Switzerland/ political debate
Risks posed by ectoparasiticides for pets

Press release and background dossier

Updated version 08.01.2026

on

Interpellation

24.3899

Should the use of fipronil and imidacloprid be restricted or even banned?

Submitted by: Stark Jakob Swiss People's Party

Date of submission: 18.09.2024 (German)

https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20243899

Notes: Contains the background document on interpellation 24.3899 (basic information, a commentary on the Federal Council's statement of 27 November 2024, the course of the debate on 6 March 2025, as well as explanatory documents, tables and references: in the text (links/footnotes) and in the bibliography). Links may lead to German pages.

Updated when the studies on water pollution were available at the end of 2025.

Where the masculine form has been used for reasons of simplicity, female persons are also included.

The facts collected in this document come from official sources, information provided by organizations and experts, as well as publicly available sources and specialist publications.
The findings and conclusions drawn from this information are the responsibility of the author.

Author: Dr Rolf Frischknecht, swissparadigm.ch, contact:rolf.frischknecht@bamboorods.ch , 0041 79 370 17 12.

Shorts/Highlights / Politics (with text references as links)

(please note that several links may lead to documents in German)

The business of fear at the expense of humans, animals and the environment

- Dogs and cats are treated for ticks and fleas with insecticides that have been banned in agriculture for years due to their high toxicity (e.g. fipronil, imidacloprid, permethrin).
- Fipronil, imidacloprid and permethrin are highly toxic to the environment, humans and animals. 2.6
- Products are very actively advertised worldwide;
  Market analyses: sales growth of approx. 11% per year; market volume of 12 billion by 2030. 2.5.6
- Organizations of parasitologists, which receive substantial financial support from the manufacturers of these products, recommend year-round "prophylactic" treatments. 2.5.7.1
- General tick treatment throughout the year is completely unnecessary in our region, as ticks are usually only active seasonally.2.4
  Tick-borne diseases in pets are quite rare; as with zoonoses, there are no data on incidence.11.8
- There are good, proven alternatives (repellents/other active ingredients, herbal products). 11.9

Systemic problem – even human medicines without environmental testing

- Human medicines also pollute waterways. An OECD report describes the risks as significant and calls for action. Problems are known to exist with painkillers, antibiotics, anti-epileptics and hormones, for example.
- Art. 81 of the Medicines Ordinance (in force since October 2008) requires an environmental assessment for the approval of medicines. It can therefore be assumed that **no environmental impact assessment (EIA)** was ever carried out for any medicines approved before October 2008.

The EU takes action

- A ***proposal*** has been presented to amend the applicable EU regulations.3.3.6
- **Article 23 requires** an **environmental impact assessment (EIA)** for all **medicinal products approved before 30 October 2005**.[1]

Political debate in Switzerland

In September 2024, Council of States member Dr Jakob Stark (SVP, TG) submitted **Interpellation 24.3899 Must the use of fipronil and imidacloprid be restricted or even banned?**

- The Federal Council's initial responses showed understanding. Additional questions ultimately led to a debate in the Council of States on 6 March 2025.8.1 .
- The Federal Council announced a comprehensive assessment of the situation in our waters and action once the results are available (review of prescription requirements, public information).

Study results Environment/waterways:

- a) **Pesticides in streams: Much remains to be done** (publication in German)
  b) **FIPRONIL POLLUTES FLOWING WATERS** (translated from German)

[1] *Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a Union code relating to medicinal products for human use and repealing Directive 2001/83/EC and Directive 2009/35/EC Articles 22-24: Environmental risk assessment*

- Fipronil: very frequent exceedances of limit values in waters below wastewater treatment plants. Origin: antiparasitic agents for pets

- Imidacloprid and permethrin: exceedances detected
  (less, proportion of antiparasitics partially masked by use as biocides)

On 24 September 2025, National Councillor Céline Weber (GLP, VD) submitted **Motion 25.4121 Water protection. Reducing harmful chemicals in everyday products at source**.

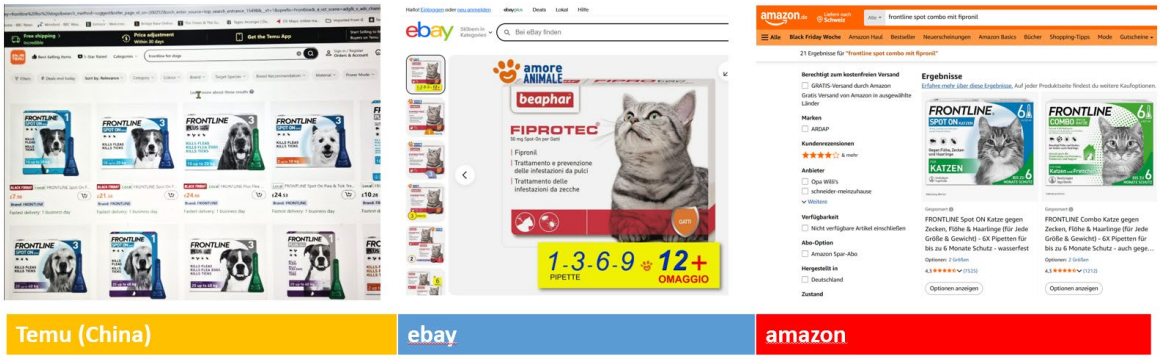
- The motion calls for a prescription requirement or labelling requirement for medicines with an increased environmental risk.

- The Federal Council's response is negative towards prescription requirements, with the possibility of an amendment to (only) labelling requirements.

Additional problem: internet trade

Medicines that are only available in pharmacies and drugstores in Switzerland or that require a prescription can be easily obtained from abroad via the internet without sufficient information.

Art. 48 of the Medicines Ordinance opens the floodgates for such imports by individuals.2.5.4 / 11.4



Demands for Switzerland

- ➢ Prohibit active ingredients that are banned in agriculture and other problematic substances or only allow them for specific purposes (prescription only/after risk analysis by specialists).
- ➢ In its newsletter dated 11 November 2025, the Swiss Veterinary Association (GST) informed veterinarians about the risks and called for a prescription requirement.
- ➢ Ensure constant monitoring:
  - Water pollution
  - Human health risks and side effects in animals
- ➢ Art. 81 of the Medicines Ordinance should be amended to require an environmental assessment for all approved medicines (including those approved before 2008).
- ➢ Approvals must be regularly reviewed in the light of newly identified risks
- ➢ Prohibit the online sale of prescription medicines

Contents

Background dossier *(basic information on the interpellation "Should the use of fipronil and imidacloprid be restricted or even banned?" with information on the parliamentary debate)*

1 Background dossier: Summary: Risks posed by ectoparasiticides for pets

1 Environmental issues

In Switzerland, as in other European countries, a significant decline in insect populations has been observed. Insectivores such as fish and birds are suffering as a result. Over half of all Swiss fish species are considered endangered or are already extinct.

Research into the causes has therefore been conducted across Europe, and the particularly toxic insecticides **fipronil, imidacloprid and permethrin** have been **banned for use in agricultural plant protection**.

However, they are **still used in flea and tick repellents for pets** and in biocides, thus continuing **to endanger aquatic fauna**.

Relevant scientific institutes, such as Imperial College London, have therefore made the risks public based on the available scientific evidence and are calling for action.

BBC **Spring Watch: The impact of flea treatments on UK rivers**

2 Situation in Switzerland – water pollution

These insecticides are aggressively marketed to pet owners as ectoparasite treatments under the slogan "tick prevention" and are available from vets, pharmacies, chemists, pet shops and online. The amount of insecticides brought into households in this way would be sufficient to treat **6,700 hectares** of potatoes with **fipronil** against wireworms and almost **12,000 hectares** of apple crops with **imidacloprid** against aphids and leaf miners, i.e. a total of around 5% of Switzerland's arable land with these insecticides, which are actually banned.

After application, ectoparasiticides spread through the animals' skin and fur and secondarily throughout the household. They not only end up in streams and rivers when dogs bathe and play, but also indirectly via secondary contamination from wastewater from agglomerations (dog/cat salons, pet utensils, hand washing by pet owners, etc.) over a longer period, leading to levels far above the limit values.

In Switzerland, too, **elevated levels** of the insecticides fipronil, imidacloprid and permethrin, which are lethal or highly **harmful** to aquatic insects, have been measured **in many water bodies** for years.

3 Risk to treated animals and humans

Recent studies indicate that insecticides used on pets can potentially **endanger human health and reproduction**.

A particular **concern** with the use of insecticides on pets is the fact that the products remain **in the household for long periods of time**, **exposing residents**, **including pregnant women and children (through contact with the animals, insecticides in carpets, furniture and possibly beds), to direct contact** with the insecticide**.**
In addition, countless side effects have been documented in treated animals.

4 Legal situation in Switzerland: double standards

Banned in agriculture – approved as a medicine

On the basis of the Plant Protection Products Ordinance (PSMV), particularly problematic active substances such as fipronil, imidacloprid and permethrin were banned for use in agriculture a few years ago on the basis of precise criteria for risk assessment in the environmental sector in connection with approval.

The approval of veterinary medicinal products is regulated by the Therapeutic Products Act and the Medicinal Products Ordinance. According to Article 81 of the Medicinal Products Ordinance (VAM, SR 812.212.21), the approval of the Federal Office for the Environment (FOEN) must be obtained before a **new** active substance is approved **for the first time** as a component of a veterinary medicinal product in Switzerland. However, there are no detailed evaluation criteria, and active substances that were approved before the ordinance came into force (2008) have not been reviewed.

The **active ingredients** have been **approved for years** (fipronil 1995/imidacloprid 1997/permethrin 1985) **without** restriction or **review**, and there has **never** been an **environmental assessment**.

There is also no clear requirement for a review of approvals in the event of new scientific findings, which has particularly fatal consequences in the case of fipronil and imidacloprid, as findings on the toxicity to humans and environmental damage caused by these active ingredients have only become increasingly known in recent years.
The Medicines Act and its implementation therefore also violate the **Federal Constitution**, namely the articles on environmental protection (Art. 74), water protection (Art. 76) and nature conservation (Art. 78), all of which require **appropriate protective provisions** in the law.

5 Risk-oriented therapies instead of long-term insecticide use

Fleas are easy to treat once diagnosed. The risk of ticks for pets is much lower than for humans. **Prophylactic, long-term treatment** with toxic insecticides, which poses increased risks to humans, animals and the environment, must be **reconsidered on a risk-based basis**.

Flea and tick control itself is **not jeopardised** by restrictions on the aforementioned insecticides, as there are sufficient other approved veterinary medicines and various effective tick repellents (repellents) containing natural substances available for this purpose.

(No products containing insecticidal active ingredients are approved for use on humans; only repellents are used for tick prevention (products such as Kik, Antibrumm, etc.).

6 Conclusions and demands

Even after the justified **ban in agriculture** (2019, 2021, 2007), the insecticides fipronil, imidacloprid and permethrin are **still approved** for **use in parasite control products** for pets and as biocides without any restrictions and continue to pollute our waters.

Environmental impact assessments were never carried out when these substances were approved more than 25 years ago, nor have they been required since.

In view of the **high risks** to the **environment**, but also **to humans** themselves and **to treated animals,** in the short term, parasite control products containing **chemical insecticides** should generally **only** be dispensed by **veterinarians with** clear **indications** and **for a limited period of time**, with appropriate warnings (**prescription only**). Any online trade must be strictly prohibited.

An examination **of the suspension/withdrawal of the relevant approvals** on the basis of **Article *16c*** of **the Therapeutic Products Act** and **Articles 6**, **9** and **48** of **the Water Protection Act**, which provide a sufficient legal basis, is imperative.
EU law also explicitly provides for such a possibility (protection of humans, animals or the environment (*Regulation (EC) No 726/2004, Article 45(4)).*

This is a systemic problem and applies to all medicinal products approved some time ago. The **EU** has recognised the problem and presented a ***proposal*** requiring a retrospective **environmental impact assessment** for **all medicinal products** approved **before 2005.**

Swiss legislation must **be amended** to ensure that all areas of law apply strict environmental criteria for the assessment of active substances, as is the case with plant protection product legislation. For all approvals where an **environmental risk assessment is lacking, such an assessment must be carried out retrospectively.**

In general**, substances with an increased risk potential should only be used** or dispensed **by persons** who have the appropriate **specialist training** and **are able to competently assess** the **risks (doctors, veterinarians, farmers, gardeners, pest controllers, etc.).**

2 Background

2.1 Environmental changes/insect decline

The decline in insect populations in Switzerland is worrying. In our waters in particular, populations and species diversity have been declining for years. According to IUCN criteria, 43% of mayflies, 40% of stoneflies and 51% of caddisflies in Switzerland are on the Red List.
At the same time, there has been a decline in fish stocks and insectivorous birds.

Insecticides pose a high risk to Swiss waters, especially small and medium-sized watercourses. The insecticides found in watercourses may originate from use as plant protection products, biocides or veterinary medicines, depending on the approved use of the insecticide in question. They enter watercourses via various diffuse and point sources from urban areas and agriculture.

The FOEN is conducting studies on the problem of insecticides in watercourses.

2.2 Ectoparasiticides: Environmental damage – scientific findings / media reports

Scientific studies from England show that insecticides also enter the environment when used on pets. In England, elevated levels of insecticides from pet ectoparasite control products have been found in many bodies of water, some of which are lethal to aquatic insects.

After application, ectoparasiticides are released into water bodies over a long period of time, not only when dogs are bathed, but also indirectly via secondary contamination (pet accessories, dog/cat salons, pet owners washing their hands, etc.)[2] , where they cause pollution above the limit values and thus damage the water insect population.

They also cause secondary damage to various fish and bird species (especially all salmonids, kingfishers, dippers and wagtails), all of which feed exclusively or at least largely on aquatic invertebrates.

For further reading, see 12.2

2.2.1 Threat to birds

In addition to indirect threats from food shortages (insectivores), birds are also directly endangered by the fur of treated pets[3] when they use it to build their nests.

2.2.2 Media reports

The threat to waterways posed by insecticides used on pets is also a relevant topic in the British media.

The issue was brought to the attention of the general public by a BBC report (2024):
BBC Spring Watch: The impact of flea treatments on UK rivers

As early as 2023, Imperial College London had publicised the risks and 24 relevant environmental organisations, including Wildlife Trust, Rivers Trust, Greenpeace and various angling organisations, had called for measures to be taken: "Ban all pesticide active substances that are not permitted for use on agricultural crops from being included in veterinary medicines for dogs and cats".

For further information, see 12.2.4

[2] Down-the-drain pathways for fipronil and imidacloprid applied as spot-on parasiticides to dogs: Estimating aquatic pollution: https://www.sciencedirect.com/science/article/pii/S0048969724003103
[3] Songbirds being killed by pesticides found in pet fur flea treatments
https://www.theguardian.com/environment/2025/jan/27/pet-fur-found-in-songbird-nests-contains-high-levels-of-pesticides-study-finds

2.3 Ectoparasiticides: aquatic toxicity / measured values in Switzerland

2.3.1 Aquatic toxicity – background

The insecticides fipronil[4] , imidacloprid[5] and permethrin[6] are highly potent insecticides with a strong negative impact on the environment. The use of these active substances in agriculture was therefore banned in 2019 (fipronil), 2021 (imidacloprid) and as early as 2007 (permethrin) (withdrawal of active substances).

However, they are still used as ectoparasiticides and biocides.

2.3.1.1 Quality criteria used

The Swiss Ecotox Centre develops quality criteria for surface waters (QCs) based on scientific literature, available data from approval procedures and internationally recognised standards.

If the environmental concentration exceeds the QS, adverse effects on aquatic organisms are have to be expected. Species from different organism groups (e.g. plants, crustaceans, insects, fish) may react differently to a substance. Quality criteria should always protect the most sensitive species. Secondary effects, such as accumulation in the food chain, are also considered. The temporal dimension is also considered in QCs. Acute QCs are intended to protect against short-term exposure (concentration peaks). Chronic QCs can be used to assess exposure over a longer period of time (e.g. continuous inputs of micropollutants from treated wastewater/derivation of QCs for fipronil, imidacloprid and permethrin, see footnotes 1-3).

2.3.1.2 Species-specific differences in toxicity

The wide variation in toxicity per active substance depending on the organism and substance is striking.

Insects and crustaceans are most sensitive to fipronil and imidacloprid, while algae and aquatic plants are significantly less sensitive. As insects and crustaceans are an important food source for fish, exceeding the EQS may also have indirect effects on fish, even if they would only be directly affected at significantly higher levels of contamination in the water. The toxicity of permethrin is comparably high for all organisms tested. The stability of the substance in the environment also plays an important role. Fipronil, for example, is broken down in the environment and the resulting degradation products (fiproles) are in some cases more toxic to insects and crustaceans than fipronil itself.

2.3.1.3 Synergistic effects/mixture toxicity

Combinations are often used in flea and tick control products. Imidacloprid and flumethrin, for example, have a much stronger effect when used together[7] . In the environment, substances from different sources mix and affect organisms and ecosystems. Toxic mixture effects can also occur when all mixture components are present in concentrations that do not cause any visible negative effects such as individual substances[8] . To date, only the negative effects of individual substances have been assessed and regulated. In Switzerland, mixtures of substances are currently taken into account in isolated cases for the assessment of water quality[9] . Internationally, there is currently a debate[10] on how mixtures should be treated in regulatory terms.

Literature: 12.2

[4] CQC (AA-EQS) and AQC (MAC-EQS) – Proposal by the Ecotox Centre for: Fipronil
https://www.oekotoxzentrum.ch/media/nksepguv/fipronil_eqs_dossier_stand-2021.pdf
[5] EQS – Proposal by the Ecotox Centre for: Imidacloprid
https://www.oekotoxzentrum.ch/media/urljbu2w/imidacloprid_eqs_dossier_stand-2016.pdf
[6] CQC (AA-EQS) and AQC (MAC-EQS) – Proposal by the Ecotox Centre for: Permethrin
https://www.oekotoxzentrum.ch/media/q05b1p1n/permethrin_eqs_dossier_update_2022_corr_2023_corr2025.pdf
[7] The synergistic action of imidacloprid and flumethrin and their release kinetics from collars applied for ectoparasite control in dogs and cats https://parasitesandvectors.biomedcentral.com/articles/10.1186/1756-3305-5-73
[8] See, for example, Silva et al., Environmental Science & Technology 2002 36 (8), 1751-1756 or Junghans et al. Aquatic Toxicology 2006 76 (2), 93-110
[9] https://www.ecotoxcentre.ch/media/100659/2013_junghans_mischungtox_aqua-gas.pdf
[10] https://www.sciencedirect.com/special-issue/10QDBFZ0HS0

2.3.2 NAWA national surface water quality monitoring network

The Swiss nationwide monitoring network for micropollutants in surface waters (NAWA)[11] has been in existence since 2018 and has since been continuously expanded with additional locations and further substances under investigation.

Since 2022, a total of 38 water bodies has been investigated, covering the range of different characteristics in Switzerland (large/small water bodies; locations with/without settlement areas, high agricultural activity in the catchment area/no agricultural land). Some locations contain treated wastewater from sewage treatment plants, while many contain no wastewater. The water bodies were selected to cover the widest possible range of potential sources of micropollutants.

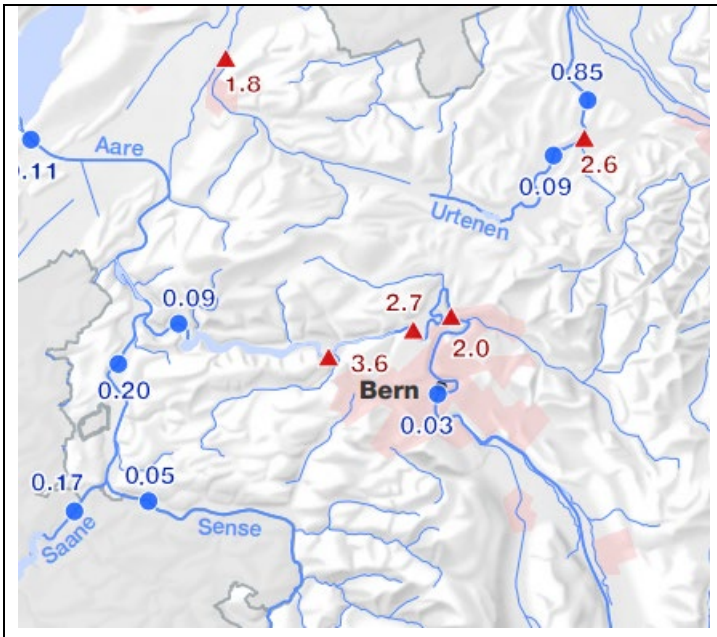
2.3.3 Measurements in Switzerland (as of 2024)

The three substances Fipronil, Imidacloprid and Permethrin exceed the chronic quality criteria/limit values and are therefore classified as problematic for water quality.

Number of exceedances in 2023 across all water bodies studied: Fipronil 74 exceedances in 10 water bodies, Imidacloprid 9 exceedances in 2 water bodies, Permethrin 69 exceedances in 15 water bodies (NAWA values).

See table in appendix 11.2 **Table: Aquatic toxicity of ectoparasiticidal agents**/limit and measurement values in Switzerland).

An example of a significant exceedance of the limit value for chronic exposure to fipronil is the Urtenen[12] (watercourse near Bern).

<table>
<tr>
<td> 
</td>
<td>Urtenen/watercourse BE

Fipronil was detected in concentrations of 1.1 to 2.9 ng/L. This significantly exceeded the quality target for chronic exposure of 0.7 ng/L*.

"As the tests carried out over a 28-day period at the Moossee-Urtenenbach wastewater treatment plant show, very large quantities of fipronil entered the Urtenen via its outlet – an average of 80 milligrams per day. Between 71 and 78 per cent of the fipronil loads in the water originate from the discharging wastewater treatment plant."

