



Protecting our health and our homes

The role of repellents and insecticides in keeping troublesome insects at bay

Insects make up half of all living organisms and play an essential role in our ecosystem, contributing to pollination and the food chain of birds and other insectivores. Only a few pose a threat to human health in Europe, but that threat can be serious. Others are more of a nuisance.

This brochure gives information on these troublesome insects in and around homes, healthcare and other institutional settings in Europe and European states' dependencies, and on the role of insecticides and repellents in protecting our health and environments. It does not cover pests and the use of pesticides in agriculture (those being outside A.I.S.E.'s scope).

A creeping threat

Insects can carry and transmit **life-threatening diseases** and can attack possessions and our food. Malaria alone killed around 435,000 people in 2017 and affected some 219 million people worldwide, more than the year before. The incidence of other, potentially deadly mosquito-borne diseases such as Dengue fever, West Nile fever and Chikungunya is also on the rise, including in Europe and its overseas departments.

1 Mn cases

Meanwhile tick-borne diseases are spreading especially rapidly in Europe. Lyme disease is now estimated to be affecting close to a million EU citizens a year¹ and tick-borne encephalitis is endemic in rural and forested areas of central, eastern and northern Europe.²

Nuisance insects, also, are becoming more of an issue. Bed bugs, which were virtually wiped out in Europe shortly after World War II, are a growing problem, and not just in the bedroom, but also for hotels, hospitals, residential care homes and even for public transport and airlines. Roaches, too, appear to be on the rise again and can infest and attack our foods and spread bacteria.



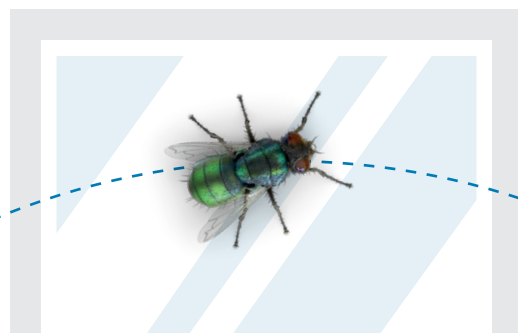
Climate, trade and travel

Increased trade and travel are part of the reason. Mosquitoes have moved from continent to continent via trade, bed bugs hitchhike in luggage, and 99% of all malaria cases in Europe are travel-related. Climate change is contributing also, creating warmer and wetter conditions in many parts of Europe.^{3,4}

These findings indicate a growing need to protect against infection, infestation and insect-transmitted disease in and around homes, healthcare and other institutional settings in Europe. In this context, repellents and insecticides provide a vital line of defence, responsibly used and strictly regulated in Europe under the Biocidal Products Regulation.

"Climate-driven risk of viral transmission from both [the *Aedes aegypti* and *Aedes albopictus*] mosquitoes will increase substantially, even in the short term, for most of Europe."

(Sadie J. Ryan et al,
March 28, 2019)



Small bugs, big problems

From cockroaches measuring more than 3 cms long to dust mites of 0.3 mms invisible to the naked eye, the insects that trouble us in Europe may be relatively diminutive in size, but they can cause enormous health issues, ranging from allergies and asthma to life-threatening illness. Here is an overview of some of the most common.

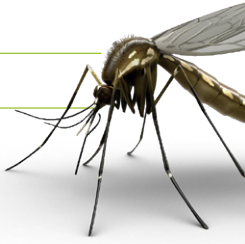
Where you find them Why they are a problem

Mosquitoes

They are attracted to a person's breath, perspiration, body heat and body odour. Female mosquitoes bite people to feed on their blood, which they need to produce offspring.

Mosquitoes need standing water to breed, which can be a pond or a lake, a backyard puddle or just some water collected in an old car tyre. Disease-carrying mosquitos can be found even in cooler parts of northern Europe.

Mosquito bites are unpleasant and can cause itchy welts. More importantly, they can transmit infectious diseases, including malaria, West Nile virus, Dengue fever, Zika virus and Chikungunya.



Fleas

They do not have wings but can jump long distances. They feed on the blood of mammals and are a common external parasite of dogs and cats but will also bite humans.

The flea attaches to the pet dog or cat when it is outdoors and then infests its fur, and the places it lives indoors, from where it can jump to the pet owner and other humans.

