lab-made version of a compound in the piperidine family. Can be derived from black pepper plants or made synthetically. Used worldwide for over 20 years.	Protects against mosquitoes, ticks, biting flies, gnats, and sandflies. Works for several hours depending on concentration. Often preferred for its lighter feel, without a strong odor or potential to damage to plastics, clothing, or gear.	Registered with US EPA and under EU BPR. Recognized by the CDC and WHO as an effective option when used as directed.	Mild skin or eye irritation possible. Animal studies have indicated potential liver and kidney effects, although these studies are not clearly shown to be relevant in humans. Harmful to aquatic life.
IR3535	Synthetic repellent developed and marketed in Europe since the 1970s. Registered with the US EPA in 1999.	Effective against mosquitoes, ticks, lice, and some biting flies. May require more frequent reapplication than DEET or Picaridin in heavy bug areas. Gentle feel and little odor.	Registered with US EPA and under EU BPR. Long history of use in the marketplace with no substantial adverse effects. Recognized by the CDC for strong mosquito protection.	Mild eye irritation possible. Can damage some plastics or fabrics.
PMD (p-Menthane-3,8-diol)	Botanically inspired active that is chemically processed from oil of lemon eucalyptus or from pine oil extract. In widespread use since 2005.	Protects against mosquitoes and some ticks. Usually lasts a few hours. Reapplication may be needed sooner in hot, humid conditions.	Registered with the US EPA and under EU BPR. It is recognized by the CDC as an effective mosquito repellent.	Eye irritation possible. Strong botanical scent may be unappealing to some. Harmful to aquatic life.
Essential Oils (e.g., geranium, clove, cornmint)	Concentrated plant oils with scents insects tend to avoid.	Shows lower repellency and shorter duration than repellents with DEET, Picaridin, and IR3535. Requires frequent reapplication.	Essential oils used for repellents in the EU require registration. In the US, essential oils meeting certain criteria are exempt from US EPA registration, prohibiting these repellents from making claims of protecting against vector-borne disease like West Nile virus, Zika, dengue, or Lyme disease.	Can cause eye and skin irritation or allergic reactions. Potential for photosensitivity. Data on long-term safety is limited vs registered actives. Some have been shown to impact the reproductive system in animal studies. May be harmful to aquatic life.

For further information

[US EPA Pesticide Information](#); [CDC Mosquito Prevention](#); [EU Biocidal Product Regulations](#)