Similarly high or even higher values were found below the wastewater treatment plant outlets in Bern and other municipalities.</td>
</tr>
<tr>
<td>Fipronil contamination in the Bern region

Daily composite samples from WWTP outlets (red triangles) show particularly high concentrations of the biocide fipronil (here in nanograms per litre).
The significantly lower levels of fipronil in the other watercourse samples are marked with blue dots.</td>
<td>* Quality target for chronic fipronil contamination
CQC (AA-EQS) and AQC (MAC-EQS) – Proposal by the Ecotox Centre for: Fipronil
QK for chronic toxicity = 0.00077 µg/L = 0.77 ng</td>
</tr>
</table>

[11] https://www.bafu.admin.ch/bafu/de/home/themen/wasser/zustand/wasser--messnetze/nationale-beobachtung-oberflaechengewaesserqualitaet--nawa-.html

[12] (Page 35 of the Water Report 2019-2022, AWA Bern: On the trail of the biocide fipronil: https://www.bvd.be.ch/content/dam/bvd/dokumente/de/awa/wasser/gew%C3%A4sserschutz/gew%C3%A4sserqualit%C3%A4t/gewaesserbericht-2023/2023-gewaesserbericht-2019-2022-gbl.pdf

2.3.3.1 Source attribution/origin of pollutants

As the active substances are approved for use in several areas (veterinary medicines and biocides), it is difficult to clearly identify the source. However, the distribution of elevated values provides clear indications:

Exceedances of fipronil have been detected almost exclusively in waters **downstream of sewage treatment plants**. Fipronil is rarely used in biocides (withdrawal as a biocide planned) but is the main active substance in many ectoparasiticides for pets.

Studies are known from the literature that describe a connection between the widespread occurrence of this active ingredient in wastewater and the treatment of fleas and ticks in pets[13] .

Most **exceedances of imidacloprid** originate from a single water body (**a** relatively **large water body without agriculture in the catchment area** with a high proportion of treated wastewater). However, there are also repeated individual exceedances of imidacloprid in other water bodies.

Permethrin exceedances are about **as common** in water bodies **with sewage treatment plants** as in water bodies **without sewage treatment plants**. Permethrin therefore also enters water bodies in relevant quantities via **sources other** than sewage treatment plants. Sources can include both veterinary medicines and biocides.

2.3.3.2 Assessment

Results from England[14] suggest that a **significant proportion** of fipronil and imidacloprid **inputs** into water bodies occur via sewage treatment plants, i.e. originate **from households**.

Fipronil and imidacloprid are the main active ingredients in ectoparasite control products for pets.

2.3.3.3 Measurements supplement

Little is known about the occurrence and **quantity of** substances **other** than **ectoparasiticides**, such as isoxazolines or larvicides (S-methoprene).

The **measurements should** therefore **be supplemented**.

[13] Fipronil washoff to municipal wastewater from dogs treated with spot-on products
https://pubmed.ncbi.nlm.nih.gov/28505888/
[14] Potential role of veterinary flea products in widespread pesticide contamination of English rivers
https://www.sciencedirect.com/science/article/abs/pii/S0048969720370911

2.4 Risks Ectoparasites Animals/humans

2.4.1 Flea problems in pets in Switzerland

Fleas occur sporadically in summer and sometimes even in well-heated rooms in winter. Severe, prolonged flea infestation can lead to itchy skin redness/hives (skin changes). In addition, some animals may develop a flea allergy (flea saliva allergy dermatitis/FAD).

Infection with the cucumber tapeworm Dipylidium caninum (dipylidiosis) is possible, but easy to diagnose and treat[15] . Cat scratch disease (bartonellosis), caused by Bartonella henselae, is usually harmless. Other possible pathogens have been described but are rare.

Once diagnosed, fleas can be successfully combated using various methods, provided the environment is thoroughly cleaned and treated as well. It is important to note that the environment may be contaminated by larvae.

2.4.2 Occurrence of tick-borne diseases in pets in Switzerland n

Ticks can transmit protozoa, nematodes, bacteria and viruses when they bite.

In **Switzerland**, however, most tick-borne **diseases in pets** are **subclinical (mild)**, i.e. the animals are only slightly/briefly ill and there is no lasting damage.

Cases have been described, but **exact figures on the incidence** of these diseases in pets **are not available**.

Vaccinations are available against the relevant diseases (babesiosis/borreliosis):

The majority of serious illnesses occur mainly in the global south.

Early summer encephalitis (ESE), which is dangerous to humans, is not relevant to pets.

Ticks are **rarely** found at **altitudes** above 1,500 metres. Ticks are **not active** at temperatures **below 7 degrees Celsius**.

The **tick season** in Switzerland is **only from March to November**
(Mittelland, shorter at higher altitudes, regionalisation partially known).

See14.7 Tick model (Federal Office of Public Health FOPH) (swisstopo/ FOPH)

Data on the occurrence of infected ticks has been collected, but is only regionalised to a limited extent.

For details, see table11.8 Tick-borne diseases pets Switzerland

2.4.2.1 Correspondence/detailed comments:

Personal communication 15.10.2024 Dr Thomas KROEBER:
***Babesiosis** (Babesia canis and various other Babesia spp., Piroplasmida: Babesiidae) is potentially fatal. In Central Europe, it is mainly transmitted by Dermacentor reticulatus.*

Author's comment: Babesiosis also occurs in Switzerland. However, experts were unable to provide any incidence figures. In Germany, the disease occurs regionally but is very rare overall.

Personal communication 15 October 2024 Dr Thomas KROEBER:
*Other diseases such as **anaplasmosis (pathogen:** Anaplasma platys**)** and **ehrlichiosis** (Ehrlichia canis) can be transmitted by the Rhipicephalus sanguineus tick, which was introduced from southern Europe (Beugnet and Marié, 2009). Anaplasma phagocytophylum, the pathogen that causes granulocytic anaplasmosis, is transmitted by Ixodes ricinus and is also found in Switzerland.[16]*

***Viral diseases** (TBE, Louping ill) are rare and are not considered relevant in Switzerland.*

Personal communication 15.10.2024 Dr Thomas KROEBER
There is a vaccine against babesiosis, caused by Babesia canis (Munir et al., 2024; Schetters, 2005),

[15] https://de.wikipedia.org/wiki/Gurkenkernbandwurm
[16] *Personal communication 15 October 2024, Dr Thomas KROEBER, Institute of Parasitology, University of Zurich*

which can prevent serious illness but not infection and must be revaccinated at relatively short intervals (ESCCAP, 2023). The Pirodog® vaccine is also available in Switzerland (https://www.vetpharm.uzh.ch/tak/tl_it_hd.htm).

A trivalent vaccine against Borrelia is available for dogs (Merilym®3), but it does not cover the diversity of Borrelia species in Europe (Vogt et al., 2019; Wilczek et al., 2023) and does not protect against TBE (i.e. the opposite of humans).

Such diseases are only transmitted when ticks are active, actually carry the pathogen (are infected) and have the opportunity to attach themselves to a pet (tick bite).

However, vector competence, i.e. the ability to transmit a pathogen, depends on various factors. These factors influence characteristics such as the ticks' preference for certain host animals, the duration of the blood meal, the interactions between the tick and the pathogen or between the tick microbiome (the totality of microbes colonising the ticks) and the pathogen, and the tick's susceptibility to infection with the pathogen. Accordingly, different pathogens are transmitted by different tick species.

The **presence** of a tick and its infection with pathogens is therefore **only of limited significance** in terms of actual **disease outbreaks**.

2.4.3 Risk of fleas/ticks to humans in Switzerland

2.4.3.1 Fleas – risks to humans

Fleas on dogs and cats are actually host-specific. Humans can also be bitten as accidental hosts if their pets have a severe flea infestation. Itching/hives are typical. Scratching can also lead to secondary bacterial infection and, if left untreated, extensive skin changes. Cat scratch disease ([17]) can be caused by fleas, but infections are more commonly caused by scratches or bites from cats (very rare, approx. 6/100,000, usually spontaneous healing, otherwise easily treatable with antibiotics).

2.4.3.2 Tick risks for humans

The FOPH monitors diseases in humans caused by tick bites[18] .

The main ones are:

1. Early summer meningoencephalitis (ESME) in humans: vaccination recommended (pets: not relevant)
2. Lyme disease in humans: treatment with antibiotics (pets: vaccination possible)

Humans mainly become infected when walking in forest edges, etc. **Swissticks recommends** avoiding high-risk areas and wearing appropriate clothing. The **use of repellents** is recommended by SUVA.

There is a conceivable risk that people could be bitten by ticks brought into the home by pets, leading to cases of illness. However, the parasitologists surveyed were unable to present any proven cases.

Slow-acting ectoparasiticides containing fipronil and imidacloprid are **of no help** in this regard, as ticks only die after 24-48 hours.

Repellents are **more suitable**, as their smell greatly reduces the attachment of ticks. In addition, after a walk, crawling ticks can be easily removed from pets by combing them out or, if they are already attached, with tick tweezers.

[17] https://leistungsverzeichnis.labor-gaertner.de/entry/1706
[18] https://www.bag.admin.ch/bag/de/home/krankheiten/krankheiten-im-ueberblick/zeckenuebertragene-krankheiten.html

2.5 Pets – ectoparasite control products: background, application, market, quantities

2.5.1 Areas of application

Ectoparasiticides are used to treat dogs and cats infested with parasites such as fleas and lice, but are now increasingly used "prophylactic" to prevent possible infestation. As a "tick prophylactic", these products are actively promoted to dog owners by exploiting their fear of tick-borne diseases.

2.5.2 Forms of application

Ectoparasiticides are applied to the skin as a liquid (spot-on), used as a spray, incorporated into collars ("flea collars") or administered orally as tablets.
Insecticides spread through the fur and skin and remain effective for several weeks. Flea collars are effective for up to 8 months.

2.5.3 Approvals / active ingredients

The Swissmedic list contains the approved ectoparasiticides for dogs and cats.
The insecticides fipronil, imidacloprid, permethrin and other pyrethroids, as well as various isoxazolines and the larvicide S-methoprene, which are banned in agriculture, are often used as insecticidal active ingredients, either individually or in combination.

In addition to veterinary medicines containing problematic active ingredients, many other approvals with different active ingredients are listed. Repellents are not subject to approval.

In contrast to Switzerland, particularly toxic agents have not been approved in Canada, for example. In the USA, class action lawsuits are pending due to fatal side effects of these agents (Seresto).

See 11.5 **Approvals Switzerland/ International legal cases (examples)**

2.5.4 Sale

Pet ectoparasite treatments containing insecticides are subject to approval and are available from vets (sales category B) and in chemists and pharmacies (sales category D), and in some cases also online.

It is quite obvious that pet owners in Switzerland are also heavily targeted by advertising from abroad (websites with prices in CHF, often not recognizable as foreign sites) (**see 11.4** Online sales - examples

Repellents are available in pet shops, pet stores, from major distributors and online. (See **11.9 Repellents - Repellent examples**)

2.5.5 Medicinal product information

When advertising, especially in online sales, insecticide-based ectoparasiticides often lack the necessary warnings regarding safe use and environmental toxicity, or these warnings can only be found on subpages.

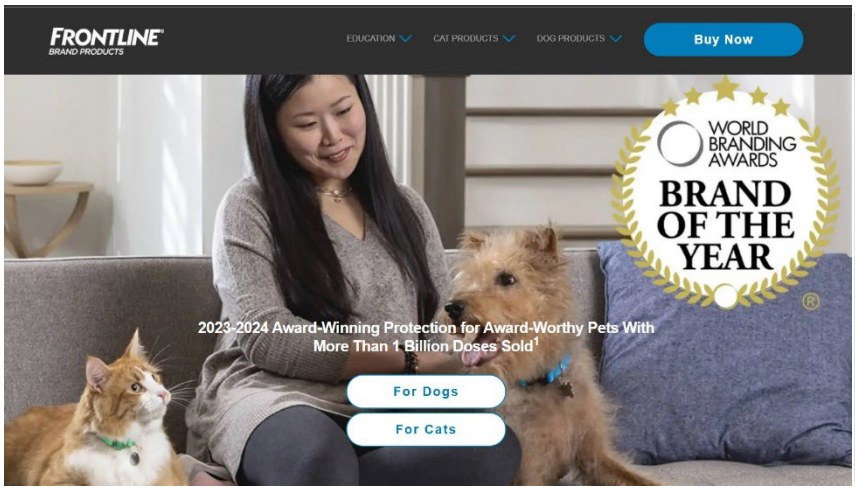
The medicinal product information enclosed with the packaging is rarely read in practice. Important warnings are largely missing, insufficient or incorrect.

In particular, there is insufficient reference to the newly recognized risks for pregnant women and children.

It is therefore urgently necessary to adapt the information to new scientific findings and to include clear warnings, as well as to enforce the ban on online sales.

2.5.6 Market volume and development

The market for pet ectoparasite treatments is growing rapidly worldwide, is highly profitable and is dominated by a few well-known manufacturers.



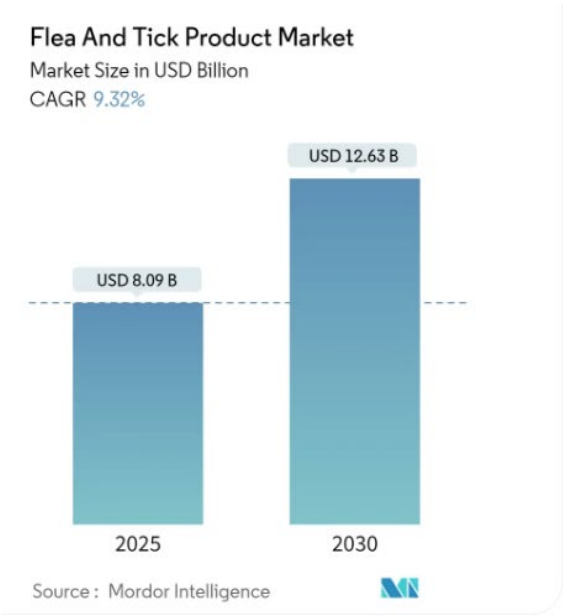
Last year, Frontline celebrated global sales of 1 billion doses within 2 years.

This means that around 134 tonnes of the insecticide fipronil were brought into people's homes and into the environment through this product alone.

That would be enough to treat 27'000 km^2 of apple orchards – more than half the area of Switzerland.
https://frontline.com/

The global market volume is expected to reach USD 12 billion by 2030.
The main markets are the USA and Europe, with strong growth in Asia.

The Seresto product (flea collar, Elanco) alone is expected to generate revenues of over 160 million USD per year[19] . This was initially marketed by Bayer Healthcare. However, Elanco Animal Health purchased the division in 2019 for 7 billion USD and has been intensifying its business ever since.



Study Period	2019 - 2030
Market Size (2025)	USD 8.09 Billion
Market Size (2030)	USD 12.63 Billion
CAGR (2025 - 2030)	9.32 %
Fastest Growing Market	Asia Pacific
Largest Market	North America
Market Concentration	Medium

Major Players

Ceva Animal Health, Elanco, Boehringer Ingelheim, Virbac, zoetis

*Disclaimer: Major Players sorted in no particular order

Expected market growth (Mordor Intelligence)
https://www.mordorintelligence.com/industry-reports/flea-and-tick-product-market--

The background to market growth is not only the growing pet market itself, but also the fact that tick-borne diseases are presented as a relevant danger to pets, and it is therefore recommended that the products be used prophylactically throughout the year. In addition, the products are aggressively advertised and sold in pharmacies/drugstores etc. and online.

[19] https://investor.elanco.com/press-releases/press-releases-details/2024/Elanco-Animal-Health-Reports-Fourth-Quarter-and-Full-Year-2023-Results/default.aspx

2.5.7 Recommendations for use from organisations and specialist agencies

2.5.7.1 ESCCAP – Private European association

The European Scientific Counsel Companion Animal Parasites (ESCCAP) is a **private association** founded in 2006 **and based in England**. It is financed by manufacturers of synthetic antiparasitic drugs (e.g. MSD, Elanco, Boehringer, etc.).

Since 2023, ESCCAP Switzerland has been an independent association that describes itself as independent of the sponsors listed on its own website.

Sponsors of **ESCCAP** Switzerland "Partners" (status 12/24)	Boehringer Ingelheim, Elanco, MSD Animal Health, vetoquinol, Virbac Santé Animale, zoetis
	https://www.esccap.ch/ueber-esccap/unsere-partner/

Swiss authorities and organisations work with this private association to develop their recommendations.

ESCCAP guidelines

ESCCAP offers guidelines[20] and, for example, a parasite test[21] , which in fact always leads to a recommendation for year-round prophylaxis. The **guidelines** are geared **towards Europe** and do not specifically address the situation in Switzerland. Even with a moderate risk of infestation (e.g. animals with regular outdoor access, which effectively applies to every dog), the guidelines recommend either regular use or even year-round application of ectoparasite treatments.

From a Swiss perspective, this is incorrect, as we have different climatic conditions. Particularly at higher altitudes or in winter, such recommendations lead to unnecessary administration of ectoparasiticides:

Example: Dog owner in JUF GR receives incorrect treatment instructions from ESCCAP

A dog owner in Juf (GR) who has a hunting dog that gets regular exercise would be advised to use tick prophylaxis all year round after consulting the ESCCAP recommendations. This would incur significant costs and expose the creek Mülibach, dog, herself and her unborn children to unnecessary risk. **There are no ticks in Juf (2300 metres above sea level).**

Amendment to the Therapeutic Products Act – opposition from ESCCAP

ESCCAP participates in Swiss consultations and represents the interests of pharmaceutical companies in the field of parasite control. An amendment to the Therapeutic Products Act (Federal Act on Medicinal Products and Medical Devices (Therapeutic Products Act, HMG)) was submitted by the FOPH for consultation[22] ; this amendment would impose stricter regulations on parasite control products. ESCCAP CH explicit opposed the tightening of regulations[23]

[20] Guideline 3, Ectoparasites, Sheet 11, Page 21 https://www.esccap.ch/demo/wp-content/uploads/2022/02/ESCCAP-CH_GL3_Ekto_rev_d_def_180222.pdf
[21] https://www.esccap.ch/ektoparasitentest/
[22] https://www.bag.admin.ch/bag/de/home/medizin-und-forschung/heilmittel/revision-hmg-2023.html
[23] https://www.esccap.ch/demo/wp-content/uploads/2024/03/ESCCAP-CH_Politik_Revision-HMG_VL_def_140324.pdf

2.5.7.2 CNRT: Swiss National Reference Centre for Ticks and Tick-borne Diseases

In August 2009, the FOPH entrusted the University of Neuchâtel with the task of enabling better monitoring of the relevant diseases and optimising laboratory diagnostics. The activity focuses on diseases in humans.

The **CNRT** comprises four institutes: the Institute of Biology at the University of Neuchâtel, the ADMED microbiological laboratory in La Chaux-de-Fonds, the Central Institute of Valais Hospitals in Sion (ICHV) and the Swiss Centre for Fauna Cartography in Neuchâtel.
Unlike ESCCAP, the CRNT provides **differentiated Swiss information**, regionalises tick occurrence and points out that the **tick season** is **only from March to November**[24] .

Information platform: **Swissticks**

2.5.8 False promises of salvation

The main selling point for pet insecticides is "tick prevention".

This promise of a cure is false, because the most common ingredients (fipronil[25] , imidacloprid[26]) only kill ticks 24 to 48 hours after the bite – at a time when potential disease carriers have long since entered the pet.

However, parasitologist Dr Kroeber puts this into perspective as follows:

"*It is true that viruses (e.g. tick-borne encephalitis, early summer meningoencephalitis, TBE) are usually transmitted immediately. However, dogs and cats rarely fall ill with viruses transmitted by ticks. Among the veterinary pathogens transmitted by ticks are mainly protozoan pathogens such as Babesia, as well as bacteria, which, however, take several hours after the tick bite to be transmitted.*

Most tick-borne cellular pathogens are not transmitted immediately. The time window before transmission is 24–48 hours for anaplasmosis, < 24 hours for ehrlichiosis, at least 36–54 hours for babesia and 12–16 hours for borrelia.

According to recent findings, rickettsiae could be transmitted immediately after the tick bite, as they do not require a reactivation period. This was investigated for Rickettsia rickettsii in a guinea pig model (Levin et al., 2020).

Author's comment:

This statement does not contradict the basic thesis that repellents are more effective. Their scent deters ticks from attacking a host very effectively.
(*The FOPH recommends repellents against ticks for human protection*).

The main pathogens are not killed quickly enough with these insecticides. Combinations with fast-acting insecticides are better.

However, it is always quicker to check and brush the animal after a walk and remove any ticks mechanically (tick tweezers).

Natural repellents have been proven to be effective and are better than insecticides for preventing tick infestation

In addition, dogs can be vaccinated against Borrelia and Babesia.

[24] https://swissticks.ch/de/zecken/
[25] https://de.wikipedia.org/wiki/Fipronil
[26] https://www.vetpharm.uzh.ch/tak/06000000/00062811.01

2.5.9 Application quantities

The exact application amount in Switzerland is not known but is likely to be relevant for over 0.54 million dogs and 1.85 million cats[27] . Although exact sales figures for Switzerland are not available, a rough estimate is possible.

In the United Kingdom, a report estimates that around 80% of animals are treated for fleas and ticks[28] .

2.5.9.1 Estimate for Switzerland

Assuming that only 30% of all pets (dogs/cats) in Switzerland are regularly treated with ectoparasiticides containing fipronil or imidacloprid, this results in a quantity of over **330 kg of fipronil** or approx. **420 kg of imidacloprid** per year (**pure substance**) entering households and, secondarily, the environment.

These quantities are comparable to studies from the United Kingdom[29] .

2.5.9.2 Illustration of quantities

The **quantity** of insecticides brought into households in this way would be sufficient to treat **6,700 hectares** of potatoes with **fipronil** against wireworms or almost **12,000 hectares** of apple crops with **imidacloprid** against aphids and leaf miners, i.e. a total of around **5% of Switzerland's arable land** with these insecticides, which are actually banned. (Quantity calculation checked by the Swiss Farmers' Association on 23 February 2025).

[27] https://www.vhn.ch/de/statistiken
[28] https://www.eastsuffolk.gov.uk/assets/Planning/Rendlesham/Folder-9/9.12-PDSA-Animal-Wellbeing-PAW-Report-2019.pdf
[29] Potential role of veterinary flea products in widespread pesticide contamination of English rivers https://www.sciencedirect.com/science/article/abs/pii/S0048969720370911

2.6 Risk to treated animals and humans / toxicity to humans/animals

When spot-on ectoparasiticides are applied, insecticide solutions are dripped onto the skin and spread over the skin and coat of the animal. In flea collars, the active ingredients are incorporated into a matrix and released continuously from it. In these cases, contact toxicity is relevant. When using sprays, particular attention must also be paid to toxicity during respiration.