Flea bites can leave the host with numerous swollen, itchy marks. They can cause allergic reactions in some people and spread infection, including plague and typhus. They breed prolifically, so a flea infestation can be very difficult to clear up.

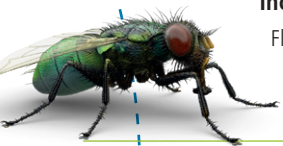


Filth flies

Including house flies, they are scavengers attracted to moist organic matter both to feed and lay their eggs.

Flies can be found around compost, rubbish, manure or dead animals. They are attracted to food odours so will hover around, and land on food in the kitchen.

Flies pick up germs and filth on their bodies or with their mouths and then redeposit them wherever they land. Their filthy habits means they can transmit many diseases, including worms, diarrheal diseases and skin and eye infections.



Bed bugs

They have small, flat, oval-shaped bodies and are wingless. Adults are brownish, about 4-5mm long and move slowly. They bite to feed on human blood.

Bed bugs are not just confined to the bedroom. They are good hitchhikers and can be found in luggage, behind electrical sockets, and other hidden places, close to humans.

Bed bugs bites leave itchy welts and can cause allergic reactions. Mental health impacts on people living in infested homes can include insomnia and anxiety. Rates of infestations have risen sharply in recent decades in Europe and North America and they can be hard to get rid of.



German cockroaches

They are a small species of cockroach, about 13-16mm long. They have wings but rarely fly, preferring to run. They generally hide in the day and come out at night.

These small roaches are attracted to food, warmth and humidity, so they are often found in domestic kitchens and bathrooms but also restaurants, hotels, food processing facilities and institutions like nursing homes.

German roaches can pick up, carry and spread harmful bacteria, including Salmonella and E. coli. Their faecal waste, cast skins, and saliva may cause allergic reactions and asthma.



Ticks

They attach themselves to animals or people as they pass by. They bite them to feed on their blood.

Ticks generally like cool woods or grassy areas. The disease-carrying species have now spread throughout Europe, including to higher altitudes and more northern latitudes. Other ticks like the dog tick are found anywhere where pets rest and play.

Ticks can transmit different diseases, including Lyme disease and tick-borne encephalitis (TBE, preventable by vaccination). The number of cases of Lyme disease in Europe (about 650,000 cases a year) has increased steadily, and TBE cases have risen nearly 400% in the last 30 years. Note that tick bites are often painless initially, and attached ticks can go unnoticed until a visual tick inspection is done.

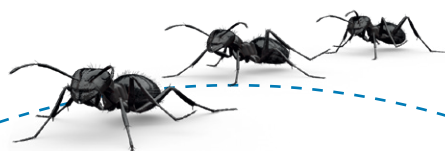


Ants

They live in colonies that can be outdoors near the home, or inside. There are thousands of ant species in the world but only a few commonly invade our homes, including pavement, pharaoh and Argentine ants.

Ants commonly find their way into the kitchen. When one ant finds food or water, it will lay down a scent trail that guides other worker ants to the source – you will see a trail of ants going back and forth.

Ants can infest and contaminate food and, when disturbed, they can bite.



Insects' presence, impact and control in Europe: A growing presence and a very

Case Studies

Mosquitoes – more and more invasive

The European Centre for Disease Control warns of a considerable spread of invasive mosquitoes in Europe since the late 1990s, including the *Culex* genus of mosquito, a vector for West Nile virus, the *Anopheles* mosquito (malaria), and the *Aedes* mosquitoes that transmit Zika, Dengue and Chikungunya.

x7
in one
year

The number of reported **West Nile virus** infections in the EU/EEA in 2018 jumped seven-fold from 2017 to over 1,500, exceeding by far the total number of cases in the previous seven years combined. Eleven EU countries were affected as far north as Austria; Bulgaria and France saw the biggest rise in cases. In total, 181 deaths were reported. The *Culex modestus* mosquito has recently spread in central and northern Europe including Sweden.⁵

The *Aedes aegypti* mosquito has become established in Madeira and some areas around the Black Sea coast, while the Asian Tiger mosquito (*Aedes albopictus*) is present in much of southern Europe. In 2012-13, Madeira reported its first **Dengue** outbreak, with 2,168 cases.

8400 cases
99%
travel-related

Most **malaria** cases in Europe are due to infected travellers returning home, but locally acquired malaria has been occurring sporadically. Between January 2016 and April 2018, six cases of hospital-acquired malaria were reported.^{6,7}

Bed bugs – not just in the bedroom

Bed bugs (*Cimex lectularius*) almost disappeared from Europe after World War II but their numbers have risen dramatically in recent decades, becoming a regular topic in the media and on internet travel forums. Why? Increased travel is the main reason for the resurgence, but other factors contribute.

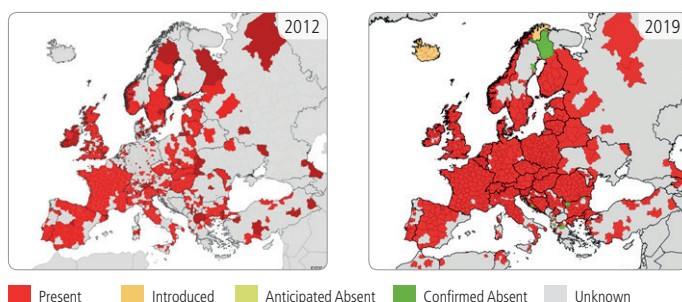
From 1 to
thousands

A single pregnant bed bug that escapes detection can rapidly result in a colony of thousands. Hotels, healthcare institutions and even airlines have suffered bed bug infestations.

Tick-borne diseases – a silent epidemic

In November 2018, Members of the European Parliament adopted a resolution calling on the EU to draw up plans to combat the “*alarm-ing*” spread of **Lyme disease**, which is affecting an estimated 650,000-850,000 Europeans every year.⁸ It was noted that infected ticks and the disease seem to be expanding geographically, with instances now also being recorded at higher altitudes and latitudes, as well as in towns and cities.

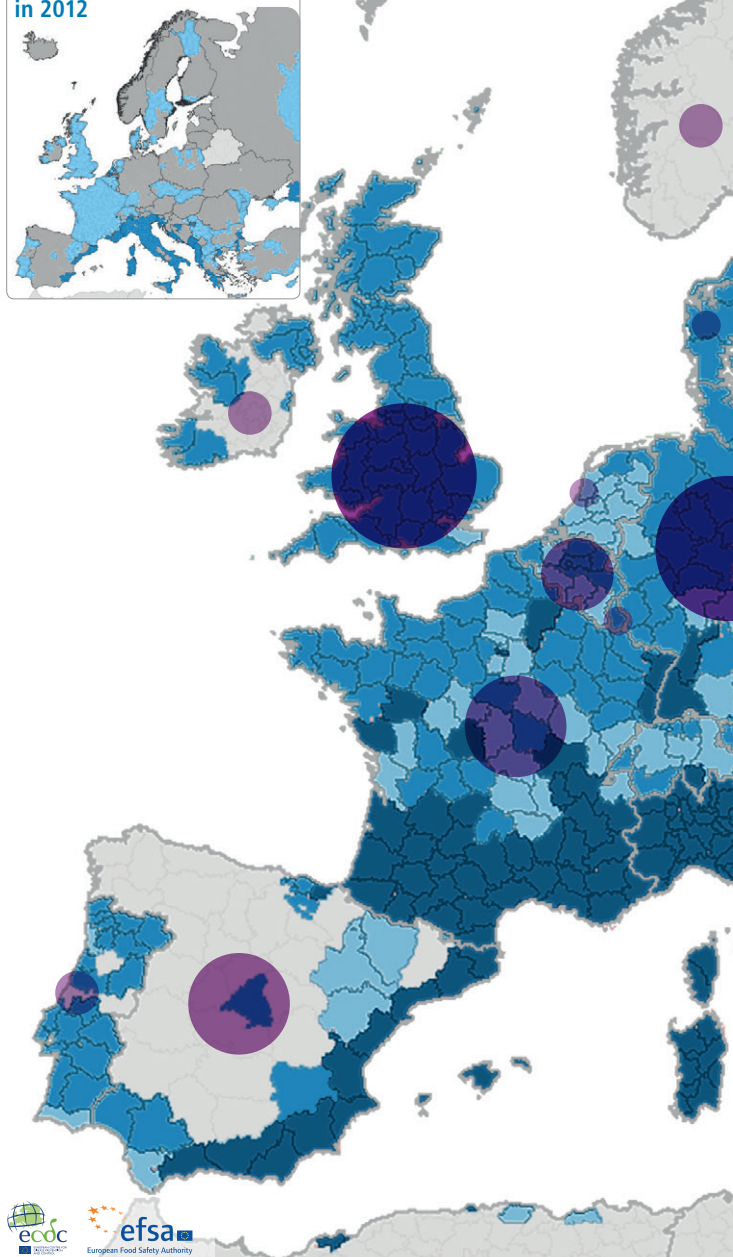
A drastic evolution of ticks (*Ixodes ricinus* here) between 2012 and 2019 in Europe