A particular concern with the prophylactic use of insecticides on pets is the fact that the **products** remain **in the household for long periods of time**, meaning that residents, including pregnant women and children (who may stroke the animals or come into contact with insecticides in carpets, furniture or possibly beds), have **long-term, direct contact with the insecticide**.

The most common ingredients, fipronil and imidacloprid, have been investigated in various studies.

While older studies point to the low acute toxicity of these active ingredients, more recent studies clearly warn of their chronic **toxicity**.
Metabolites are often significantly **more toxic** than the parent substances.

Recent studies also show that the chronic toxicity of many pesticides is generally underestimated due to shortcomings in the experimental design[30] .

The most common immediate reaction to all topically (superficially) applied ectoparasiticides is **skin inflammation**. This affects both the animals treated and **humans** during application. It is partly due to the properties of the active ingredients used (14.3 Manufacturers' safety data sheets), but can also be seen as a reaction to the carriers/solvents.

2.6.1 Fipronil[31][32][33]

Active ingredient group: phenylpyrazole, LD_{50} 97 mg/kg

2.6.1.1 Mechanisms of action/metabolites

- Fipronil blocks GABA-gated chloride channels in the central nervous system. The disruption of GABA receptors by fipronil prevents the uptake of chloride ions, leading to excessive neuronal stimulation and death of the target insect. [5,6,7]
- Fipronil has a different binding affinity for GABAA receptor subunits, with a higher binding affinity for insect receptor complexes than for mammalian complexes. The lower binding affinity for mammalian receptors increases selectivity for insects and increases the margin of safety for humans and animals.[5,6,8,9]
- Fipronil sulphone, the primary biological metabolite of fipronil, is said to be twenty times more active on mammalian chloride channels than on insect chloride channels.[10] Fipronil sulphone is said to block GABA-gated chloride channels in vertebrates six times more strongly than fipronil, but has a similar toxicity to the parent compound in mammals.[8]
- Fipronil desulfinyl, the primary environmental metabolite (photoproduct) of fipronil, is 9–10 times more active at the chloride channel of mammals than the parent compound, reducing the selectivity between insects and humans when exposed to this metabolite. [8,11]

[30] An analysis of the use of historical control data in the assessment of regulatory pesticide toxicity studies https://www.sciencedirect.com/science/article/pii/S027323002400165X
[31] Fipronil https://en.wikipedia.org/wiki/Fipronil
[32] National Pesticide Information Centre, USA: Fipronil technical sheet (partially outdated) http://npic.orst.edu/factsheets/archive/fiptech.html

[33] Veterinary Toxicology (Third Edition) Ch 42, Fipronil https://www.sciencedirect.com/science/article/abs/pii/B9780128114100000428

2.6.1.2 Toxicity of fipronil

In 2026, scientific data classified fipronil as significantly more acutely toxic than DDT, especially for beneficial organisms such as honey bees and certain aquatic organisms. While DDT is known for its long persistence in the environment and bioaccumulation, fipronil is much more "effective" in terms of volume.

1. Toxicity to insects

Fipronil is many times more lethal to insects than DDT.

Honeybees: Fipronil is estimated to be more than 6,000 times more toxic than DDT when it has an acute effect. A single standard flea treatment for a medium-sized dog contains enough fipronil to potentially kill millions of bees if it enters the environment directly.

Mode of action: It is a systemic insecticide, meaning it can penetrate an entire plant or organism, so even small residues can be highly effective in disrupting the central nervous system of pests.

2. Toxicity to aquatic organisms and birds

- **Fish**: Fipronil is **highly to very highly toxic** to many fish species (e.g. LC50 of 0.083 mg/l for bluefin sunfish). DDT is also toxic to fish, but fipronil poses a more immediate threat at much lower concentrations in water.
- **Birds**: Fipronil is highly toxic to certain wild birds such as quails and pheasants (LD50 ~11 mg/kg).

2.6.1.3 Toxicity to mammals and humans

Although fipronil is more toxic than DDT, it is designed to act more selectively on the nervous system of insects (GABA receptors) than on that of mammals.

Acute lethality (LD50): In rats, the oral LD50 for fipronil is approximately 95–97 mg/kg. In contrast, the oral LD50 of DDT for rats is approximately 113–250 mg/kg, making fipronil approximately 2 to 3 times more toxic to mammals at acute doses.

The potential exposure of humans to ectoparasiticides was demonstrated using fipronil (e.g. in Spot-on Frontline) as an example[34] .

The highest concentration of fipronil (589.3 +/- 205.7 ppm) was detected 24 hours after the application of Frontline and was no longer detectable in the gloves collected after 5 weeks. **Repeated exposure to such contamination may pose a risk to human health**.

In treated animals, acute poisoning occurs mainly when the products are licked off after treatment; however, like humans, they are also exposed to chronic toxic effects during long-term use (prophylactic use).

When ingested, **fipronil** has been observed to cause sweating, nausea, vomiting, headaches, abdominal pain, dizziness, restlessness, weakness and tonic-clonic convulsions. Hormonal changes were also found in animal experiments. In addition, reproductive disorders such as smaller litter size, lower body weight, fewer matings, lower fertility, lower survival rate after implantation and lower survival rate of offspring, as well as delayed physical development in young animals, were also observed. Effects on brain activity have also been demonstrated.[35]

Fipronil is suspected of causing cancer ("U.S. EPA classified fipronil as 'Group C – possible human carcinogen,' based on 'increases in thyroid follicular cell tumours in both sexes of the rat.'[12] ").

However, recent studies also describe relevant **risks** in the area of **human reproduction**.

[34] Human exposure to fipronil from dogs treated with Frontline https://pubmed.ncbi.nlm.nih.gov/12361121/
[35]Effects of Fipronil on the EEG of Long Evans Rats
https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=230786

A field study conducted among the Korean population[36] showed that the metabolite fipronil sulphone crosses the placental barrier to the human embryo and negative effects on the health of children were demonstrated.

Distribution of fipronil in humans, and adverse health outcomes of in utero fipronil sulfone exposure in newborns

"Serum fipronil sulfone was detected in a specific population of mother-neonate pairs and their matched biological fathers in a manner suggestive of regular exposure to fipronil among urban residents. The findings also suggest that serum fipronil sulfone placentally transfers to the foetus and ***affects infantile adverse health outcomes****."*

In addition, negative effects on sperm have been demonstrated[37]

In treated animals, acute poisoning occurs mainly when the products are licked off after treatment.

2.6.2 Imidacloprid[38][39]

Active ingredient group: Neonicotinoid, LD_{50} 424mg/kg

Comparatively **high amounts of imidacloprid** are used in long-acting flea collars.
Seresto ad us. vet., a collar against ectoparasites for dogs > 8 kg, contains 4.5 g of imidacloprid. This would be **enough to kill a small child** (LD_{50} 424 mg/kg).

Data from the USA show many cases of poisoning in humans, including when using ectoparasite control products for pets[40] . The authors recommend banning the unnecessary use of such active substances in the interests of human health

"Given the evidence of neurotoxicity, the EPA should use its legal authority to cancel unsafe products and unnecessary uses – including from seed treatments, and residential pet and lawncare products – to prevent further human suffering."

2.6.2.1 Mechanism of action/metabolites

- Imidacloprid is effective upon contact or ingestion.[2] It is a systemic insecticide that rapidly migrates through plant tissue after application.[2,10]
- Imidacloprid acts on various types of postsynaptic nicotinic acetylcholine receptors in the nervous system.[11,12] In insects, these receptors are only found in the central nervous system. After binding to the nicotine receptor, nerve impulses are initially released spontaneously, after which the neuron can no longer transmit signals.[13,14] Prolonged activation of the receptor is due to the fact that acetylcholinesterases cannot break down the pesticide.[12] This binding process is irreversible.[5]
- The binding affinity of imidacloprid to nicotinic receptors in mammals is much lower than that of nicotinic receptors in insects.[15] This also appears to be true for other vertebrate groups, including birds.[16,17]
- The effect of the imidacloprid degradation product desnitro-imidacloprid on the nicotinic acetylcholine receptor of nerve cells is **similar in strength to that of nicotine** and thus significantly stronger than that of imidacloprid as the parent substance[41] .

[36] Distribution of fipronil in humans, and adverse health outcomes of *in utero* fipronil sulfone exposure in newborns https://www.sciencedirect.com/science/article/abs/pii/S1438463918308575
[37] Proteomic analysis of fipronil-induced molecular defects in spermatozoa https://www.nature.com/articles/s41598-024-57876-4
[38] Imidacloprid https://de.wikipedia.org/wiki/Imidacloprid
[39] National Pesticide Information Centre, USA: Imidacloprid technical sheet (partially outdated) http://npic.orst.edu/factsheets/archive/imidacloprid.html
[40] Human acute poisoning incidents associated with neonicotinoid pesticides in the U.S. Incident Data System (IDS) database from 2018–2022 – frequency and severity show public health risks, regulatory failures https://ehjournal.biomedcentral.com/articles/10.1186/s12940-024-01139-2
[41] Acute effects of the imidacloprid metabolite desnitro-imidacloprid on human nACh receptors relevant for neuronal signalling https://link.springer.com/article/10.1007/s00204-021-03168-z

2.6.2.2 Toxicity of imidacloprid

The use of the neonicotinoid imidacloprid can cause lethargy, vomiting, diarrhoea, salivation, muscle weakness and ataxia, all of which indicate the effect of imidacloprid on nicotine receptors.

Chronic effects: Imidacloprid is thought to be an endocrine disruptor in humans with multiple negative effects (findings in animal studies): it impairs metabolic homeostasis, contributes to obesity and disrupts steroidogenesis by inhibiting cytochrome P450 (CYP) enzyme activity[42] .

Imidacloprid is toxic to reproduction in both the parental and subsequent generations. It is "weakly" mutagenic and teratogenic[43] . Studies on pregnant women have also found strong evidence of disturbances in sugar metabolism[44] . Neonicotinoids are associated with the occurrence of congenital malformations and autism spectrum disorder.

Multiple neonicotinoids in children's cerebrospinal fluid, plasma and urine

"Among pesticides, neonicotinoids (NN), which are selectively neurotoxic and bind to nicotinic acetylcholine receptors (nAChRs), are of special concern for their impacts on the environment and human health since they are the most widely used class of insecticides worldwide [6] and are ubiquitously found in the environment [7], wildlife [8], and various foods [9, 10].

*In humans, NN have been associated with **small-for-gestational-age neonates, congenital malformations, autism spectrum disorder, memory loss and finger tremor** [15,16,17,18,19]. NN toxicological studies in rodents or mammals/human cell lines have been shown to be **cytotoxic, genotoxic, hepatotoxic, haematotoxic, nephrotoxic** and potentially **immunotoxic** [20,21,22,23].*
*Among pesticides, NN definitely represent a **potential significant public-health risk**."*

Impact of imidacloprid exposure on gestational hyperglycaemia: A multi-omics analysis

*"Despite IMI's low toxicity to non-target organisms, growing evidence indicates that **chronic exposure to IMI could pose potential risks to mammals, including humans**. Studies in animals and humans are limited but have associated IMI exposure with **overweight/obesity**, **insulin resistance, liver steatosis, increased intestinal permeability, bile acid metabolism and metabolic changes** (Lu et al., 2023 2021b …). In addition, a cross-sectional study using NHANES 2015–2016 data found that IMI and its metabolite 5-hydroxy-IMI might have adverse effects on insulin and glucose homeostasis (Vuong et al., 2022).*

*... there is a stable **association** between IMI exposure and **gestational diabetes mellitus** (GDM) (Mahai et al., 2023)."*

[42] Imidacloprid as a reproductive toxicant and endocrine disruptor: investigations in laboratory animals https://pubmed.ncbi.nlm.nih.gov/29990292/
[43]https://link.springer.com/article/10.1007/s00204-021-03168-z https://de.wikipedia.org/wiki/Imidacloprid
[44] Impact of imidacloprid exposure on gestational hyperglycaemia: A multi-omics analysis https://pubmed.ncbi.nlm.nih.gov/38850706/

2.6.3 Permethrin[45]

Active ingredient group: Pyrethroid, LD_{50} 2280- 3580 mg/kg

2.6.3.1 Toxicity

Permethrin is the most widely used synthetic insecticide of type I in the pyrethroid class worldwide. It was originally assumed that permethrin had low toxicity to non-target species.

However, recent studies show that permethrin may have a **variety of toxic effects** on animals and humans, such as neurotoxic, immunotoxic, cardiotoxic, hepatotoxic, reproductive, genotoxic and haematotoxic effects, toxic effects on the digestive system and cytotoxicity.

A growing number of studies suggest that oxidative stress plays a crucial role in the various toxicities associated with permethrin[46] .

Permethrin is toxic to cats. [4][49][50] Many cats die after being treated with flea control products intended for dogs or through contact with dogs that have recently been treated with permethrin. [51] In cats, it can cause hyperexcitability, tremors, seizures and death.[52]

2.6.4 Reported damage to animals and humans

Damage to pets after use and to users is regularly reported[47] ; the US Environmental Protection Agency keeps a register.

2.6.4.1 EPA Incident Data System (IDS)

https://ordspub.epa.gov/ords/pesticides/f?p=359:1

Frontline (spot-on, fipronil, sometimes combined with S-methoprene and pyriproxyfen, depending on the product):
53,045 reported cases of harm, including 1,579 deaths in pets and 1,257 cases in humans

Seresto (flea collar, imidacloprid + flumethrin)
111,526 reported cases of harm, including 3,309 deaths in pets and 980 cases in humans

Permethrin (various products): around 74,000 cases in pets, 16,000 cases in humans

Further reading:12.4 Toxicity (human/animal) of insecticides used in ectoparasite control products

[45] Permethrin-https://en.wikipedia.org/wiki/Permethrin
[46] Permethrin-induced oxidative stress and toxicity and metabolism. A review
https://www.sciencedirect.com/science/article/abs/pii/S0013935116301621
[47] A survey for small animal veterinarians regarding flea and tick control pesticide products
https://pmc.ncbi.nlm.nih.gov/articles/PMC3174502/

2.7 Alternatives to tick control with insecticides - Repellents

Quick removal of observed ticks by manual removal is easily achievable.
Vaccinations are also available against babesiosis and borreliosis.

Repellents containing fragrances, oils and other substances are also used successfully to repel ticks.

Their effectiveness is explained by their smell or the changes in the smell of the animal/human. This prevents ticks from recognising their prey and keeps them away.

They are superior to approved veterinary medicines containing insecticides and thus also prevent ticks from entering the home.

Pet shops, major retailers and online stores sell tick repellents containing natural substances ***(see 11.9*** Repellents - Repellent examples ***).***

Products used on humans, such as Kik, Antibrumm, etc., also contain such substances.

Grosclaude, J. *(2023). Efficacy of plant-derived compound compared to ectoparasiticides: A literature review:*

p.36: "A study investigates the preventive efficacy of a natural oil mixture containing garlic oil, rapeseed oil and rosehip oil against the main tick species, Ixodes ricinus and Rhipicephalus sanguineus. The mixture ... proved that in infested treated animals, the skin irritation and inflammation caused by tick bites decreased ... The efficacy of the mixture was proven and resulted in ***100% protection*** *against tick infestation with complete safety and no report of adverse effects.*

Therefore, the application of essential oils mixture is promising against tick infestation in dogs *[cited from: Amer et. Al https://researcherslinks.com/table_contents_detail/Advances-in-Animal-and-Veterinary-Sciences/33/1383/html]."*

p.40: "Indeed, the desire for sustainable production without compromising the safety of the animals ... that ***plant-derived products*** *are promising and* ***can be used effectively*** *in the environment of companion animals or for treating heavy infestation ..."*

Further reading:12.5 ***Repellents for controlling ectoparasites***

2.8 Risk analysis/risk-oriented use of parasite control products

The interpellation is not directed against parasite treatment per se. In view of the fact that fleas and ticks, as well as their treatment with insecticides, pose a potential health risk to animals and humans, a risk analysis is recommended in which risks and opportunities are identified, quantified and compared in a risk-opportunity matrix.

2.8.1.1 Risk factors/opportunity analysis

(estimated values; values: risk: 0=none 1=low 2=medium 3=high / in the case of convenience: opportunity)

Fleas: Occurrence: present, animal-to-animal transmission necessary

Ticks: Occurrence: present, density dependent on biotope and regionalised, altitude and season dependent

Environmental risk (see2.2)

Fipronil and imidacloprid pose an immediate threat to aquatic organisms. The risk is high with long-term/prophylactic use (3) and moderate with single use (therapy) (2). Other ectoparasiticides containing insecticides also pose risks to the environment, but to a lesser extent (not clarified in detail) (1 for short-term use/2 for prophylactic use).

Repellents pose only a low/undetermined risk to the environment (0).

Risk to animal health from parasites (see2.4)

Fleas: in acute infestations, present, medium (2) see2.4.1 Flea problems in pets in Switzerland

Ticks: Switzerland; tick-borne diseases found in our country are mostly harmless (subclinical), posing only a moderate risk (2) (see chapter 2.4.2 Occurrence of tick-borne diseases in pets in Switzerland .

Risk to animal health from treatment (see2.6)

The main focus is on toxicological risks; these have little effect in the case of short-term treatment (1). In the case of prophylactic treatment, chronic toxicity is the main concern:
Estimated values: Fipronil/imidacloprid relevant/high (3) - Other insecticides: not clarified in detail; estimate (2), repellents low risk (1); however, repellents have limited effectiveness in cases of acute infestation.

Risk to humans

The overall risk to humans is composed of the possible risks posed by parasites (see2.4.3) Parasites) and those posed by the toxicity of the agents used (see2.6 .)

Ectoparasiticides reduce the risk of tick bites, but have been shown to have negative effects on human health, especially when used long-term (prophylactically) (active ingredients present in the home over a long period of time/chronic exposure of people in the household).
(with fipronil/imidacloprid: risk 3, other insecticides: not clarified in detail – risk assessment = 2)

Repellents are generally not very toxic, but in rare cases they can cause skin reactions, often due to the carrier substances (risk negligible, max. 1).

Convenience

The effort involved in applying repellents and brushing/removing ticks after a walk is greater than that involved in applying ectoparasiticides with insecticides (spot-on every 1-2 months or flea collar, depending on type, replacement after a few months).

The ease of application makes commercially available insecticide-based ectoparasiticides popular (convenience 2), whereas repellents need to be applied more frequently, depending on the product (convenience 1). However, it is even easier to do nothing where it is not necessary, especially outside the tick season or for animals vaccinated against Lyme disease and babesiosis (convenience 3).

2.8.1.2 Risk matrix

Values: Risk: 0=none 1=low 2=medium 3=high / in the case of convenience: Opportunity

	=best choice		=Worst choice

a) **Flea infestation, treatment after diagnosis, short term**

Factor/type of measure	No treatment	Repellents	Ectoparasiticides with insecticides	Ectoparasiticides with fipronil/imidacloprid
Risk to animal health from parasites	2	1	0	1
Risk to animal health from treatment	0	1	1	1
Environmental risk	0	0	1	2
Human risk	2	2	1	1
Conclusion Risk	4	4	**3**	**5**
Convenience	3	1	1	1

b) **Prophylactic treatment against flea infestation**

Factor/type of measure	No treatment	Repellents	Ectoparasiticides with insecticides	Ectoparasiticides with fipronil/imidacloprid
Risk to animal health from parasites	1	1	1	1
Animal health risk during treatment	0	1	2	2
Environmental risk	0	0	2	3
Human risk	1	0	1	2
Conclusion Risk	**2**	**2**	**5**	**8**
Convenience (opportunity)	3	1	2	2

c) **Prophylactic treatment against ticks**

Factor/type of measure	No treatment	Repellents	Ectoparasiticides with insecticides	Ectoparasiticides with fipronil/imidacloprid
Risk to animal health from parasites	2	1	1	1
Risk to animal health during treatment	0	1	2	3
Environmental risk	0	0	2	3
Human risk	2	1	2	3
Conclusion	4	**3**	**7**	**10**
Convenience (opportunity)	3	1	2	2

2.8.1.3 Conclusion Risk management

Treatment with insecticide-based ectoparasiticides is indicated in cases of proven flea infestation.

For prophylaxis, treatment with insecticide-based ectoparasiticides is generally more harmful, especially if they contain fipronil or imidacloprid, when comparing the toxic effects on humans, animals and the environment with the risks posed by parasites.
Where there is no particular risk, repellents are the best choice.

Conclusion on flea treatment

In the event of a confirmed infestation: **short-term treatment with, for example, insecticide sprays** is **appropriate** and responsible. There are various active ingredients that are less toxic than imidacloprid and fipronil. Repellents are not a good choice as they are of little or only delayed use in the event of an active infestation.

Prophylactic treatment of cats or dogs against fleas, particularly with highly toxic insecticides, is unnecessary and risky for both humans and animals. Fleas can be easily controlled when detected, provided that the treatment is carried out correctly and environmental hygiene is optimised. In addition, it should be noted that long-term use of such treatments can lead to the development of resistance, particularly in fleas.

Conclusion on tick prevention

The use of any type of prophylactic treatment is unnecessary during the winter months, as ticks are hardly active at this time. The duration of the tick-free/low-tick period varies depending on altitude and region.

The exact incidence of tick-borne diseases in pets in Switzerland is unknown. However, these are usually mild (subclinical).

No evidence has been found that veterinary medicines containing the active ingredients fipronil and imidacloprid are more effective than other products containing insecticides.

The toxic **risks** of long-term/continuous prophylactic use of insecticide-containing ectoparasiticides containing fipronil or imidacloprid **outweigh** the expected **benefits**.

Prophylactic use of insecticide-based parasite treatments may only be indicated where there are truly high risks, such as with hunting dogs, in animal shelters or when travelling abroad.

Where possible, animals should be vaccinated (babesiosis, borreliosis).