Source: <https://ecdc.europa.eu/en/publications-data/ixodes-ricinus-current-known-distribution-january-2019>

Zooming here on the presence of *Aedes albopictus* invasive mosquito (2019) and aggregated cases of Zika, Dengue and Chikungunya (2017)

Aedes albopictus presence in 2012



ECDC and EFSA, map produced on 16 Jan 2019. Data presented in this map are collected by the Vector Control Centres (VCCs). Data do not reflect the official views of the countries. * Countries/Regions are displayed at different scales to fit the map.

Aggregated cases of Zika, Dengue and Chikungunya per country (2017)

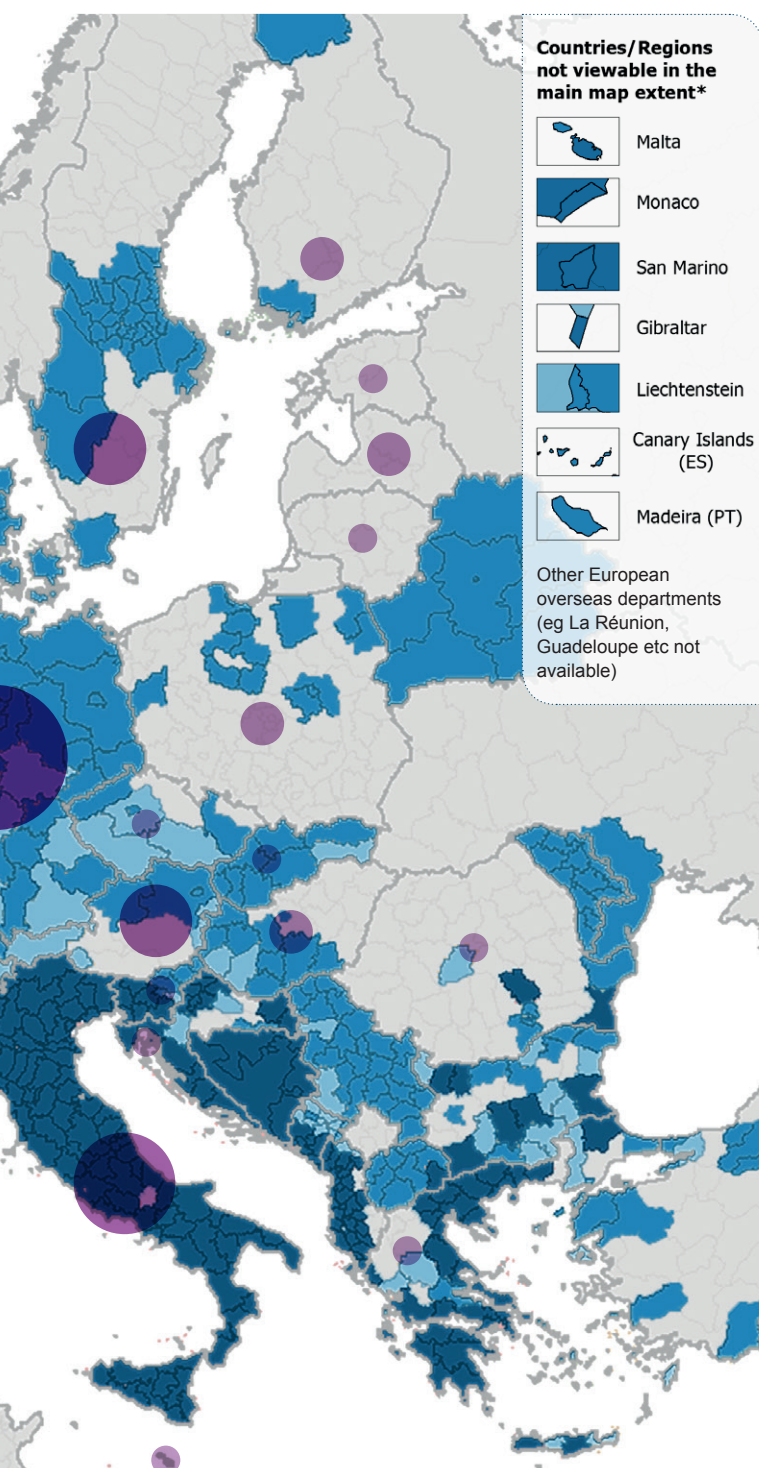


Distribution of *Aedes albopictus* Asian Tiger mosquito in Europe (Jan 2019)



Sources: All diseases: ECDC Atlas - <https://atlas.ecdc.europa.eu/public/index.aspx>
Aedes albopictus mosquito: <https://ecdc.europa.eu/en/publications-data/aedes-albopictus>
European Centre for Disease Prevention and Control and European Food Safety Authority

diverse situation across Member States



*rNet project. Maps are validated by external experts prior to publication. Please note that the depicted data facilitate their visualisation. Administrative boundaries © EuroGeographics, UNFAO, TurkStat.