Tick repellents without insecticides are effective and **are** well **suited** for prophylactic use before a walk, even in areas with a high risk of ticks.

Note: Products used on humans, such as Kik, Antibrumm, etc., contain only such substances.

Risk minimisation for humans

The risks posed by ticks are manageable for humans if they follow the recommendations of the FOPH (appropriate clothing, use of repellents, vaccination against TBE).

To prevent ticks from entering the home, it is advisable **to use repellents** on pets, as their scent minimises the attachment of ticks. In addition, crawling ticks can be easily removed by combing.

Slow-acting ectoparasiticides containing fipronil and imidacloprid are not effective, however, as ticks only die after 24-48 hours.

Need for research

Risk-oriented use of ectoparasiticides is only possible if the actual risks are known. **Research in the field of parasitology** should therefore be intensified in order to obtain the facts necessary for targeted treatment, such as the occurrence of infected ticks and the incidence of disease cases specific to each region.
In addition, the effect of repellents needs to be clarified in a differentiated and in-depth manner.

Responsibility

In a policy paper entitled "[48] ", British veterinary professional organisations have explicitly committed themselves to the responsible use of antiparasitic drugs. In Switzerland, the ***Swiss Veterinary Association (***GST) would be **responsible** for developing the necessary **guidelines** for **the responsible use** of these drugs and informing the veterinary profession.

Overall requirement

As the appropriate and risk-appropriate use of insecticide-based ectoparasiticides requires specialist knowledge, these should only be available to veterinarians (prescription only).

[48] BVA, BSAVA and BVZS policy position on responsible use of parasiticides for cats and dogs https://www.bva.co.uk/media/4352/bva-bsava-and-bvzs-policy-position-on-responsible-use-of-parasiticides-for-cats-and-dogs.pdf

3 Legal situation regarding veterinary medicines

3.1 Legal basis in Switzerland

3.1.1 Constitutional basis

The Federal Constitution, namely the articles on environmental protection (Art. 74), water protection (Art. 76) and nature conservation (Art. 78), which apply to all areas of law, require protective provisions in the respective legislation. Art. 118 requires that regulations be enacted on the handling of foodstuffs, medicinal products, narcotics, organisms, chemicals and objects that may pose a risk to health.

3.1.2 Veterinary medicine law

Veterinary medicine law is regulated by the Therapeutic Products Act ([49] , SR 812.21) and the Medicinal Products Ordinance ([50] , 812.212.21).

Under the Therapeutic Products Act, approvals may be reviewed or revoked at any time if risks to human and animal health are identified:

Art. *16c*[71] Review of approval

The Institute may review the approval at any time; it may adapt the approval to changed circumstances or revoke it.

Swissmedic writes:

"According to Art. 16c of the Therapeutic Products Act (TPA, SR 812.21), 'The Institute may review the approval at any time; it may adapt the approval to changed circumstances or revoke it.'

However, as you also mention, such a review requires "newly proven" risks. This can be either a report to Swissmedic (via pharmacovigilance), a new evaluation by a foreign authority (e.g. also so-called referral procedures of the EU) or a newly discovered risk within the framework of an internal procedure. The identification of a new risk triggers a signal procedure in which the appropriate measures are identified and implemented."

According to Art. 28 VAM, marketing approval holders are also obliged to "continuously and unsolicitedly adapt the medicinal product information to the current state of science and technology as well as to new events and assessments".

However, both the law and the ordinance fail to mention in their purpose clauses that veterinary medicinal products must not pose a threat to the environment, biodiversity or water bodies. Such protective provisions are also lacking in the other provisions of the law and the ordinance.

The only provision on veterinary medicinal products in the Medicinal Products Ordinance that establishes a link to environmental concerns can be found in Art. 81.

Art. 81 Involvement of the Federal Office for the Environment[51]

[1]***Before*** *an active substance is approved* ***for the first time*** *as a component of a veterinary medicinal product, the* ***approval*** *of the Federal Office for the Environment (****FOEN****) must be obtained. In other cases, the FOEN must be consulted in cases of particular environmental relevance or at its request.*

[49] Therapeutic Products Act (HMG) https://www.fedlex.admin.ch/eli/cc/2001/422/de
[50] Medicinal Products Ordinance (VAM) https://www.fedlex.admin.ch/eli/cc/2018/588/de
[51] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on Medicinal Products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* as Art. 44a by Annex 5 No. 1 of the Release Ordinance of 10 September 2008, in force since 1 October 2008 (AS 2008 4377)

3.1.3 Environmental protection law

Under the current **Water Protection Act (GSchG)**, it is mandatory to prevent water pollution:

Art. 6 Principle

1 It is prohibited to discharge substances that may pollute water directly or indirectly into a body of water or to allow them to seep into the ground.

2 It is also prohibited to deposit or spread such substances outside a body of water if this creates a concrete risk of water pollution.

Art. 9 Federal Council regulations on the discharge and seepage of substances

1 *The Federal Council shall lay down the requirements for the water quality of surface and groundwater.*

2 *It shall issue regulations on:*
a. the discharge of waste water into water bodies;
b. the infiltration of wastewater;
c. substances which, due to their nature, may enter water and which, due to their properties or consumption quantities, may pollute water bodies or be harmful to the operation of wastewater treatment plants.

Approvals for substances harmful to water must be reviewed:

3 *An approval for plant protection products and biocidal products (pesticides) must be reviewed if:*
b) the ecotoxicologically justified limit values for pesticides are repeatedly and widely exceeded in surface waters.

.....

5 *If it is not possible to ensure compliance with the limit values through application requirements, the **approval** of the pesticides in question or, in the case of plant protection products, the approval of the active substance must be **withdrawn**.*

However, **medicinal products** are **not** explicitly mentioned here!

According to **Art. 48** of the Water Protection Act, the federal authority that enforces another federal law or an international treaty is also responsible for enforcing the Water Protection Act in the fulfilment of this task. In this case, enforcement is carried out by the authority that enforces the Therapeutic Products Act, i.e. Swissmedic.

3.1.4 Plant protection product law

Plant protection product law (916.161 Ordinance on the Placing of Plant Protection Products on the Market (Plant Protection Products Ordinance, PSMV)) contains **clear environmental requirements** regarding the permissible risk to water bodies.

Fipronil, imidacloprid and permethrin did not meet the requirements and were therefore banned.

Plant protection product legislation also requires existing approvals to be reviewed[52] .

[52] Article 8 of the Plant Protection Products Ordinance https://www.fedlex.admin.ch/eli/cc/2010/340/de#art_8

3.2 Legal basis at EU level

EU legal bases **require** an **environmental impact assessment for veterinary medicines**.

Unfortunately, **exceptions** have been made **for pet medicines up to now**.

3.2.1.1 Legal basis in detail

Regulation (EC) No 726/2004 and REGULATION (EU) 2019/6 contain provisions on the consideration of environmental effects in the benefit-risk assessment of veterinary medicinal products and on the data requirements relating to these effects. An environmental risk assessment is therefore mandatory for all new applications.

REGULATION (EU) 2019/6

Article 37 ***Decisions to refuse approvals***

An approval shall be refused if any of the following reasons apply:

i) The risks to public or animal health or to the environment are not adequately taken into account.

Article 72

Environmental protection documentation and environmental risk assessment for certain veterinary medicinal products

The list referred to in Article 70(1) shall ***not*** *include* ***any reference veterinary medicinal products*** *approved* ***before 1 October 2005*** *which are considered to be potentially harmful to the environment and which have* ***not*** *been subject to* ***an environmental risk assessment****.*

If the reference veterinary medicinal product was approved before 1 October 2005 and is considered to be potentially harmful to the environment and has not been subject to an environmental risk assessment, the competent authority shall require the marketing approval holder to update the relevant environmental protection documentation referred to in Article 8(1)(b), taking into account the review referred to in Article 156 and, where applicable, the environmental risk assessment of the generic veterinary medicinal products of such reference veterinary medicinal products.

Article 103

Pursuant to Article 103, Member States may **lay down conditions** for the retail distribution of veterinary medicinal products on their territory which are justified on grounds of the protection of public and animal health or the protection of the environment, provided that these conditions comply with Union law and are proportionate and non-discriminatory.

Article 129

According to Article 129 of REGULATION (EU) 2019/6, temporary **safety restrictions** may be imposed at any time in the event of a **risk** to public **health**, **animal health** or the **environment** that requires immediate action.

3.2.2 EMA environmental risk assessment (ERA) procedure[53]

"European legislation requires all veterinary medicines to undergo an environmental risk assessment (ERA) based on their expected use. The ERA is an evaluation of the possible hazards to the environment posed by a veterinary medicine.

The basic requirements are supplemented by very detailed requirements for environmental risk assessment ([54]). A specific guideline for aquatic toxic risks exists[55]

3.2.3 Exceptions for medicines for pets – no environmental assessment!

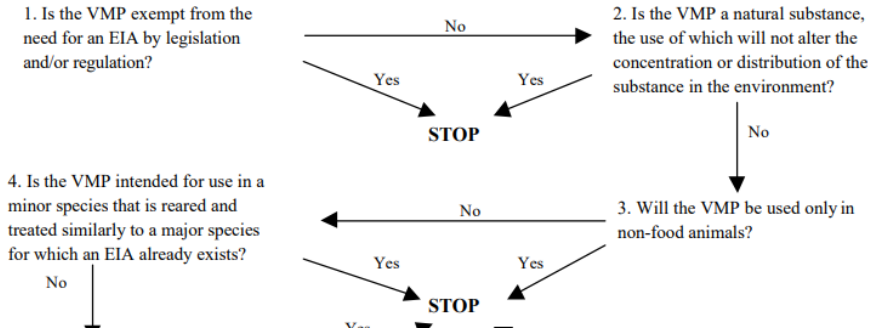
The checks have been simplified in the case of ectoparasiticides for pets in previously applicable guidelines; no environmental risk assessment (ERA) is required.
This is justified by a lower risk to the environment, assuming that fewer animals are treated and therefore less medicine is used overall (EMA/VICH, 2000).

In the European Union (EU) and the European Economic Area (EEA), the environmental risk assessment (ERA) of veterinary medicinal products is tiered and carried out in two phases.

Phase I consists mainly of a decision tree that focuses on qualitative and quantitative criteria to determine whether the ERA for a veterinary medicinal product should proceed to a higher-tier assessment (i.e. Phase II) or whether it can end in the first phase.

For animals not used for food production (pets), this decision tree ends in phase 1 – phase 2, which would include an environmental impact assessment, is not addressed, and the EIA is thus omitted.

Figure 1. Phase I Decision Tree



For pets, drug testing ends very early – **before an environmental assessment.**

Therefore, veterinary medicinal products intended for cats and dogs, for example, have not generally required a Phase II environmental impact assessment to date.

Around two-thirds of all products approved by 2020 did not enter a Phase II ERA because they were intended for use in pets[56] .

The legal basis for this exemption in the overarching EU legislation could not be found.

[53] **Environmental risk assessment (ERA):** https://www.ema.europa.eu/en/veterinary-regulatory-overview/marketing-authorisation-veterinary-medicines/environmental-risk-assessment-veterinary-medicines
[54] **Guideline on environmental impact assessment for veterinary medicinal products in support of the VICH guidelines GL6 and GL38** https://www.ema.europa.eu/en/documents/scientific-guideline/guideline-environmental-impact-assessment-veterinary-medicinal-products-support-vich-guidelines-gl6-and-gl38_en.pdf
[55] https://www.ema.europa.eu/system/files/documents/scientific-guideline/gl-assessing-risk-vmps-groundwater_en.pdf
[56] Regulatory review of the environmental risk assessment of veterinary medicinal products in the European Union, with particular focus on the centralised authorisation procedure
https://enveurope.springeropen.com/articles/10.1186/s12302-020-00374-x

3.2.4 Rethinking in the EU – environmental assessments also required for pet products

However, the document "Reflection paper on the environmental risk assessment of ectoparasiticidal veterinary medicinal products used in cats and dogs[57] " sets out considerations regarding the environmental assessment of parasite control products for pets.

"*VICH GL6 (EMA/VICH, 2000) considers these risks to be negligible due to the small amounts used on each individual animal. However, due to the increase in pet populations and changes in how they are kept, this assumption may no longer be appropriate*."

In particular, it points out that the environmental risks may be relevant for surface waters. It is proposed that VICH GL6 (EMA/VICH, 2000) be reviewed to determine whether the current standard approach of stopping the ERA after a Phase I assessment is still appropriate.

3.2.5 EU legal basis for suspending existing approvals for veterinary medicinal products containing the active substances fipronil and imidacloprid

Approvals may be suspended at national level if newly identified risks to the environment, human health and animal health become apparent.

Regulation (EC) No 726/2004, Article 45

(4) Where urgent action is necessary to protect human or animal health or the environment, a Member State may, on its own initiative or at the request of the Commission, suspend the use of a veterinary medicinal product approved in accordance with this Regulation on its territory.

Where active substances were approved before 2005, Article 72 of REGULATION (EU) 2019/6 shall apply in order to require the marketing approval holder to submit the necessary environmental protection documentation.

[57] 20 November 2023 EMA/CVMP/ERA/31905/2021 Committee for Veterinary Medicinal Products (CVMP) Reflection paper on the environmental risk assessment of ectoparasiticidal veterinary medicinal products used in cats and dogs https://www.ema.europa.eu/en/documents/scientific-guideline/reflection-paper-environmental-risk-assessment-ectoparasiticidal-veterinary-medicinal-products-used-cats-and-dogs_en.pdf

3.3 Legal comparisons / necessary legal adjustments

3.3.1 Analysis Switzerland: Medicinal products legislation versus plant protection products legislation - applying double standards

Based on plant protection legislation, which contains clear environmental requirements, including permissible risks to water bodies, and also requires reviews[58] , fipronil, imidacloprid and permethrin have been banned.

In contrast, these insecticides are still approved for use in veterinary medicines for an unlimited period.

The discrepancy is obvious: very high requirements for plant protection products, review and revocation of existing approvals – no reviews for the same active substances in the field of veterinary medicines.

The approval of veterinary medicines is regulated by the Therapeutic Products Act and the Medicines Ordinance (VAM).

Both the **Act** and the Ordinance **fail to stipulate in their purpose clauses** that **medicinal products must not pose a threat to the environment**, biodiversity or water bodies. Such protective provisions are also largely absent from the other provisions of the Act and the Ordinance.

The provision concerning the necessity of an environmental impact assessment in Art. 81 VAM has only been in force since 1 October 2008. Earlier approvals were not reviewed.

For a new approval of veterinary medicinal products, the **FOEN** must **give** its **approval** and be consulted on other enforcement matters (Art. 81 VAM[59]).

The aforementioned **requirement for approval by the FOEN** is of no help because there is a lack of **substantive, specifically formulated environmental, nature and water protection regulations for veterinary medicinal products**.

Unlike with PPPs, there is also **no periodic review** after approval, even though there is now **solid** scientific evidence on the toxicity of these active substances to humans and the environment.

The active ingredients in ectoparasiticides for pets have been approved for years (fipronil 1995/imidacloprid 1997/permethrin 1985) without restriction or review, and there has **never** been an **environmental assessment**.

Swissmedic justifies this situation by stating that the **active ingredients** were **approved before** Art. 81 VAM (2008) **came into force**.

The **law on medicinal products** and its **implementation in the area of ectoparasiticides** for pets thus **violates the Federal Constitution**, namely the article on environmental protection (Art. 74), the article on water protection (Art. 76) and the article on nature conservation (Art. 78), which apply to all areas of law and require effective protective provisions in the respective legislation.

Environmental protection is a **cross-cutting task**; the relevant constitutional article refers to all areas of law and products, including veterinary medicine law.

[58] Article 8 Plant Protection Products Ordinance https://www.fedlex.admin.ch/eli/cc/2010/340/de#art_8

[59] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on Medicinal Products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* as Art. 44a by Annex 5 No. 1 of the Release Ordinance of 10 September 2008, in force since 1 October 2008 (AS 2008 4377)

3.3.2 Comparison of veterinary medicine law and plant protection product law

Table 1: Protection of aquatic animals in the approval of products	
Veterinary medicine law	**Plant protection product law**
FOEN approval only for initial approval Art. 81 Medicinal Products Ordinance (**not implemented** for **fipronil/imidacloprid)** Testing procedures with regard to the environment/water bodies not legally defined The FOEN must be consulted "in other enforcement cases or in cases of particular environmental relevance**": unclear – not very effective** Approval reviews possible in accordance with Art. 16c HMG; criteria include health risks but not environmental hazards	The following requirements apply to the protection of aquatic animals when approving plant protection products: **"Annex 9CI-2.5.2.2 Plant Protection Products Ordinance[60] , SR916.161 (Risks to aquatic organisms):** 1 If there is a possibility of exposure of aquatic organisms, approval shall not be granted if: a. the ratio between toxicity and exposure[61] for fish and Daphnia is less than 100 for acute exposure and less than 10 for long-term exposure; b. the ratio between inhibition of algae growth and exposure is less than 10; c. the highest bioconcentration factor (BCF) for plant protection products containing readily biodegradable active substances is greater than 1000 and for plant protection products containing other active substances is greater than 100. 2 Approval may nevertheless be granted if an appropriate risk assessment provides practical evidence that the use of the plant protection product under the proposed conditions will not have an unacceptable impact on the viability of the species directly and indirectly (predators) exposed. Approval review possible at any time: **Art. 8** Review of approved active substances by the approval body
Active substances **approved** for years **without restriction or review** **(Fipronil 1995/ Imidacloprid 1997/ Permethrin 1985)**	**Fipronil:** Active substance withdrawal: 1 August 2019; sell-out period: none, as no plant protection products containing fipronil were approved in Switzerland at that time. The last product containing fipronil was withdrawn on 11 April 2013 (sell-out period: 11 April 2013, use-by date: 11 April 2014) **Imidacloprid:** Active substance withdrawal: 1 July 2021 Sell-out period: 31 December 2021 Use period: 1 June 2022 **Permethrin:** Active substance withdrawal: 1 January 2007 Sell-out period: 31 December 2008 Use period: n/a

[60] **Plant Protection Products Ordinance (PSMV) https://www.fedlex.admin.ch/eli/cc/2010/340/de**

[61] **Annex 9 PSMV 9CI-2.5.2.2Risks to aquatic organisms** https://www.fedlex.admin.ch/eli/cc/2010/340/de#annex_9/part_I/lvl_u3/lvl_d4e260/lvl_u39

Assessment criteria: 9BI-2.5.2.2Risks to aquatic organisms Para. 3 lit. b and d:

"The toxicity/exposure ratio (TER_{acute}) is defined as the quotient of acute LC50 or EC50 and predicted short-term concentration in the environment."

"The long-term toxicity/exposure ratio ($TER_{chronic}$) is defined as the quotient of NOEC and predicted long-term concentration in the environment."

3.3.2.1 Comments on Art. 81 VAM

There is a crucial difference between paragraphs 1 and 2 of Art. 81 of the Medicinal Products Ordinance:

Art. 81 Involvement of the Federal Office for the Environment

1 *Before an active substance is approved for the first time as a component of a veterinary medicinal product, the approval of the Federal Office for the Environment (FOEN) must be obtained. In other cases, the FOEN must be consulted in cases of particular environmental relevance or at its request.*

2 Before an active substance is approved for the first time as a component of a medicinal product for human use, the environmental risks must be assessed. The assessment shall be based on the EMA guideline of 1 June 2006 on the assessment of the environmental risk of medicinal products for human use. The FOEN shall be consulted in cases of particular environmental relevance or at its request.

In the EU, the EMA Guideline on environmental impact assessment for veterinary medicinal products in support of the VICH guidelines GL6 and GL38 of 1 March 2009 applies[62]

However, this guideline is not mentioned in Art. 81 para. 1 of the Medicinal Products Ordinance, although it is mentioned for human medicinal products.

The EMA Guideline **makes an exception** specifically **for veterinary medicinal products for pets**. Based on the questionable (and, in the case of ectoparasiticides, incorrect) assumption that veterinary medicinal products for pets are not relevant to the environment due to their quantity, the approval process is terminated at phase 1, meaning that **no environmental assessment** is carried out.

Swiss legislation currently goes further than EU regulations, which do not provide for environmental assessments for pet medicines, whereas Swiss legislation does.

However, discussions are underway in the EU to amend the relevant directive, as the problem of environmental hazards posed by ectoparasiticides for pets has been recognised[63] .

3.3.2.2 Switzerland: EIA only for new approvals

The reference in Art. 81[64] of the Medicines Ordinance requires environmental impact assessments, but **only** applies to **"new" approvals**. This is incorrect because no environmental assessment was carried out for any approvals prior to its entry into force (2008). This contrasts with the Plant Protection Products Ordinance, which requires post-approval reviews.[65]

3.3.2.3 EU: EIA also possible for already approved active substances

In the EU, Article 72 of Regulation (EU) 2019/6 applies to active substances approved before 2005. This means that the approval holder can be required to submit the necessary environmental protection documentation immediately.

[62] ***EMA Guideline on environmental impact assessment for veterinary medicinal products in support of the VICH guidelines GL6 and GL38*** *of 1 March 2009* *https://www.ema.europa.eu/en/documents/scientific-guideline/guideline-environmental-impact-assessment-veterinary-medicinal-products-support-vich-guidelines-gl6-and-gl38_en.pdf*

[63] 20 November 2023 EMA/CVMP/ERA/31905/2021 Committee for Veterinary Medicinal Products (CVMP) Reflection paper on the environmental risk assessment of ectoparasiticidal veterinary medicinal products used in cats and dogs https://www.ema.europa.eu/en/documents/scientific-guideline/reflection-paper-environmental-risk-assessment-ectoparasiticidal-veterinary-medicinal-products-used-cats-and-dogs_en.pdf

[64] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on medicinal products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* as Art. 44a by Annex 5 No. 1 of the Release Ordinance of 10 Sept. 2008, in force since 1 Oct. 2008 (AS 2008 4377)

[65] Art. 8 Plant Protection Products Ordinance https://www.fedlex.admin.ch/eli/cc/2010/340/de#art_8

3.3.3 Conclusion 1: Requirements in Switzerland – implementation within the existing legal framework

3.3.3.1 Review, adapt and revoke approvals

In Switzerland, approvals may be reviewed or revoked at any time in accordance with the Therapeutic Products Act if risks to human and animal health are identified:

Art. *16c*[71] Review of approval

The Institute may review the approval at any time; it may adapt the approval to changed circumstances or revoke it.

As relevant health risks have been identified in the case of the ectoparasiticides under consideration, an immediate review of the approval is necessary and revocation should be considered.

In **general**, **all medicinal products** that have been **approved for a long time** (approval before 2008) should be **reviewed**. The EU also provides a legal basis for revoking existing approvals for veterinary medicinal products on health and environmental grounds[66] :

This is very important in terms of the environment (EIA, if one has not yet been carried out) and also in terms of human health, as toxicological research is much more advanced than it was when these medicines were approved, and should definitely be enforced.

3.3.3.2 Change in dispensing category

In view of the dangers to humans and animals, the use of ectoparasiticides containing insecticides must be preceded by a risk analysis *(see2.8 Risk analysis/risk-oriented use of parasite* control products *).* Only a veterinary specialist can provide the necessary expertise.

All ectoparasiticides containing insecticides should therefore be classified as **Category B (available on medical or veterinary prescription)**.

3.3.3.3 Apply the Water Protection Act

Art. 9 GSchG obliges the Federal Council to issue regulations on substances if they pollute water "due to their properties or the quantity consumed". These conditions are clearly met in this case. The Federal Council must therefore correctly issue regulations, for example in the Water Protection Ordinance, requiring the withdrawal of the use of fipronil, imidacloprid and also permethrin as veterinary medicines.

According to Art. 48 GSchG, enforcement is the responsibility of the authority that enforces the Therapeutic Products Act, i.e. Swissmedic must then review/revoke the approvals.

3.3.3.4 Influence on the EU/EMA – subsequent amendment to Art. 81 VAM

Switzerland is represented in the EMA's expert committees. It should exert its influence there to ensure that environmental concerns are also given sufficient consideration in the case of veterinary medicinal products for pets.

After that, at least **Art. 81 VAM para. 1** could be **amended** and, like para. 2, **refer** to the relevant **EMA guideline**:

[66] ***Regulation (EC) No. 726/2004*** ***Article 45***

(4) Where urgent action is necessary to protect human or animal health or the environment, a Member State may, on its own initiative or at the request of the Commission, suspend the use of a veterinary medicinal product authorised in accordance with this Regulation within its territory.

3.3.4 Conclusion 2: Amendments to Swiss law necessary

EU legislation is, in principle, very strong in the area of environmental testing requirements for veterinary medicinal products and provides very detailed guidelines in this regard. It provides a legal basis for suspending existing approvals for veterinary medicinal products on environmental grounds, as well as the possibility of requiring marketing approval holders of active substances approved before 2005 to submit environmental documentation.

These global legal principles are less clear in Swiss legislation.

Medicines legislation should be adapted globally to be equivalent to EU legislation **in** order to **take sufficient** account **of environmental risks in the approval process**.

In particular, amendments are needed **to the purpose clauses of the Therapeutic Products Act and water protection legislation** in order to address the **environmental risk posed by medicinal products**.

In the case of veterinary medicinal products containing the same active substances as plant protection products, it should be adapted to ensure that **environmental impact assessments** (EIA) are also mandatory for veterinary medicinal products, at least **in** accordance **with standards equivalent to those for plant protection products**.

It must be ensured that **existing approvals are** also **subject to** comprehensive **review**.

In the EU, active substances approved before 2005 may be used in accordance with Article 72 of REGULATION (EU) 2019/6 to require the approval holder to submit the necessary environmental protection documentation without delay.

This legal provision is lacking in Switzerland.

Where no **environmental impact assessments** have been carried out to date, these must **be requested immediately**.

It can be assumed that EIAs will lead to the same results as in agriculture.

3.3.5 Systemic problem – human medicines without environmental assessment

It can be assumed that no **environmental impact assessment (EIA)** was ever carried out for any medicinal products approved before 2008. The approval requirements were much simpler.

Human medicines also pollute waterways. A report by the OECD[67] describes the risks as significant and calls for action. Problems are known to exist with painkillers, antibiotics, anti-epileptics and hormones, for example.[68]

3.3.6 Outlook: Further development of EU legislation in the field of medicinal products

The EU has recognised the problem. A ***proposal*** has been presented to amend the applicable EU regulations, in which Articles 22-24 tighten the requirements for environmental risk assessments (ERA) in the context of the approval of medicinal products.

Article 23 makes an **environmental risk assessment (ERA) mandatory** for all **medicinal products** approved **before 30 October 2005**[69].

Pharmaceutical companies are to be required to assess and limit potentially adverse effects on the environment and public health.

[67] OECD Report **Pharmaceutical Residues in Freshwater** https://www.oecd.org/en/publications/pharmaceutical-residues-in-freshwater_c936f42d-en.html

[68] https://www.umweltbundesamt.de/sites/default/files/medien/3521/bilder/dateien/toxizitaet-arzneistoffe-wasserorganismen-lange-tabelle-uba2024.pdf

[69] ***Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the establishment of a Union code relating to medicinal products for human use and repealing Directive 2001/83/EC and Directive 2009/35/EC*** ***Articles 22-24: Environmental impact assessment***

3.3.7 Regulatory impact assessment

Withdrawing the approval of veterinary medicines and biocides containing fipronil, imidacloprid and permethrin would have **no negative impact** on **animal health or human risk**.

There are sufficient **other effective active substances** (veterinary medicinal products and repellents) that **fulfil the** same **purpose** just as well or even better.

From an economic point of view, no lasting damage is to be expected for the pharmaceutical industry either, as the sales volume will be distributed among the remaining products.

In addition, the patent protection for older medicines has often expired, which means that such medicines can be copied at will and their even lower yield cannot be used to finance innovation.

If all insecticide-based ectoparasite treatments were to be made **prescription-only**, their market volume could potentially decline, but this could be offset by overall **gains for the environment** and **human health** (elimination of chronic exposure).
In addition, manufacturers of alternative effective products would benefit accordingly.

The position of veterinarians would be **strengthened** by the obligation to carry out a risk assessment.

The general **introduction of environmental considerations into the purpose clauses of drug legislation** would primarily be a **correction of the legal system** and an adaptation to the applicable law of our neighbouring countries.

Requiring and reviewing environmental impact assessments, even for medicines that were **approved before 1 October 2008** and do not yet have an EIA, would be **costly**, but would finally level the playing field for new and older medicines.

4 Fact collection/proposed measures

4.1.1 Collection of facts

Based on the information gathered, the following can be concluded:

1. A significant **decline in insect populations** can be observed in Switzerland.
   Fish and birds are suffering as a result.

2. Particularly **problematic insecticides** (e.g. fipronil, imidacloprid, permethrin) have been banned **for use in agriculture**, **but** some of the insecticides banned for agricultural use are **approved as ectoparasiticides for pets (dogs and cats)**.

3. The **total amount** of insecticides used in this way that enters the environment is **considerable**. In Switzerland, this would be equivalent to treating around 6,700 hectares of potatoes with fipronil against wireworms and almost 12,000 hectares of apple crops with imidacloprid against aphids and leaf miners.

4. These products are **actively and increasingly advertised** under the banner of "tick prevention" (advertising based on fear of tick-borne diseases).

5. **The advice** given by private organisations and in publications **on year-round tick prevention** is **incorrect** for Switzerland. The tick season only lasts from March to November.

6. **Diseases** transmitted by ticks **do occur** in Switzerland**, but** they are **rare and usually harmless** (subclinical) or can be prevented by vaccination.

7. **Prophylactic flea protection is unnecessary**, as rapid treatment is possible in the event of infestation.

8. **Ectoparasite control products** are **sold** by vets, but also by chemists and drugstores, and **sometimes online without sufficient warnings,** and are achieving ever-increasing sales records.

9. After application, ectoparasiticides are released into **water bodies** over a long period of time, where they cause **pollution** that in some cases exceeds **the limit values**.

10. **Ectoparasiticides**, namely fipronil and imidacloprid, are **absorbed by humans during** application, but also through subsequent **contact with pets**. They remain **present in the household for a long time**.

11. **Toxic effects on humans** and many side effects in treated animals have been demonstrated. **The metabolites** produced are **often** significantly more **toxic** than the parent substances.

12. The **medicinal product information** (package leaflet) does **not** contain **warnings that are in line with the current state of scientific knowledge** and **are insufficiently visible**.

13. Although an **environmental assessment** is required for initial approval, **no environmental impact assessments have ever been carried out for either fipronil or imidacloprid** – not even after these substances were banned in agriculture (in 2019 and 2021 respectively).

14. **Pharmaceutical legislation lacks clear material requirements for the protection of water bodies** and biodiversity, which would also allow for revocation in the event of environmental hazards. This also violates the Federal Constitution. In the EU, **environmental impact assessments** may be required retrospectively for medicinal products approved before 2005.

15. **EU** legislation **allows approvals to be suspended at any time** if there are risks to humans, animals or the environment.

16. Given the inherent dangers, the **use** of parasiticides containing insecticides **requires** a **prior diagnosis or risk analysis**. All products containing problematic active ingredients should therefore be subject to **prescription**.

17. The **interpellation is not directed against parasite treatment** per se. There are **plenty of other** approved **parasite control products with lower risks** for use on pets, as well as many effective repellents.

4.1.2 Options for action/proposed measures

As scientific studies show that ectoparasiticides containing fipronil and imidacloprid pose a risk to water bodies, treated animals and humans, action is needed.

- **Science:**
  - Increased investigation of the contamination of Swiss water bodies by parasite treatments (including active ingredients other than those investigated to date)
  - Increased parasitological research to quantify possible risks more accurately and to be able to provide treatment recommendations adapted to regional and seasonal conditions
  - Recommendations for use should only be made by independent domestic institutions in accordance with conditions in Switzerland
- **Communication:**
  - Information for vets and animal owners about the risks to humans, treated animals and the environment (online, via organisations, via authorities, press)
  - Information on alternatives – repellents as prophylaxis
- **Veterinarians**
  - Only risk-oriented use with clear indications and for a limited period of time (=parasite infestation)
- **Legislation:**
  - **Amend drug legislation**: **environmental risks** must **also be taken into account for existing drug approvals** (environmental impact assessments)
  - **Prohibitions** on the use of highly toxic insecticides (e.g. fipronil, imidacloprid, permethrin) in the pet sector and households, at least **equivalent to** those in **agriculture**.
  - **Change in the dispensing category** for ectoparasite treatments
    – **Sale only** by veterinary professionals with clear indication (**prescription required**)
    – Online sales and dispensing in pharmacies, drugstores and pet shops must be prohibited.
- **Approval authorities:**
  - Immediate review of all approvals with problematic active substances
  - Environmental impact assessments with at least the same standards as for plant protection products
  - **Review of approval suspension/withdrawal** for problematic active substances.
  - **Regular review of** all approvals
  - Adaptation of medicinal product information (package leaflets) to scientific findings
    - **Highly visible warnings regarding environmental hazards**
    - **Clear warnings for humans**: In particular, it should be pointed out
      - The product should only be applied with gloves
      - Refrain from stroking (skin/hair contact) treated animals and bathing in water during the period of effectiveness
      - That there may be particular risks for people of reproductive age/during pregnancy
- **Cross-border trade:** Increased controls on mail order sales, warnings also on websites, action against websites that specifically target the Swiss public

5 Interpellation

Interpellation 24.3899 Must the use of fipronil and imidacloprid be restricted or even banned? was submitted by Council of States member Stark Jakob. TG Swiss People's Party on 18 September 2024. Co-signatory was Council of States member Daniel Jositsch. ZH Social Democratic Party.

6 Response from the Federal Council on 27 November 2024

The Federal Council's response was very quick, but unclear on some points and lacking specific data. Therefore, in-depth research was carried out, the results of which are summarised in this paper.

The facts collected in this document come from official sources, information provided by organisations and experts, as well as publicly available sources and specialist publications. The findings and conclusions drawn from this are the responsibility of the author.

6.1 Relevant discussions/correspondence

6.1.1 Swissmedic, 13.02.2025

The author pointed out the human toxicity of the active ingredients fipronil and imidacloprid and the fact that the risk of ticks is much lower for pets than for humans. It was also clarified that the author was merely compiling a background report. Any decision is solely a matter for politicians.

Swissmedic explained the approval process, namely that Swiss legislation in the field of medicinal products for pets is actually more advanced than that of the EU in that an environmental assessment is required, at least for initial approval.

A simplified approval process is used for ectoparasiticides for pets. However, the EU authorities have recognised the risks and are therefore discussing amending the relevant directive.

The lack of an environmental impact assessment for fipronil, imidacloprid and permethrin was explained by the fact that, at the time of their approval, Article 81 of the Medicines Ordinance was not yet in force in its current form.

On 25 February 2025, Swissmedic clarified this as follows:

- ***What criteria are used to assess the environmental risk?***
  The three active substances mentioned are measured in the national river monitoring programme of the federal government and the cantons (NAWA TREND). To assess the risk to aquatic life, the concentrations measured in watercourses are compared with the ecotoxicological limit value in the Water Protection Ordinance or with the analogously derived ecotoxicological quality criteria (quality criteria proposals Oekotoxzentrum | Oekotoxzentrum). If these are exceeded, a risk to aquatic organisms cannot be ruled out. In addition, sales volumes for biocides for 2024 will be available for the first time in 2025 (Art. 30c Biocidal Products Ordinance), while Swissmedic will determine the sales volumes of veterinary medicinal products containing these active substances for the last three years (including 2024). This may provide clues as to the origin of the pollution. If the findings of the monitoring, sales figures and other data, such as land use, show that veterinary medicines contribute significantly to water pollution, appropriate measures will be taken.

- ***Are these comparable to the requirements in the PSM Ordinance https://www.fedlex.admin.ch/eli/cc/2010/340/de#annex_9/part_I/lvl_u3/lvl_d4e260/lvl_u39?***
  According to the PSMV, PPPs must not have unacceptable side effects on animals and the environment . This corresponds to the requirements for veterinary medicinal products. The assessment criteria for PPPs are set out in guidelines issued by the European Food Safety Authority (EFSA). The data requirements for assessing an active substance as a plant protection product are more extensive than those for assessing it as a veterinary medicinal product. The

EFSA's assessment results and the European Commission's considerations regarding the approval of the active substance are adopted by the Swiss authorities and serve as the basis for the assessment of a specific PPP application. The FOEN assesses veterinary medicinal products for pets containing new active substances on the basis of the VICH and EMA guidelines, regardless of whether or not an assessment has already been carried out by the EU.

- *Imidacloprid and permethrin are currently still approved as biocidal active substances, while fipronil was approved as a biocidal active substance until September 2023. Additional data is required to determine precisely whether veterinary medicinal products contribute significantly to water pollution. Swissmedic and the Federal Office for the Environment (FOEN) are in contact to evaluate the situation, determine the actual contribution of veterinary medicinal products and, if necessary, initiate the necessary measures.*

- *The safety of veterinary medicinal products containing fipronil or imidacloprid is a regular topic of discussion internationally. Swissmedic is monitoring the data and is in contact with other authorities. According to current knowledge, these veterinary medicinal products do not pose a risk to users when used correctly. Over the past 20 years, Swissmedic has received two reports of reactions to veterinary medicinal products containing fipronil in humans as part of its pharmacovigilance activities. None of these reports were considered serious. There have been no reports of reactions in humans to veterinary medicinal products containing imidacloprid. Data on user safety are included in every application for marketing approval for veterinary medicinal products and are reviewed accordingly.*

- *According to Article 81 of the Ordinance on Medicinal Products (VAM, SR 812.212.21), the approval of the FOEN must be obtained in all cases before an active substance is approved for the first time as a veterinary medicinal product. The FOEN assesses veterinary medicinal products for pets in accordance with VICH Guideline 6 and the EMA Guideline on environmental impact assessment for veterinary medicinal products in support of VICH Guidelines GL6 and GL38. Veterinary medicinal products containing the active substances fipronil, imidacloprid and permethrin were first approved in the 1980s and 1990s, i.e. before the VAM came into force, and therefore no initial assessment of the active substances was carried out by the FOEN at that time. Warnings regarding the danger to fish and aquatic organisms posed by the active substances contained in the veterinary medicinal products are included in the product information for these veterinary medicinal products, even though the initial environmental assessment was not carried out in accordance with the procedure currently in use.*

- *Like the EU, Switzerland complies with the international VICH guidelines. Discussions are currently underway within VICH regarding a possible amendment to VICH Guideline 6 to require a Phase II Ecotoxicological Assessment for pets where indicated.*

Swissmedic would like to receive the background dossier once it has been compiled.

7 Response to the Federal Council's statement of 27 November 2024

7.1 Summary

The Federal Council's response is comprehensive and provides answers to all the questions raised. Action is promised.

The risk to water bodies posed by the insecticides fipronil and imidacloprid is confirmed. Detailed data from EAWAG show many exceedances of the limit values for fipronil and permethrin, and a slightly lower number for imidacloprid.

According to Article 81 of the Ordinance on Medicinal Products (VAM, SR 812.212.21), the approval of the Federal Office for the Environment (FOEN) must be obtained before a new active substance is approved for the first time as a component of a veterinary medicinal product in Switzerland. **No environmental impact assessments have ever been carried out for either fipronil or imidacloprid**. Swissmedic justifies this by stating that the legal situation was different when they were approved more than 25 years ago.

It is also worrying that, despite increasing evidence of the **toxicity of these substances**, not only **for** the **environment** but also **for humans and animals**, even after these substances were banned in agriculture (in 2019 and 2021 respectively), no environmental impact assessment or approval review was ever carried out and no risk-based adjustment of the medicinal product information was ever made. Instead, Swissmedic refers to the responsibility of the marketing approval holders – which has apparently not been fulfilled.

The treatment and prevention of fleas and ticks is not being called into question. Short-term treatment for flea infestations is sensible, but there are many less toxic products available. Prophylactic administration requires a prior risk analysis. In addition to veterinary medicines containing problematic active ingredients, various repellents are also available that have been proven to minimise tick bites.

The guidelines of a private European organisation (EASCCP), financed by manufacturers, which recommends year-round tick prophylaxis, are not uniformly applicable to Switzerland and in some cases contradict the advice of Swiss specialist agencies.

7.1.1 Conclusions

It makes no sense to apply double standards. If a substance is too toxic for use in agriculture and is banned there, the same must apply in other areas.

Legislation in the field of medicinal products must be adapted to ensure that **environmental testing** is at least **as rigorous as in the field of plant protection products**. Legislation on biocides should also be reviewed.

All approvals of medicinal products and biocides containing active substances that have already been banned in agriculture must be reviewed. Missing environmental impact assessments must be carried out using the same test criteria as for plant protection.

A risk analysis must be carried out before using products with an increased risk potential. These risks can only be assessed by specialists trained in veterinary medicine (**dispensing category B/prescription only**).

For veterinary medicinal products containing the active substances fipronil or imidacloprid and possibly permethrin, a withdrawal or suspension of approval on the basis of **Art. *16c*** of **the Therapeutic Products Act** and **Art. 6**, **Art. 9** and **Art. 48** of **the Water Protection Act** should **be considered**, as these active substances are problematic for the environment and humans and there are sufficient alternatives.

This is a systemic problem and applies to all medicinal products that were approved some time ago. The **EU** has recognised the problem and presented a ***proposal*** requiring a retrospective **environmental impact assessment** for **all medicinal products** approved **before 2005.**

7.2 Points 1/2. Situation in Swiss waters

Federal Council response 27 November 2024:

1. / 2. In many Swiss watercourses, sensitive animal species are exposed to an excessive risk of damage from the insecticides fipronil and imidacloprid. The federal government and the cantons continuously monitor fipronil, imidacloprid and other selected active ingredients in veterinary medicines at 38 measuring points of the national surface water monitoring programme NAWA. Eawag, the water research institute of the Swiss Federal Institutes of Technology (ETH), will also publish the results of a study at the end of 2025 in which other active substances in wastewater treatment plants and watercourses will also be investigated. Based on these results, the federal government and the cantons will review the NAWA monitoring programme and adjust it if necessary. The Federal Council therefore currently sees no need for further investigations in water bodies.

Comment:

In its response, the Federal Council makes it clear that the insecticides fipronil and imidacloprid pose a relevant risk to aquatic organisms. Investigations are ongoing. The question was what values are already available. Answers were provided by EAWAG (table in appendix).

There were many detectable exceedances of limit values, which threaten aquatic fauna, particularly insects, and thus contribute to the decline of fish and bird populations that feed on this food.

The toxicity of these substances to aquatic organisms and the values measured in 2023 were researched and presented. See ***chapter2.3.1 Aquatic toxicity – background*** *and****14.2 Table: Aquatic toxicity of ectoparasiticidal agents/limit and measurement values*** in Switzerland .

In the case of fipronil and imidacloprid, the distribution of samples above the limit value (below sewage treatment plants) indicates that the pollutants enter the sewage system and water bodies via domestic wastewater. This is consistent with research findings from the United Kingdom.

However, values for other active substances used in ectoparasitic agents and biocides are missing (e.g. isoxazolines, S-methoprene, etc.). The toxicity of these active substances should also be clarified and the extension *of the NAWA measurement programme* to these substances should be examined.

7.3 Point 3 Approvals

Response from the Federal Council, 27 November 2024:

3. Currently, 16 veterinary medicines containing the active ingredient fipronil and four containing the active ingredient imidacloprid are approved for use in pets in Switzerland. In accordance with Article 81 of the Medicinal Products Ordinance (VAM, SR 812.212.21), the approval of the Federal Office for the Environment (FOEN) must be obtained before a new active ingredient is approved for the first time as a component of a veterinary medicinal product in Switzerland. The FOEN reviews the relevant dossiers for environmental risks in accordance with international guidelines. The product information for many of the veterinary medicinal products concerned already contains general information on the known environmental risks.