Disease	Number of cases reported in Europe in 2017, EU/EEA
Malaria	8393 (with >50% cases in FR & UK)
Dengue	2016
Chikungunya	548
Zika virus	2119
Tick-borne encephalitis	2550
West Nile Virus	2011

Source: ECDC atlas

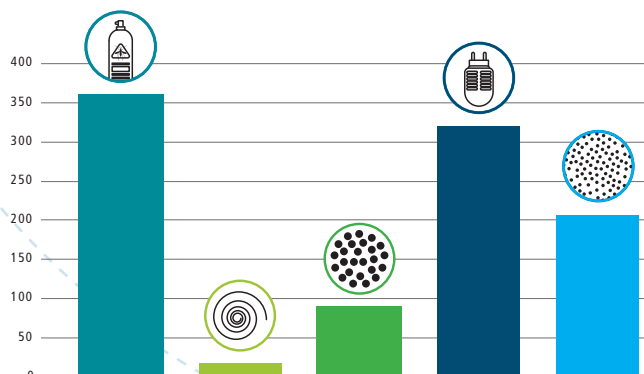
current-known-distribution-january-2019
Stockholm: ECDC; 2019.

Insecticides

Types of products used in Europe*

- Spray / aerosol insecticides** – typically instant release products for crawling or flying insects, including cockroaches, ants, flies and mosquitoes.
- Insecticide coils** – slow-release products designed for flying insects, typically mosquitoes.
- Insecticide baits** – attractant formulations designed for crawling or flying insects.
- Electric insecticides** – for example, a slow-release electric diffuser device which takes liquid or tablets, targeting mainly mosquitoes and flies.
- Other home insecticides** – including Insecticide dust, a dry product, which kills insects by contact after they pick up the dust on their bodies.

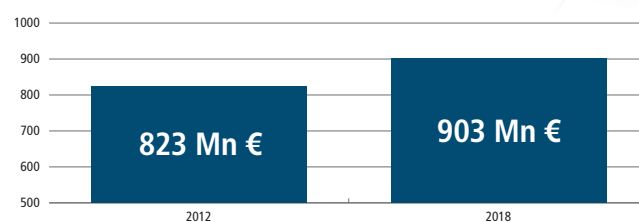
Total sales* in 2018: 903 million EUROS (EU/EEA)⁹



* Household related only - Source: Euromonitor.