Comment:

Fipronil was first approved by Swissmedic as an active substance for veterinary medicinal products on 2 March 1995 and imidacloprid on 2 July 1997. An environmental impact assessment (EIA) was

not carried out at that time, nor has one ever been carried out since (*see14.1 Email correspondence with Swissmedic* **).**

Since then, extensive scientific reports on the environmental risks have been published, leading to fipronil being banned for use in agriculture in 2019 and imidacloprid in 2021 (active substance withdrawal). Despite information about this ban, Swissmedic still did not require an EIA.

There are also approvals after these dates (14.6 list of approvals).

Recent scientific findings indicate that fipronil, imidacloprid and permethrin have **high chronic toxicity for humans** and animals.

The medicinal product information is printed in small type, is barely legible, is not concise enough, is not in line with the latest scientific findings and, above all, is hardly ever read when purchasing online.

For veterinary medicines containing the active ingredients fipronil or imidacloprid and possibly permethrin, a withdrawal or suspension of approval on the basis of **Art. *16c*** of **the Therapeutic Products Act** and Art. 6, Art. 9 and **Art. 48 of the Water Protection Act**, which provide a sufficient legal basis, as these active ingredients are problematic for the environment and humans and there are sufficient alternatives.
This is also possible under EU law.

All approvals for medicinal products and biocides containing active substances that have already been banned in agriculture must be reviewed. Missing environmental impact assessments must be carried out using at least the same assessment criteria as in plant protection.

7.4 Points 4/5. Tax category / measures

Response from the Federal Council 27 November 2024:
4. / 5. Medicinal products are classified into a dispensing category according to the criteria set out in Articles 40–44 of the VAM. These include, for example, the type of application and risks to treated animals and users, but classification based on environmental risks is not currently planned.

Comment:

7.4.1 Risks to treated animals and users

The *risks to treated animals and users* were not sufficiently taken into account when fipronil, imidacloprid and permethrin were approved over 25 years ago, as they were not yet known.

Recent studies show that, in addition to the already known **risks for treated animals,** there are also **risks for humans**.

The ingredients fipronil and imidacloprid have been investigated in various studies. While older studies point to low acute toxicity, more recent studies indicate chronic toxicity (risks to human reproduction, hormonal changes, reproductive toxicity, sugar metabolism disorders, possible cancer, etc.). Metabolites are often significantly more toxic than the active ingredient.

It is particularly **worrying** that large quantities of insecticides that are proven to be chronically toxic are primarily brought into **households**, where people, including **children and pregnant women**, are **exposed to** these **toxic substances over long periods of time**.

*See **chapter2.6 Risk to treated animals and humans / toxicity to humans/animals** and **appendix15.4 Toxicity (human/animal) of insecticides used in ectoparasite control products***

In addition, the US Environmental Protection Agency (EPA) has recorded a large number of side effects for treated animals, including deaths, for the market leaders Seresto and Frontline. A class action lawsuit in the USA against the Seresto flea collar was successful

*(see **appendix15.4.4 Risk to treated pets (fipronil/imidacloprid)** and:**14.5 Approvals in Switzerland/international legal cases (examples))***

7.4.2 Classification based on environmental risks

For veterinary medicinal products, it would be sensible to require an assessment of the dispensing category based on environmental risks in order to ensure risk-appropriate and thus limited use.

Response from the Federal Council on 27 November 2024:

The Federal Council will examine measures to reduce water pollution caused by fipronil and imidacloprid from their use as veterinary medicines. This will also include examining the possibility of making veterinary medicines prescription-only on the basis of scientific data on environmental risks. This would ensure targeted treatment under veterinary supervision and raise awareness of environmental risks among livestock owners.

Comment:

The Federal Council's intention is welcomed.

The current category D classification for ectoparasiticides containing insecticides is not acceptable. Sale in pharmacies and chemists is not acceptable, as the risks cannot be adequately communicated in this way.

7.4.2.1 Risk analysis necessary – prescription requirement

In view of the dangers of using ectoparasiticides containing insecticides, every use must be preceded by a risk analysis *(see2.8 Risk analysis/risk-oriented use of parasite* control products *).* **Only** a veterinary specialist can provide the necessary **expertise**.

All ectoparasiticides containing insecticides should therefore be classified as **Category B (available on medical or veterinary prescription)**.

Animal owners should be made aware of the environmental risks, as well as the risks to treated animals and humans, immediately and comprehensively, not only by veterinarians, but also by federal agencies, the specialist press and relevant organisations.

Response from the Federal Council, 27 November 2024:

However, the possibility of targeted treatment with veterinary medicines that have been proven to be effective against external parasites is important and must remain in place for reasons of animal welfare and animal health, as well as to protect humans from zoonoses.

Comment:

...for animal welfare and animal health reasons...

The **interpellation is not directed against parasite treatment** per se.

Treatment against parasites would still be guaranteed even if the approvals for parasite treatments containing fipronil or imidacloprid were withdrawn immediately, as many other topical parasite treatments are approved[70] .

[70] Swissmedic list of veterinary medicinal products
https://www.swissmedic.ch/dam/swissmedic/de/dokumente/internetlisten/erweiterte_tam.xlsx.download.xlsx/Erweiterte_Arzneimittelliste%20TAM.xlsx

Various insecticide-freeRepellents for controlling ectoparasites have been scientifically proven to be effective ***(see2.7 ,14.9 and15.5*** Repellents for controlling ectoparasites ***).***

In Switzerland, tick-borne diseases in pets are relatively rare (exact incidence unknown) and predominantly subclinical (mild). Vaccinations are available against two dangerous diseases.

A risk analysis also shows that animal welfare and animal health may be at greater risk from the prophylactic, long-term use of insecticide-based ectoparasiticides.
See***2.8 Risk analysis/risk-oriented use of parasite control products)***

Note: individual insecticide-based products that are approved in Switzerland have not been approved in other countries or are involved in legal cases (e.g. Seresto flea collar, Canada).
*Details:****14.5 Approvals in Switzerland/international legal cases (examples)***

Response from the Federal Council on 27 November 2024: ...Protection of humans from zoonoses...

The parasitologists consulted were unable to cite any cases where a human being had been proven to have been infected by ticks brought in by pets.
However, slow-acting insecticides such as fipronil and imidacloprid would be of little use in preventing such cases, as the ticks could still be brought into the home alive.

It would be better to use repellents (alternative substances such as plant oils, etc.) as a preventive measure so that ticks do not attach themselves to pets in the first place.

The FOPH only recommends such repellents for use on humans.

Response from the Federal Council, 27 November 2024:

*The **EU** plans to amend the guidelines for assessing environmental risks. If the criteria for assessing the environmental risks of parasiticides for dogs and cats are tightened, the federal government will review the existing approvals in Switzerland if necessary.*

Comment:

There is a **legal basis at EU level that generally** requires **substantive approval requirements for veterinary medicinal products** in relation to the environment **(**REGULATION (EU) 2019/6 / Regulation (EC) No 726/2004).

The requirements are specified in the ***EMA Guideline on environmental impact assessment for veterinary medicinal products in support of the VICH guidelines GL6 and GL38*** *of 1 March 2009*.

However, until now **there has been no obligation** to carry out **environmental assessments for medicinal products for pets**.

Article 81 VAM[71] refers to a guideline from the European Medicines Agency for human medicinal products (paragraph 2), but not for paragraph 1 (veterinary medicinal products). This is correct according to the above, as medicinal products for pets are currently exempt in the EU. In this respect, Swiss legislation is stricter than that of the EU, with a general requirement for environmental testing.

This previous exemption is also viewed critically by EU experts. The **requirements for environmental testing of ectoparasiticides for pets will be revised shortly**[72]

[71] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on Medicinal Products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* by section I 3 of the Ordinance of 18 August 2004 (AS 2004 4037). Version in accordance with Annex 5, Section 2 of the Release Ordinance of 10 September 2008, in force since 1 October 2008 (AS 2008 4377)
[72] 20 November 2023 EMA/CVMP/ERA/31905/2021 Committee for Veterinary Medicinal Products (CVMP) Reflection paper on the environmental risk assessment of ectoparasiticidal veterinary medicinal products used in cats and dogs

No environmental assessments were ever carried out for medicinal products approved before 2008. Swissmedic justifies this on the grounds that these products were already approved before this provision came into force (2008[73]).
In the EU, however, an EIA can be requested at any time (Article 72 of REGULATION (EU) 2019/6).

EU legislation allows for **the immediate suspension of approvals** and the immediate request for expert opinions from the approval holder **if risks to humans, animals and the environment** are proven (Art. 45, paragraph 4 **of Regulation (EC) No 726/2004**).

In addition, **regular** legal **reviews of approvals** should be required, as toxicological research in both the human and environmental fields is constantly advancing and yielding new findings.

Overall, it must be noted that environmental protection measures are poorly anchored in Swiss drug legislation. In particular, there is a lack of anchoring in the purpose clauses and, in contrast to plant protection product legislation, a lack of concrete assessment criteria.

See ***chapter3 Legal situation regarding veterinary medicines***

7.5 Point 6 Competent authorities/ESCCAP

Response from the Federal Council 27 November 2024:
6. The information provided by the European Scientific Counsel Companion Animal Parasites (ESCCAP) aims to effectively combat parasites in pets and thus better protect the health of animals and humans. The recommendations are based on scientific literature and are technically sound from this perspective. It should be noted that flea or tick infestations not only affect animal welfare, but can also transmit various diseases to animals and humans.

Comment:

The reference by organisations and authorities to the recommendations of a private organisation must be questioned, especially when officially commissioned specialist agencies come to different conclusions.

The European Scientific Counsel Companion Animal Parasites (**ESCCAP**) is a **private association** founded in 2006 with **no official mandate**, based in England[74] . It is **funded** **by manufacturers** of synthetic ectoparasiticides (e.g. MSD, Elanco, IDEXX, Zoetis, Boehringer, etc.).
The ESCCAP guidelines and their parasite test are geared towards Europe as a whole and are not particularly applicable to Switzerland – they recommend either regular use or even **year-round application** of ectoparasite treatments for dogs that are regularly exercised (which is mandatory!). (see2.5.7.1)

In contrast, **a** great **deal of specialist knowledge with regional relevance** has been developed in **Switzerland** in the field of ticks by the EPFL[75] and the **CNRT** **tick reference centre**. Among other things, a geographical tick map[76] (swisstopo/FOPH – see appendix) is also available, which shows that ticks in Switzerland vary greatly depending on the region and do not occur at all in higher altitudes. The Swiss Tick Reference Centre points out that the **tick season only** lasts **from March to November**[77] .

For details, **see chapter2.5.7 Recommendations for use**

Answer BR 27.11.2024: A flea or tick infestation ... affects animal welfare

[73] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on medicinal products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* as Art. 44a by Annex 5 No. 1 of the Release Ordinance of 10 Sept. 2008, in force since 1 Oct. 2008 (AS 2008 4377)
[74] https://www.esccap.org/
[75] Mapping to predict the distribution of ticks in Switzerland - Tick map Switzerland CHUV/ EPFL: https://actu.epfl.ch/news/mapping-to-predict-the-distribution-of-ticks-in-sw/
[76] Tick map Swisstopo/ FOPH https://s.geo.admin.ch/90inv14odyg8
[77] https://swissticks.ch/de/zecken/

A flea infestation is not usually a problem and can be effectively treated with various products containing no problematic active ingredients, provided that the environment is thoroughly cleaned.

The diseases caused by ticks in Switzerland are usually **mild** in domestic animals, and most of them are rare. Swiss parasitologists have **not** been able to **provide** exact **incidence** figures. Vaccinations are available against various such diseases.

Early summer meningoencephalitis (ESME), which is dangerous to humans, rarely occurs in pets (however, humans can be vaccinated against it). (See **details at2.4** Risks Ectoparasites Animals/humans **and table14.8 Tick-borne diseases Pets Switzerland)**

Tick repellents containing insecticides, on the other hand, pose a **real risk to pets**.
Data from the USA indicate that products containing fipronil and imidacloprid have caused many **side effects in pets**, some of them severe, including death. ***See2.6.4***

Overall**,** it is therefore **questionable whether a general ban on such insecticides would not be better for animal welfare**.

Response BR 27.11.2024...various diseases are transmitted to animals and humans

Comment:

The real risk of flea- and tick-borne diseases in pets is difficult to assess (incidence data for Switzerland is lacking), but overall the effects are minor (mostly mild/subclinical course).

When asked, Swiss parasitologists were unable to provide accurate regionalized data on the occurrence of infected ticks or the incidence of these diseases. *(**See chapter2.4 Risks Ectoparasites Animals/humans*** and ***table14.8 Tick-borne diseases Pets Switzerland)***

Parasitologists were unable to cite any cases where a **human being** was proven to have been infected by ticks brought in by pets.

Furthermore, the **active ingredients** fipronil and imidacloprid would **not** offer **any** further **prevention**, as they **are** very **slow-acting**.

Repellents, which **prevent ticks from attaching themselves** due to their smell, are much **more** effective. (see**2.7 Alternatives to tick control with insecticides - Repellents)**

Overall, however, **flea and tick control** is **not called into question.**

A number of active ingredients can be used effectively against diagnosed acute flea infestations.

However, the risks of prophylactic treatment against fleas are likely to outweigh the benefits. In areas with low tick density or outside the tick season, prophylactic administration of insecticides can be dispensed with without exposing the animals to a high risk.

Prophylaxis may be advisable when travelling to southern regions, for specific uses (hunting dogs, disaster dogs) or for cats with flea allergies.

Where necessary, even after a ban on highly toxic insecticides, there are enough other approved active ingredients and alternative substances to minimise tick infestation or remove any ticks manually.

A **risk-based, responsible approach** would be advisable.

As the proper and risk-appropriate use of insecticide-based **ectoparasiticides** requires specialist knowledge, these should **only be administered by a vet (prescription required).**

*See**2.8 Risk analysis/risk-oriented use of parasite control products***

8 Council of States debate on 6 March 2025

8.1 Debate content

https://www.parlament.ch/de/ratsbetrieb/amtliches-bulletin/amtliches-bulletin-die-verhandlungen?SubjectId=67073

President (Caroni Andrea, President): Mr. Stark has declared himself partially satisfied with the Federal Council's written response. He requests discussion. - There is no opposition to this.

Stark Jakob Member of the Council of States for Thurgau Swiss People's Party (V)

Video of the vote Print vote

Stark Jakob (V, TG):

I must make a preliminary remark. This issue is not a core issue for me. A veterinarian friend of mine who emigrated to England and spends a lot of time in nature drew my attention to how much fish stocks have declined. Scientific studies in England have found excessive residues of veterinary drugs in streams, rivers and lakes. The result is a decline in the number of insects and larvae that live in and around the water, and because these in turn are an important food source for fish and birds, their numbers are also declining. Species are endangered or dying out.
I became alert – which is why I am making this proposal – when I learned that highly toxic insecticides, which were banned in agriculture a few years ago for this very reason, are now being used to prevent ticks and fleas in pets such as dogs and cats. These are fipronil and imidacloprid, which enter the water directly from dogs when they bathe and play, or indirectly via wastewater from dog salons and so on. It should be noted that there are now proven and non-toxic alternatives for tick prevention.
The Federal Council's response is comprehensive and provides answers to all the questions raised. Action is promised, and for this I would like to express my thanks and appreciation. Unfortunately, this response also confirms that Swiss waters are contaminated with fipronil and imidacloprid. I do not question the importance of tick and flea prevention for animal welfare. However, if the side effects of the drugs on nature are so serious, it is necessary to switch to existing alternatives. With this in mind, I call on the Federal Council to amend Article 81 of the Medicines Ordinance so that active substances are subject to periodic review.
It is somewhat shocking that no environmental impact assessment has been carried out for either fipronil or imidacloprid to date, even after these substances were banned in agriculture. Since then, there has been no review of the approval and no adjustment of the medicinal product information. There is a need for action here, Madam Federal Councillor.
Swift action can be taken when dispensing such veterinary medicines. What is needed here, and this is important, are clearly higher requirements, which could be achieved by making them prescription-only.

I would like to thank the Federal Council for already examining the possibility of a prescription requirement, and I would like to encourage it to introduce a prescription requirement for veterinary medicines containing

the active ingredients fipronil and imidacloprid as soon as possible. This is the minimum that must be done as long as these active ingredients are still approved in veterinary medicines. *AB 2025 S 100 / BO 2025 E 100*

Jositsch Daniel Member of the Council of States Zurich Social Democratic Party (S)

Video of the vote Print vote

Jositsch Daniel (S, ZH):

I am now speaking in my capacity as the new President of the Swiss Fishing Association. Eight months ago, I had the privilege of following in the footsteps of Roberto Zanetti or, if you like, stepping into his large flippers. It is important to note that I was elected to this office for one reason only. Another person was actually intended to be president of the Swiss Fishing Association. However, this person was then removed from the running because she was elected to the Federal Council and is currently a Federal Councillor. That is why I know, of course, that Federal Councillor Baume-Schneider, who is here in this chamber today, must have a special place in her heart for fish and for the welfare of fish.
I would like to thank my colleague Mr Stark for raising this issue. It is indeed a very important one. As you know, three quarters of fish in Switzerland are endangered. It is therefore important to me that you take up this cause. As we are in fact dealing with the former president-designate of the fishing association, I am sure that it is in very good hands.

Baume-Schneider Elisabeth Federal Councillor

Video of the vote Print vote

Baume-Schneider Elisabeth, Federal Councillor:

This is the "testimony" section. I was tipped to become the president of this important association. I said with a laugh that it is easier to be friends with bees than with fish, but that fish need our full attention. They are a very important indicator when it comes to public health and the environment.
In this matter, it is all a question of proportionality. I have many arguments, but I will only mention a few points. Even today, sixteen veterinary medicines containing fipronil as an active ingredient and four containing imidacloprid as an active ingredient are approved, particularly for treating dogs and cats. The environmental protection aspect must be taken into account in relation to these treatments. We therefore need to raise awareness among pet owners and vets about the environmental risks and change the dispensing category so that only vets are approved to dispense these medicines. We also need to be much more precise.
On the other hand, what may support the author of the interpellation is that water analyses show that the active insecticidal ingredients used in veterinary medicines contribute to water pollution. An in-depth study on this subject will be published later this year. Depending on the results, and if it is proven – as is to be feared – that veterinary medicines play a significant role not only in water contamination but also, in the case of fipronil and imidacloprid, the health of fish, the Federal Council will then examine what concrete measures need to be taken so that we do not simply say that it is a question of proportionality. We will need to be closely monitored by the end of the year to see what will be done once we have this study available.

President (Caroni Andrea, President): That concludes the matter.

8.2 Key findings

- An in-depth study on this subject will be published later this year.
  This year, a study will be published

- to further raise awareness among animal owners and veterinarians of the environmental risks and change the discount category
  Animal owners and veterinarians should be informed about the environmental risks of these drugs
  The dispensing category should be adjusted

9 Further developments following the debate in the Council of States

9.1 Swiss Veterinary Association SVA

Correspondence via email with the outgoing president, O. Glardon, yielded few results. After an exchange of emails and personal contact with a board member who showed great understanding for the issue, the new president, Roberto Mossi, promised to address the matter at the next board meeting in early May.

In its newsletter dated 11 November 2025, the SVA informed veterinarians about the risks and called for a prescription requirement.

9.2 Test purchases

Test purchases in pharmacies and drugstores in the summer of 2025 (various/German-speaking Switzerland) clearly showed that sales staff were inadequately trained.

When asked about flea treatments for cats for prophylactic use (cat has no fleas), Frontline was usually recommended spontaneously and without asking about the diagnosis or family circumstances. Alternatives were usually not mentioned.

The sales staff had no information whatsoever about the fact that this product could potentially **endanger human health and reproduction** and that precautions must be taken when using it.

No mention was made of the fact that when insecticides are used on pets, the products remain **in the household for a long time**, meaning that **residents**, **including pregnant women and children (who** may **stroke the animals or come into contact with insecticides in carpets, furniture or possibly beds), have direct contact** with the insecticide**.**

No reference was **ever made** to any precautions that should be taken due to the **environmental hazard**.

Possible **side effects in** treated **animals** were also **not mentioned**.

Only at the Laupen pharmacy were the risks pointed out during a sales conversation and alternatives discussed.

9.3 Sales on the internet

Internet sites such as ch.miscota.com continue to sell parasite treatments for pets containing toxic insecticides such as Frontline (fipronil; spot-on) and Seresto (imidacloprid; flea collar) without sufficient warnings.

This is even though Frontline may only be sold by pharmacies and chemists after professional consultation (category D, consultation required) and Seresto (category B, prescription required) may only be sold by medical professionals.

10 Synthesis

This dossier shows that **flea and tick treatments for pets** containing active ingredients that **potentially endanger human and animal health and our environment** are available on the market.

However, they **do not offer** any **comparable benefits** for humans and animals, as other, less dangerous substances (repellents) serve the same purpose. Measures are urgently needed.

In particular, long-term **"prophylactic" use must be questioned**, as the risks to humans, treated animals and the environment outweigh the moderate danger posed by ticks and fleas.

This recommendation is made by a private organisation based in the United Kingdom, which is financially supported by the manufacturers. It is adopted by Swiss organisations and authorities, even though specialist agencies in Switzerland limit the tick risk to certain times of year and the incidence of tick-borne diseases in our pets is not sufficiently known. In addition, the course of the disease is usually mild in pets and vaccinations are available for some diseases.

10.1.1 Possible courses of action

10.1.1.1 Legislation

Swiss legislation in the field of medicinal products is very weak regarding environmental hazards. This reference is already missing in the purpose clauses of the Therapeutic Products Act[78] , even though the relevant articles[79] in the Constitution require coverage in all areas.

Although Article 81[80] of the Medicinal Products Ordinance requires environmental impact assessments, this requirement **only** applies to **"new" approvals**. This is problematic because no environmental assessments were carried out for any approvals prior to the ordinance coming into force (2008).

Water protection legislation would provide a basis but is not consistently applied.

10.1.2 Approvals

Due to the newly discovered high risks to humans, animals and the environment, compared to the lack of necessity for the corresponding active substances, **a suspension/withdrawal of the relevant approvals** on the basis of **Section *16c* of the Therapeutic Products Act** and **Sections 6, 9** and **48 of the Water Protection Act**, which provide a sufficient legal basis, is imperative.
EU law also explicitly provides for such a possibility (protection of humans, animals or the environment (*Regulation (EC) No 726/2004, Article 45(4)).*

Enforcement is the responsibility of Swissmedic (**Art. 48** GschG).