No available data on professional applications/services

Evolution of Insecticides sales in Europe



Consumption of insecticides per capita

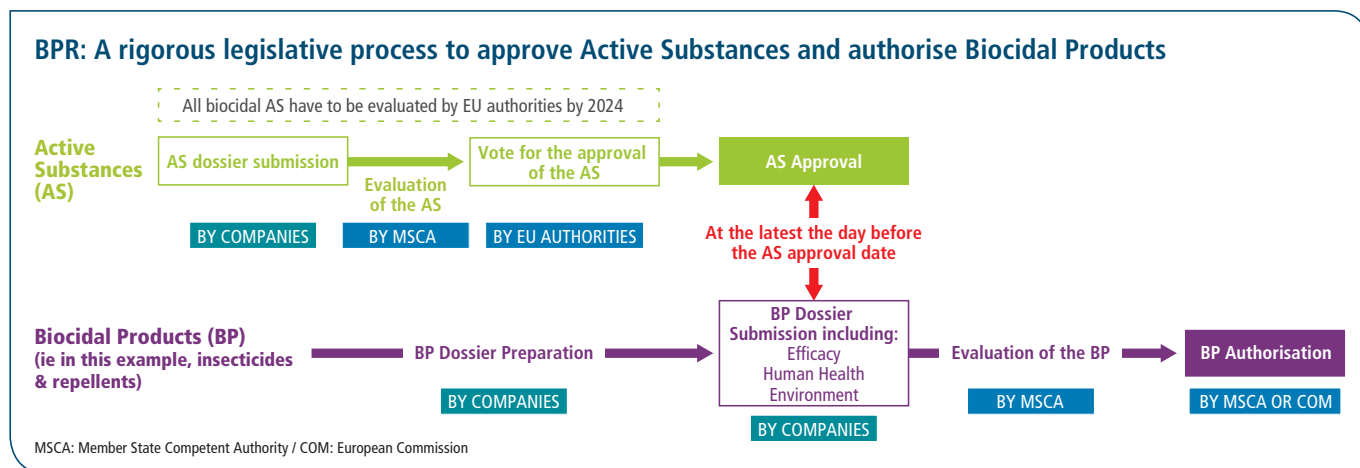
Consumption level (in value 2018, per capita)	Countries
> 3 €	Italy, Austria, Spain
2-3 €	France, Greece, Switzerland
1-2 €	Croatia, Hungary, Romania, Slovakia, Slovenia, Belgium, Cyprus, Denmark, Finland, Germany, Luxembourg, Malta, Norway, Portugal
<1 €	Bulgaria, Czech Republic, Latvia, Lithuania, Poland, Serbia, Iceland, Ireland, Netherlands, Sweden, UK

Source : Euromonitor

Repellents & insecticides: Strictly controlled

Before any insecticide can be put on the market in Europe, it must meet the high standards of human and environmental protection and efficacy prescribed by the Biocidal Products Regulation (BPR) and be specifically authorised.

The process is a thorough one. First, the active substance, or substances, in the insecticide must be submitted for approval and then the complete insecticide product, with the active substance in it, is submitted and evaluated for efficacy and human and environmental safety. Only if the product meets all these standards can it be authorised by a Member State Competent Authority or the European Commission.



In addition, all biocidal products, including insecticides and repellents, must comply with additional labelling requirements on top of those that normally apply to all products. They must give clear directions for use, frequency of application and dose rate, list any adverse side effects and directions for first aid, and instruct how to dispose of the product and its packaging safely.

Where applicable, the label must also state the duration of necessary ventilation of treated areas and warn if there is any specific danger to the environment, for example, a risk that the product might harm other creatures.

Labelling of insecticides & repellents: addressing safe use and disposal

On top of complying with the various CLP Regulation requirements, insecticides & repellents' labels must clearly indicate, inter alia:

- directions for use, frequency of application and dose rate, in a manner which is meaningful and comprehensible to the user
- adverse side effects and any directions for first aid
- directions for the safe disposal of the product and its packaging

... and where applicable:

- duration of necessary ventilation of treated areas
- information on any specific danger to the environment particularly concerning protection of non-target organisms

Extract from BPR Art.69

Avoiding insecticide resistance

Insecticide resistance describes the decreased susceptibility of an insect population to a substance that was previously effective at controlling or killing that species. It was first observed in agriculture when insect pests exhibited a greater capability of survival after deployment of the same dose and type of insecticide crop after crop.