In **general**, medicinal products that have been **approved for a long time** (approval before 2008) should be reviewed. This applies both to the environment (EIA, if one has not yet been carried out) and to human health, as toxicological research has progressed significantly since their approval.

These requirements are in line with the applicable EU legislation[81] in the field of medicinal products.

[78] Therapeutic Products Act https://www.fedlex.admin.ch/eli/cc/2001/422/de
[79] Federal Constitution Environmental Protection Article (Art. 74), Water Protection Article (Art. 76) Nature Conservation Article (Art. 78)
[80] Art. 81 VAM Inserted into the repealed version Ordinance of 17 October 2001 on Medicinal Products (Medicinal Products Ordinance, VAM) valid *01.01.2002 - 01.01.2019* by section I 3 of the Ordinance of 18 August 2004 (AS 2004 4037). Version in accordance with Annex 5, Section 2 of the Release Ordinance of 10 September 2008, in force since 1 October 2008 (AS 2008 4377)
[81] *Regulation (EC) No 726/2004 Article 45(4) and Articles 72, 103 and 129 REGULATION (EU) 2019/6*

10.1.3 Sales categories

The sales regulations/dispensing categories must be adapted at least to the extent that the use of products with potentially dangerous active substances in all areas, as is the case with plant protection products, may only take place after a prior risk analysis by appropriately trained specialists (in this case veterinarians) (**prescription only (dispensing category B)**).

10.1.4 Purchases abroad/online trade

Internet trade in medicinal products subject to approval should be prohibited in general (amendment to Art. 48 of the Medicinal Products Ordinance).

10.1.5 Fundamental considerations

10.1.5.1 Apply the same standards

There is a significant difference between plant protection products and medicinal product legislation. While plant protection products are subject to environmental reviews, such reviews have never been carried out on medicinal products that were approved a long time ago.

11 Appendix

11.1 Mail exchange with Swissmedic

11.1.1 Enquiry of 02.08.24, reply from Swissmedic 13.08.24

Swissmedic: I have summarised some of the points from the telephone conversation in writing below:

- In the case of approval of a veterinary medicinal product with a new active substance, the Federal Office for the Environment (FOEN) must approve the approval, and in other cases of enforcement the FOEN must be consulted in cases of particular environmental relevance or at its request (Article 81 of the Medicinal Products Ordinance).
- The antiparasitics approved as veterinary medicinal products are divided into dispensing categories B (veterinary prescription only) or D (dispensed by the veterinary profession, pharmacies or drugstores - in all cases with specialist advice).
- Mail-order sales in Switzerland: Mail-order sales of these veterinary medicinal products are only permitted if a veterinary prescription is available (for dispensing category B) or specialist advice is provided (for dispensing category D) and the pharmacy or drugstore has a corresponding licence for this activity. Your reports of sales via Galaxus or by Pharmacie de la Sarraz listed below have already been forwarded to Swissmedic's market surveillance department. The reports have been recorded, but we are not approved to provide you with any further information.
- Mail-order business abroad: In principle, pet owners are permitted to order and import veterinary medicinal products for their own pets via the Internet, but only in small quantities, which is interpreted as "a maximum of one month's supply" (Article 48 of the Medicinal Products Licensing Ordinance). If Swissmedic receives reports of illegal veterinary medicinal products being offered on foreign websites, these reports are generally forwarded to contact persons in the "Working Group of Enforcement Officers". Swissmedic is part of this network and maintains a good dialogue with the European authorities involved. Whether the foreign products/internet sites are ultimately removed/cleaned up is not within Swissmedic's sphere of influence.
- Therapeutic claims must be substantiated as part of the approval procedure and approved by Swissmedic. These may therefore only be advertised if they are listed in the medicinal product information under the heading "*Indications for use"*.
    - The "onset of action" on ticks must be proven by studies, for which the EU has developed guidelines. In the EU, an "immediate effect" can be listed in the medicinal product information against ticks if, for example, 90% of the ticks have died *within* 48 hours. As far as the "immediate effect" on fleas and ticks is concerned, this term is not accepted by Swissmedic/in Switzerland (in contrast to the EU). The actual duration until sufficient effectiveness must be declared, and only this may be advertised.
    - If protection against the transmission of pathogens is advertised, this may also only be advertised if it is listed as an indication in the medicinal product information, i.e. if it has been scientifically proven and approved by Swissmedic.
- The veterinary medicinal products approved in Switzerland can be found on the Swissmedic website under the following link: Lists and directories (swissmedic.ch).
- The open-ended approval of a veterinary medicinal product does not mean that the risk-benefit profile cannot be reviewed. According to Article 16c of the Therapeutic Products Act, Swissmedic can review, adapt to changed circumstances or revoke the approval at any time.
- Biocidal products are also subject to approval (by the Federal Office of Public Health (FOPH)). Most of the repellents for use on animals are approved as biocidal products under product type 19 *Repellents and attractants* (and not as veterinary medicinal products). As mentioned, biocidal products are also approved under product type 18 *insecticides, acaricides and products against other arthropods*. Addendum to the telephone call: Insecticides for use on animals (and not exclusively in the environment) are still in the border area between biocidal products and veterinary medicinal products. See also Classification of permethrin-containing preparations for topical use on animals (swissmedic.ch) and Permethrin-containing topical insecticides (admin.ch).

11.1.2 Urgent enquiry 28.11.24 to Swissmedic with request for information

Questions: sent on 28.11.24 (in black)

Swissmedic replies (in red) on 02.12

In principle, the information, which presumably comes from swissmedic, is promising.

The Federal Council will examine measures to reduce water pollution by fipronil and imidacloprid from their use as veterinary medicinal products. A prescription requirement for veterinary medicinal products based on environmental risk will also be examined on the basis of scientific data. This would ensure targeted treatment under veterinary supervision and enable livestock farmers to be sensitised to environmental risks.

We still have questions about some unclear statements in the BR's answer, which you can probably clarify:

Questions:

1. How long will it take to implement these measures?

Implementation of the measures must be examined on the basis of scientific data. This requires cooperation with other authorities, and the corresponding exchange has been initiated - as promised in the response to Ip. Stark - has been initiated. If the review of the scientific data shows that an adjustment of the dispensing category is necessary, the usual procedural deadlines for variation applications for approval apply for the reallocation (see Art. 25a-25b of the Ordinance on Medicinal Products [VAM, SR 812.212.21] in conjunction with section 6.4.1. of the *guidance document on time limits for approval applications*).

2. When and how will veterinarians and animal keepers be sensitized (we had asked the Swiss Veterinary Society to inform veterinarians immediately, but this was not done)?

As soon as the environmental risks of the two substances have been sufficiently clarified and a decision has been taken on any adjustment of the dispensing category, the competent authorities will decide on the appropriate information to be provided to the veterinary profession and livestock farmers.

3. 16 veterinary medicinal products containing the active substance fipronil and 4 containing the active substance imidacloprid are currently approved for pets in Switzerland.

A Questions:

1. How are the approvals counted? Are different dosages included on the list but not counted as marketing approvals?

Approvals are counted by approval number (see column A in the Excel list). For many veterinary medicinal products, there are several dosage strengths under one approval number in order to be able to dose as precisely as possible. The various dose strengths of a veterinary medicinal product are numbered consecutively 01, 02, 03 etc. (see column B "Dose strength number" in the Excel list). These are not counted as an approval, but run under the same approval number. Example: The veterinary medicinal product Frontline Spot On dogs ad us. vet., solution for dropping has the approval number 53840; it is approved with 4 different dose strengths for 4 different weight classes (01 to 04).

2. Can you tell us which lines on the approval list are counted as approval and which are not?

See above.

3. Can you tell us how many pet antiparasitics (by your count) are approved that **do not** contain fipronil or imidacloride?

We assume that the question relates exclusively to topical parasiticides for dogs and cats. We have included the Excel list in the appendix and highlighted the corresponding approvals in yellow. **This brings us to 14 approvals against ectoparasites in dogs and cats that contain neither fipronil nor imidacloprid** (you can find these approvals by filtering column A according to the colour yellow). Of these, two veterinary medicinal products have an export approval (i.e. they are only approved for distribution abroad) and one of the veterinary medicinal products (Felpreva ad us. vet., solution for instillation for cats) is approved but not yet available on the Swiss market. It is also possible to search for veterinary medicinal products on the veterinary medicinal products compendium and filter by species, type of application, etc. However, only veterinary medicinal products are listed there. However, only veterinary medicinal products that are already on the market can be found there.

Continue:

In accordance with Article 81 of the Ordinance on Medicinal Products (VAM, SR 812.212.21), the approval of the Federal Office for the Environment (FOEN) is obtained before a new active substance is approved for the first time as a component of a veterinary medicinal product in Switzerland.

B Questions:

1. Can we conclude from this that no further consideration is given to newly identified environmental risks after initial approval? Even if these are serious?

No, this interpretation is not correct. According to Art. 16c of the Therapeutic Products Act (TPA, SR 812.21), "The Agency may review the approval at any time; it may adapt the approval to changed circumstances or revoke it." However, as you also mention, such a review requires "newly proven" risks. This can either be a notification to Swissmedic (via Pharmacovigilance), a new evaluation by a foreign authority (e.g. also so-called referrals procedures of the EU) or a newly discovered risk as part of an internal procedure. The identification of a new risk triggers a signalling procedure in which the appropriate

measures are identified and implemented.
According to Art. 28 TPO, marketing approval holders are also obliged to "update the medicinal product information continuously and without being asked to do so to reflect the current state of science and technology as well as new events and assessments".

2. When were medicinal products containing the ingredients **fipronil and imidacloprid** first approved**?**

The active substance fipronil was first approved with the veterinary medicinal product 53004 Frontline ad us. vet., spray for dogs and cats, on 2 March 1995. The active substance imidacloprid was first approved with the veterinary medicinal product 54149 Bayvantage ad us. vet. solution for instillation for cats, on 2 July 1997 .

3. Was a FOEN report available at the time?

No.

4. Were you informed when the active substances **fipronil and imidacloprid** were banned for use in agriculture?

There is a regular exchange between the federal offices and Swissmedic. We have received this information.

*4 / 5 The categorisation of medicinal products into a dispensing category is based on the criteria of Art. 40 - 44 of the VAM. These are, for example, the type of use and **risks for treated animals and users**, but there is currently no provision for categorisation based on environmental risks*

There are new indications of the **toxicity** of fipronil **to humans:**

There are clear indications of a risk to humans (Chapter 2.4. of the enclosed documentation): In a field study in the Korean population [1] it was shown that the metabolite fipronil-sulfone crosses the placental barrier to the human embryo and negative effects on the health of the children were demonstrated. In addition, negative effects on sperm have been demonstrated [2] Further findings can be found in the literature cited.

Please also read **Human exposure to fipronil from dogs treated with frontline**
https://pubmed.ncbi.nlm.nih.gov/12361121/

These risks are particularly relevant for young people of reproductive age

C Questions

1. Are the newly published scientific findings on the toxicity of the ingredients regularly evaluated after approval?
2. If so, how often?

According to Art. 28 TPO, marketing approval holders are obliged to "update the medicinal product information continuously and without being asked to do so to reflect the current state of science and

[2] Proteomic analysis of fipronil-induced molecular defects in spermatozoa
https://www.nature.com/articles/s41598-024-57876-4
[1] Distribution of fipronil in humans, and adverse health outcomes of *in utero* fipronil sulfone exposure in newborns
https://www.sciencedirect.com/science/article/abs/pii/S1438463918308575

technology as well as new events and assessments". Swissmedic receives information about new risks on an ongoing basis. Possible sources, in addition to approval holders and pharmacovigilance reports, are foreign procedures, adaptations and publications of internationally valid guidelines and contacts with foreign authorities. A systematic evaluation of the specialised literature is not possible for resource reasons due to the volume (PubMed currently provides 1986 hits for fipronil alone...).

3. Does Swissmedic have the authority to change the dispensing category immediately after new risks become known?

Yes, Swissmedic has this approval. Dispensing categories can be adapted as part of review procedures (Art. 16c TPA).

The scientific findings at least suggest that gloves should be worn when applying these products, especially as a young person of reproductive age. However, this is not actually stated in the instruction leaflets for the pet products - but is certainly stated in the manufacturer's safety data sheet (BASF, enclosed).

D Questions

1. Are the package leaflets regularly reviewed and adapted to new findings?
2. If yes, at whose instigation and how often (date/ examples from veterinary medicine?)?

In principle, approval holders are obliged under Art. 28 TPO to "update the medicinal product information continuously and without being asked to do so to reflect the current state of scientific and technical knowledge and new events and evaluations" (see above). An additional regular and systematic review of all veterinary medicinal product information (currently for more than 700 veterinary medicinal products) by Swissmedic is not possible. Swissmedic initiates adjustments as part of larger review procedures or on a risk-based basis after new risks are identified for individual veterinary medicinal products or groups of veterinary medicinal products.

11.2 Table aquatic toxicity ectoparasite active substances/ limit and measured values Switzerland

Values 2023

Active ingredient	Limit value Switzerland Annex 2 GschV	QK*	National of surface water quality since	Number of overruns**
Fipronil	General limit value 0.1 µg/L	0.0032 µg/L for acute toxicity and 0.00077 µg/L for chronic toxicity	2021	74 exceedances at 10 water bodies, with 1066 measurements on 45 bodies of water
The main degradation product (metabolite fipronil-sulfone) is 1.9 to 6.6 times more toxic to aquatic organisms than fipronil Further information: contains a CF3 group and is considered a PFAS				
Imidacloprid	0.1 µg/L must observed at all times . 0.013 ug/L must an average of be. maintained for 2 weeks	0.1 µg/ L for acute toxicity and 0.013 µg/L for chronic toxicity	2018	9 exceedances at 2 water bodies, with 1054 measurements on 45 bodies of water
Permethrin	General limit value 0.1 µg/L	0.0025 µg/L for acute toxicity / .00027 µg/L for chronic toxicity.	2019	69 overruns at 15 watercourses, with 404 measurements in 24 bodies of water

Source EAWAG/ 1-2025

* QK= Quality criteria proposals of the Ecotox Centre for Waters

**Number of exceedances of the chronic QC in 14-day composite samples 2023, with total number of measurements

11.3 Safety data sheets of the manufacturers

11.3.1 Fipronil[82]

BASF Safety Data Sheet according to Regulation (EC) No. 1907/2006 as amended. Date / revised on: 23.08.2022 Version: 4.0 Product:

Pictogram:

Signal Word:
Warning

Hazard Statement:

H302	Harmful if swallowed.
H317	May cause an allergic skin reaction.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary Statement:

P101	If medical advice is needed, have product container or label at hand.
P102	Keep out of reach of children.
P103	Read carefully and follow all instructions.

Precautionary Statements (Prevention):

P260	Do not breathe mist.
P264	Wash contaminated body parts thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/clothing/eye protection.

Precautionary Statements (Response):

P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P303 + P352	IF ON SKIN (or hair): Wash with plenty of soap and water.
P314	Get medical advice/attention if you feel unwell.
P330	Rinse mouth
P333 + P311	If skin irritation or rash occurs: Call a POISON CENTER or physician.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P391	Collect spillage.

Precautionary Statements (Disposal):

P501	Dispose of contents and container to hazardous or special waste collection point.

82 https://download.basf.com/p1/000000000030776861_SDS_CPA_PH/en_PH/Regent_Fipronil._30776861_SDS_CPA_PH_en_2-2.pdff

11.3.2 Extract from the safety data sheet Imidacloprid[83] (Confidor)

2.2 Label elements

Labelling in accordance with the Hazardous Substances (Safety Data Sheets) Notice 2020 as amended

Hazard label for supply/use required.

Signal word: Warning

Hazard statements

H302	Harmful if swallowed.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.
H421	Very toxic to the soil environment.
H431	Very toxic to terrestrial vertebrates.
H441	Very toxic to terrestrial invertebrates.

Precautionary statements

P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician if you feel unwell.
P391	Collect spillage.
P501	Dispose of contents/container in accordance with local regulation.

....

Hand protection	Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Wash gloves when contaminated. Dispose of when contaminated inside, when perforated or when contamination on the outside cannot be removed. Wash hands frequently and always before eating, drinking, smoking or using the toilet. Material: Nitrile rubber Rate of permeability: > 480 min Glove thickness: > 0.4 mm Protective index: Class 6 Directive: Protective gloves complying with EN 374.
Eye protection	Wear goggles (conforming to EN166, Field of Use = 5 or equivalent).

[83] https://www.cropscience.bayer.co.nz/-/media/bcs-inter/ws_newzealand/use-our-products/product-import-files/insecticides/confidor/confidor-sds.pdf

11.3.3 Extract from the safety data sheet Permethrin[84]

Supelco®

www.sigmaaldrich.com

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Version 6.4
Revision Date 04.03.2024
Print Date 31.01.2025
GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Permethrin

Product Number : 45614
Brand : Sigma-Aldrich

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram

Signal Word Warning

Hazard Statements

H302 + H332	Harmful if swallowed or if inhaled.
H317	May cause an allergic skin reaction.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary Statements

P261	Avoid breathing dust.
P273	Avoid release to the environment.
P280	Wear protective gloves.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell.
P302 + P352	IF ON SKIN: Wash with plenty of water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
Supplemental Hazard Statements	none

8.2 Exposure controls

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Body Protection
protective clothing

Respiratory protection
required when dusts/vapours/aerosols are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.
Recommended Filter type: Filter type ABEK-P

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.
These measures have to be properly documented.

Control of environmental exposure
Do not let product enter drains.

[84] https://www.sigmaaldrich.com/CH/en/sds/sial/45614

11.4 Online sales - examples

The pet ectoparasite products approved by Swissmedic belong to dispensing category B (dispensed on medical or veterinary prescription)[85] or D[86] (dispensed following specialist advice from persons in accordance with Article 25 paragraph 1 letters a, b and d TPA (e.g. pharmacists/druggists

Online dispensing is therefore clearly prohibited.

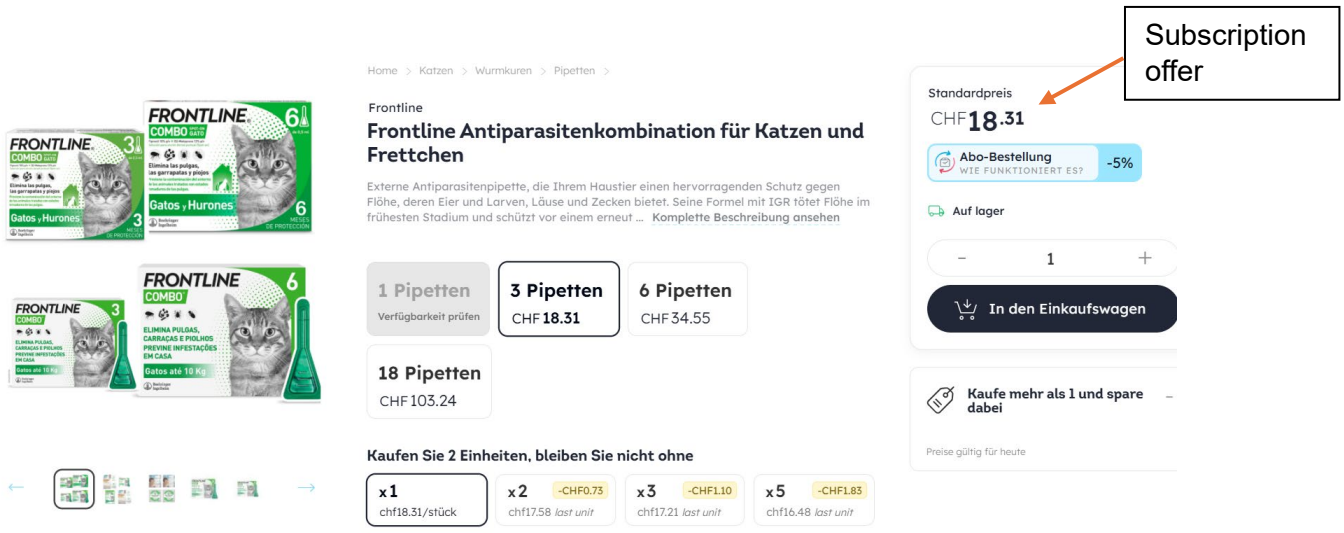
In fact, there are **many offers for online ordering on the Internet - without any specialist advice**

The manufacturer of the market leader Frontline (Boehringer Ingelheim) actively advertises online ordering in pharmacies on its website - warnings are completely absent here. https://frontline.ch/de/produkte/frontline-spot-on-hund; However, the product must be collected from a pharmacy.

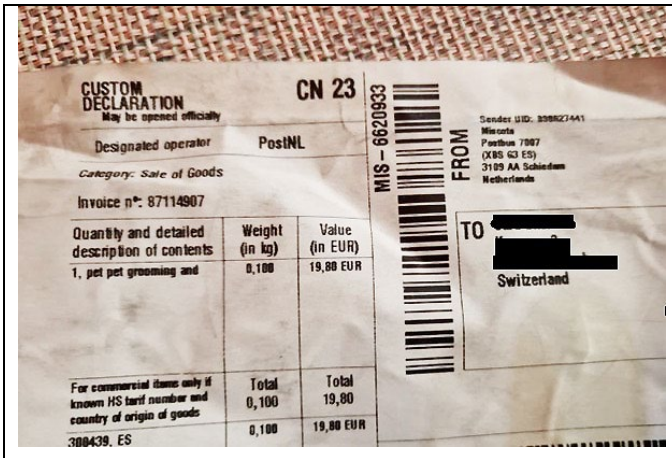
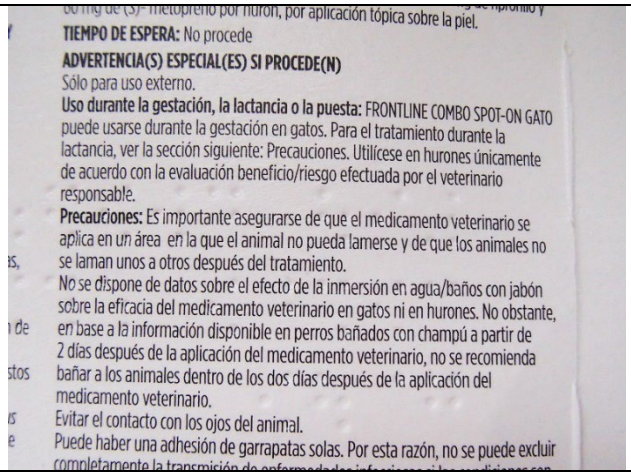
Sale via web online: Reports of sales via Coop, Galaxus and various pharmacies and drugstores were already forwarded to Swissmedic's market surveillance organisation in summer 2024 - the websites are no longer accessible.