The mechanism of insecticide resistance is now much better understood: insecticides do not cause genetic changes within insects leading to them becoming resistant, instead they select for the 'survival of the fittest'. If an individual insect within a population already carries a gene making it more tolerant than others, this insect will better survive exposure and pass on its genes to the next generation. Over time, and with repeated exposure, the percentage of individuals can rise to a level where the substance is no longer effective.

This means that the two main drivers for the development of insecticide resistance are the reproduction rate of the insect species and the level of continuous exposure of a large population to an insecticide. Consumers and professionals using pest control products in a selective and targeted manner are unlikely to contribute to insecticide resistance since the impact of the products is limited to relatively few insects in a population. By the same reasoning, the availability of a variety of effective active substances can also help to avoid insecticide resistance.

Tips for prevention and safety

Manufacturers of insecticides take very seriously their responsibility to ensure that products are used safely and only as and when necessary.

- **First measures:**

Measures to make homes and premises unattractive to troublesome insects should always be the first port of call, including mopping up pools of stagnant water, using screens and mosquito nets, good kitchen and food hygiene, and use of repellents where appropriate.

- **If these do not prove sufficient, then insecticides may be considered:**

The advice then is to always select the insecticide for the specific insect, follow the instructions on the label carefully, and use the optimal amount. Manufacturers and regulations ensure that instructions for safe use and disposal are clear and accessible.

- **If the first operation is not successful, or if the problem is more severe:**

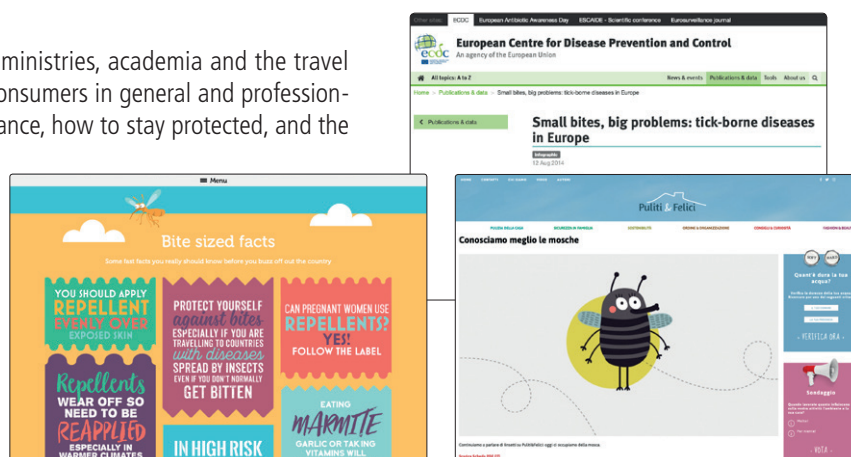
The intervention of a professional intervention may be sought (see also CEPA, the European pest management services trade association).

Various initiatives by industry associations, health ministries, academia and the travel industry aim to raise awareness among travellers, consumers in general and professionals about the risk of insect-borne diseases and nuisance, how to stay protected, and the responsible and safe use of insecticides.

BUG OFF: <https://www.bug-off.org>

ECDC: <https://ecdc.europa.eu/en/publications-data/small-bites-big-problems-tick-borne-diseases-europe>

Puliti&Felici: <http://pulitiefelici.it/it/blog/ven-21062019-1508/conosciamo-meglio-le-mosche>



References

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- <http://environmentlive.unep.org/foresight>
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- <https://www.consumered.org/campaigns/mosquitoes-ticks>
- 1 <http://www.europarl.europa.eu/news/en/press-room/20181106IPR18328/parliament-calls-for-alarming-spread-of-lyme-disease-to-be-tackled>
- 2 <https://ecdc.europa.eu/en/tick-borne-encephalitis/facts/factsheet>
- 3 <https://journals.plos.org/plosntds/article?id=10.1371/journal.pntd.0007213>
- 4 <https://ecdc.europa.eu/en/publications-data/mosquito-borne-diseases-emerging-threat>
- 5 <http://www.e-m-b.org/sites/e-m-b.org/files/JEMCA%2036%20p%201-2.pdf>
- 6 <https://ecdc.europa.eu/en/news-events/hospital-professionals-should-strictly-follow-standard-precautions-avoid-rare-possible>
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- 9 Euromonitor 2018