Example 1: Frontline (dispensing category D) Miscota Switzerland | Online shop for pet supplies

Trial order on 5 November 2024 online



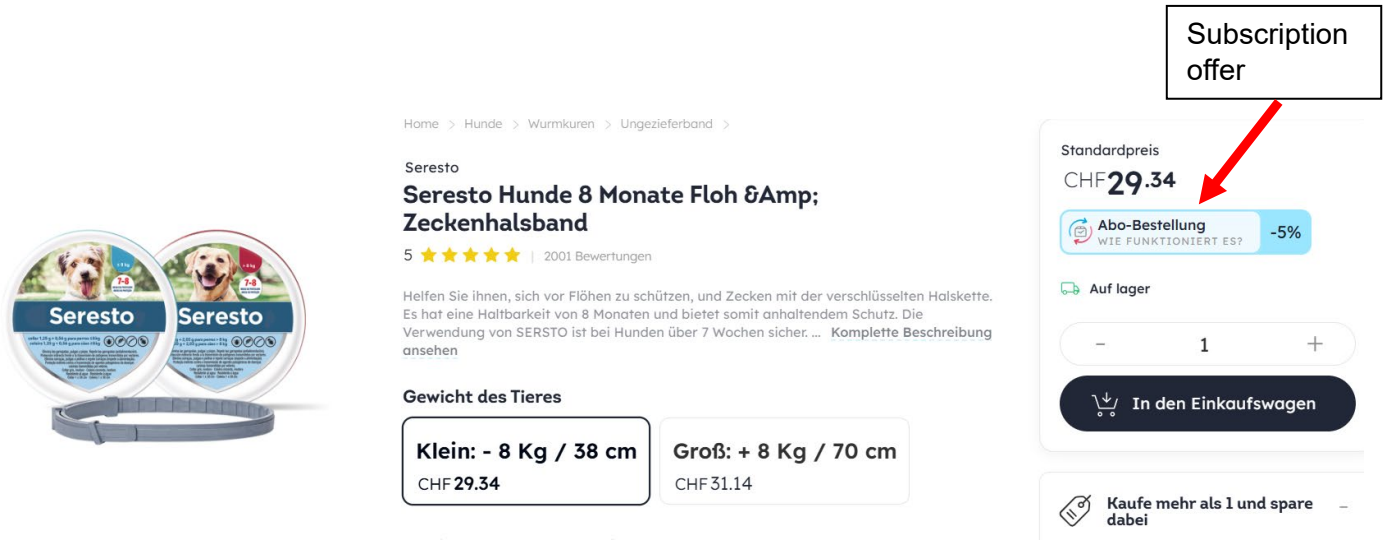
Delivery: 3 weeks later via Holland, **drug information only in Spanish**

	
Delivery 3 weeks later via Holland	**Drug information only in Spanish**

[85] https://www.fedlex.admin.ch/eli/cc/2018/588/de#art_42
[86] https://www.fedlex.admin.ch/eli/cc/2018/588/de#art_43

Example 2: Seresto collar (release category B) Miscota Switzerland | Online-Shop für Haustierbedarf

Trial order online at the end of January 2024 via



Available online, also by subscription, description barely comprehensible hardly any warnings

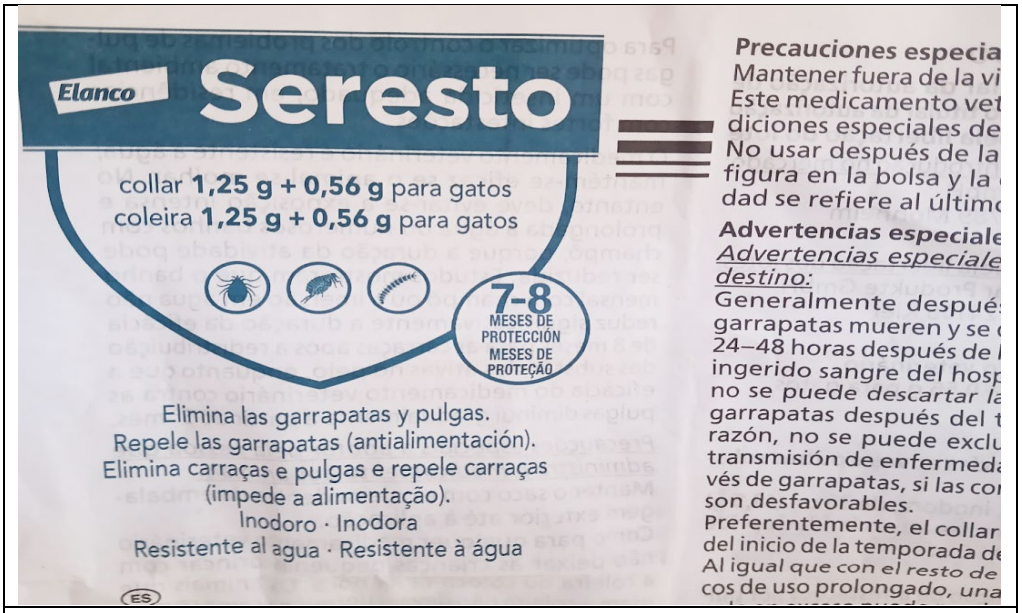
Beschreibung

Seresto Hunde 8 Monate Floh &Amp; Zeckenhalsband

Helfen Sie ihnen, sich vor Flöhen zu schützen, und Zecken mit der verschlüsselten Halskette. Es hat eine Haltbarkeit von 8 Monaten und bietet somit anhaltendem Schutz. Die Verwendung von SERSTO ist bei Hunden über 7 Wochen sicher. Seine Komponenten sind wasserbeständig. Darüber hinaus zeigen die Ergebnisse zweier feld klinischer Studien, die in endemischen Gebieten von Leishmania infantum durchgeführt wurden, einen signifikanten Rückgang des Risikos der Übertragung von Leishmania durch Flespiele * bei Hunden, die in Bezug auf die unbehandelten

... Es gilt als ernst, da es keine Heilung hat und in Spanien endemisch ist. Vorteile - Die aktiven Prinzipien wurden strengen Versuche unterzogen, um garantieren zu können, dass sie für Ihren Hund und für die ganze Familie geeignet sind. - Es ist für Hunde ab 8 Wochen absolut sicher. - Die aktiven Prinzipien, die sich im Kragen befinden, werden progressiv und in kleinen Dosen freigesetzt, auf diese Weise ist es auf diese Weise

Received in the beginning of February -



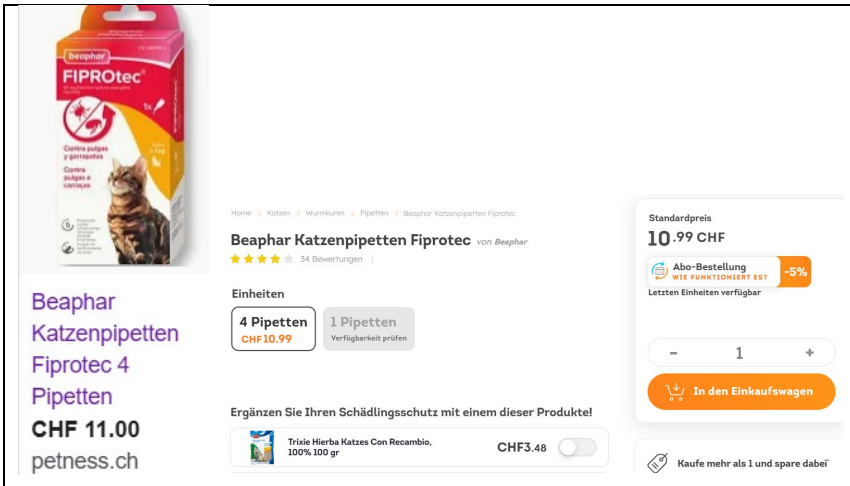
Drug information only in Spanish and Portuguese

Further examples: https://all4pets.ch/products/seresto-floh-und-zeckenhalsband / https://bestseller-shop.ch/seresto-halsband-fuer-grosse-hunde-ab-8-kg-7-8-monate-schutz-vor-zecken-floehen

Example 3: Product with unclear active ingredient - Beaphar fiprotec

Petness Switzerland

https://ch.petness.eu/katzen/beaphar/p-246779



Online application with subscription order

Composition: Chemicals?

From the name it can be assumed that the product contains fipronil. However, there is no information on this, nor any warnings.

The product is not approved in Switzerland, but is sold in Switzerland

4 Foreign websites

Online orders are also possible on various foreign webshops, warnings are usually missing

https://www.medpets.de/frontline-spot-on-katze / / https://www.bio-apo.com/product/seresto-halsband-f-grosse-hunde.1827977.html / https://www.produits-veto.com/de/Produkt/advantix-kleiner-hund-elanco-gegen-fl%C3%B6he/#description-product / ....etc.

5 Subscription orders

An individual may import ready-to-use medicinal products that are not approved in Switzerland in the small quantities required for personal use. In principle, pet owners are therefore permitted to order and import veterinary medicinal products for their own pets online, but only in small quantities, which is interpreted as "a maximum of one month's supply" (Article 48 of the Medicinal Products Licensing Ordinance).

In many cases, subscription orders are possible, i.e. the product is sent regularly. The legislation is circumvented by regular mailing.

11.5 Approvals Switzerland/ International legal cases (examples)

11.5.1 Approvals Switzerland

In addition to the veterinary medicinal products with the problematic active substances (16 veterinary medicinal products with the active substance fipronil, 4 with the active substance imidacloprid), 14 approvals with other active substances are listed.[87]

The active substance fipronil was first approved with the veterinary medicinal product 53004 Frontline ad us. vet., spray for dogs and cats, on 2 March 1995.
The active substance imidacloprid was first approved for cats with the veterinary medicinal product 54149 Bayvantage ad us. vet. solution for instillation on 2 July 1997

*In accordance with **Art. 81** of the Ordinance on Medicinal Products (VAM, SR 812.212.21), the approval of the Federal Office for the Environment (FOEN) is obtained before a new active substance is approved for the first time as a component of a veterinary medicinal product in Switzerland.*

In contrast**, neither fipronil nor imidacloprid have ever undergone environmental impact assessments**
An approval review was not carried out even after these substances were banned in agriculture (2019 and 2021 respectively).

11.5.2 Canada Refusal of approval,

Canada refused to authorise Seresto[88] , in particular because the approval documents were prepared by the company concerned (Bayer)

11.5.3 Legal cases USA/ Seresto

Class Action Suit, California March 22, 2021

Citing EPA Docs, Class Action Alleges Seresto Flea, Tick Collars Are Excessively Dangerous for Pets, Humans

Vargas et al v. Elanco Animal Health Incorporated March 22, 2021

https://www.classaction.org/news/citing-epa-docs-class-action-alleges-seresto-flea-tick-collars-are-excessively-dangerous-for-pets-humans

Class Action Suit, Indiana October 12, 2022

Seresto Flea Collar Class Action Alleges Bayer, Elanco Misled Pet Owners About Deadly Product

Shannon v. Bayer Healthcare LLC et al.

https://www.classaction.org/news/seresto-flea-collar-class-action-alleges-bayer-elanco-misled-pet-owners-about-deadly-product

The cases were closed on 26 January 2024 with a payment of USD 15 million in favour of the plaintiffs.

U.S. Congress Hearing June 16, 2022, Subcommittee on Economic and Consumer Policy

https://oversightdemocrats.house.gov/news/press-releases/during-subcommittee-hearing-experts-and-pet-owners-call-on-epa-to-take-dangerous

Final Report: **Seresto Flea and Tick Collars:Examining Why a Product Linked to More than 2,500 Pet Deaths Remains on the Market**

[87] List of veterinary medicinal products Swissmedic
https://www.swissmedic.ch/dam/swissmedic/de/dokumente/internetlisten/erweiterte_tam.xlsx.download.xlsx/Erweiterte_Arzneimittelliste%20TAM.xlsx
[88] Health Canada's Pest Management Regulatory Agency, Seresto Collar for Large Dogs (2013-1614); Seresto Collar for Small Dogs (2013-1616); and Seresto Collar for Cats (2013-1618) (Apr. 15, 2016). Cited in
https://oversightdemocrats.house.gov/sites/evo-subsites/democrats-oversight.house.gov/files/2022.06.15%20ECP%20Seresto%20Staff%20Report%20FINAL.pdf III.C

11.6 Active approvals Ectoparasiticides for pets with fipronil, imidacloprid, permethrin

Swissmedic Status 30.9. 2025

Approval number N° d'autorisation	Designation of the veterinary medicinal product Dénomination du médicament à usage vétérinaire	Approval holder Titulaire de l'autorisation	Date of first approval of the medicine Date de première autorisation du médicament	Period of validity of the approval * Durée de validité de l'AMM *	Dispensing category of medicinal product Cat. de remise du médicament	Active ingredient(s) Principe(s) actif(s)	Composition Composition
53004	Frontline ad us. vet., spray for dogs and cats	Boehringer Ingelheim (Switzerland) GmbH	02.03.1995	Unlimited	D	fipronilum	fipronilum 2.5 mg, copovidonum, alcohol isopropylicus, aqua, ad solutionem per 1 ml.
53752	Frontline Spot On cat ad us. vet., solution to be dripped on	Boehringer Ingelheim (Switzerland) GmbH	24.04.1996	Unlimited	D	fipronilum	fipronilum 50.00 mg, ethanolum, polysorbatum 80, povidonum, E 320 0.1 mg, E 321 0.05 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.5 ml.
53840	Frontline Spot On Dogs S ad us. vet., solution to be dripped on	Boehringer Ingelheim (Switzerland) GmbH	30.04.1997	Unlimited	D	fipronilum	fipronilum 67.0 mg, ethanolum, polysorbatum 80, povidonum, E 320 134.0 µg, E 321 67.0 µg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 0.67 ml.
53840	Frontline Spot On Dogs M ad us. vet., solution to be dripped on	Boehringer Ingelheim (Switzerland) GmbH	30.04.1997	Unlimited	D	fipronilum	fipronilum 134.0 mg, ethanolum, polysorbatum 80, povidonum, E 320 268.0 µg, E 321 134.0 µg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 1.34 ml.
53840	Frontline Spot On Dogs L ad us. vet., solution to be dripped on	Boehringer Ingelheim (Switzerland) GmbH	30.04.1997	Unlimited	D	fipronilum	fipronilum 268.0 mg, ethanolum, polysorbatum 80, povidonum, E 320 536.0 µg, E 321 268.0 µg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 2.68 ml.
53840	Frontline Spot On Dogs XL ad us. vet., solution to be dripped on	Boehringer Ingelheim (Switzerland) GmbH	30.04.1997	Unlimited	D	fipronilum	fipronilum 402.0 mg, ethanolum, polysorbatum 80, povidonum, E 320 804.0 µg, E 321 402.0 µg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 4.02 ml.
65550	Fiproclear Spot-on S ad us. vet., solution for dogs	ufamed AG	13.10.2015	Unlimited	D	fipronilum	fipronilum 67.0 mg, alcohol butylicus, povidonum K 12, polysorbatum 80, E 321 0.067 mg, E 320 0.134 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.67 ml.
65631	Fiproclear Spot-on 50 mg ad us. vet., solution for cats	ufamed AG	06.07.2016	Unlimited	D	fipronilum	fipronilum 50 mg, alcohol butylicus, povidonum K 12, polysorbatum 80, E 321 0.05 mg, E 320 0.1 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.5 ml.
65550	Fiproclear Spot-on M ad us. vet., solution for dogs	ufamed AG	13.10.2015	Unlimited	D	fipronilum	fipronilum 134.0 mg, alcohol butylicus, povidonum K 12, polysorbatum 80, E 321 0.134 mg, E 320 0.268 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 1.34 ml.

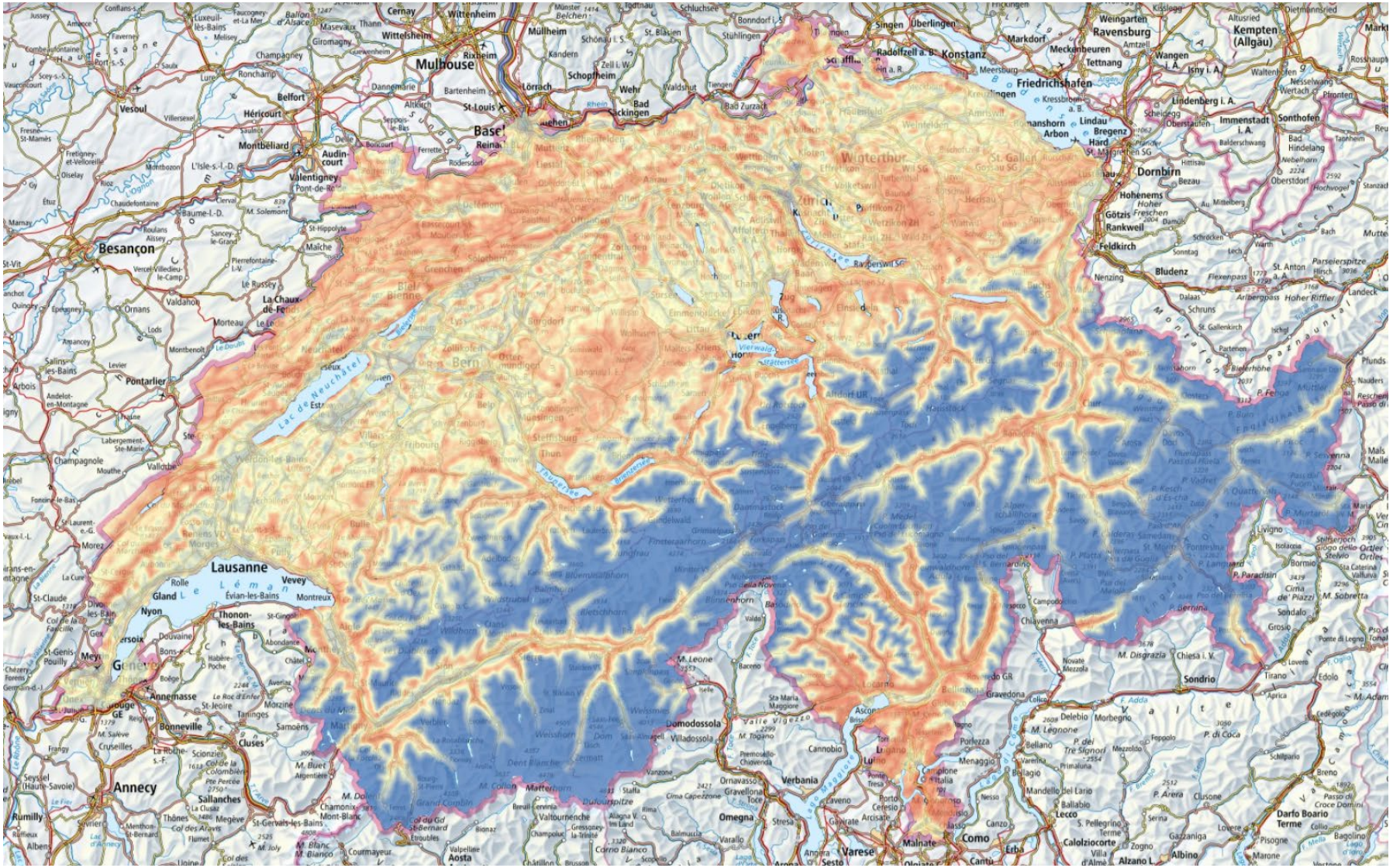
65550	Fiproclear Spot-on L ad us. vet., solution for dogs	ufamed AG	13.10.2015	Unlimited	D	fipronilum	fipronilum 268.0 mg, alcohol butylicus, povidonum K 12, polysorbatum 80, E 321 0.268 mg, E 320 0.536 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 2.68 ml.
65550	Fiproclear Spot-on XL ad us. vet., solution for dogs	ufamed AG	13.10.2015	Unlimited	D	fipronilum	fipronilum 402.0 mg, alcohol butylicus, povidonum K 12, polysorbatum 80, E 321 0.402 mg, E 320 0.804 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 4.02 ml.
60439	Effipro Spray ad us. vet., spray solution for dogs and cats	Virbac (Switzerland) AG	02.06.2010	Unlimited	D	fipronilum	fipronilum 2.5 mg, copovidonum, alcohol isopropylicus, aqua purificata, ad solutionem per 1 ml.
60440	Effipro Spot On cats ad us. vet., solution for instillation	Virbac (Switzerland) AG	09.06.2010	Unlimited	D	fipronilum	fipronilum 50 mg, E 320 0.1 mg, E 321 0.05 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.5 ml.
60441	Effipro Spot On Dogs S ad us. vet., solution for instillation	Virbac (Switzerland) AG	03.06.2010	Unlimited	D	fipronilum	fipronilum 67 mg, E 320 0.134 mg, E 321 0.067 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.67 ml.
60441	Effipro Spot On Dogs M ad us. vet., solution for instillation	Virbac (Switzerland) AG	03.06.2010	Unlimited	D	fipronilum	fipronilum 134 mg, E 320 0.268 mg, E 321 0.134 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 1.34 ml.
60441	Effipro Spot On Dogs L ad us. vet., solution for instillation	Virbac (Switzerland) AG	03.06.2010	Unlimited	D	fipronilum	fipronilum 268 mg, E 320 0.536 mg, E 321 0.268 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 2.68 ml.
60441	Effipro Spot On Dogs XL ad us. vet., solution for instillation	Virbac (Switzerland) AG	03.06.2010	Unlimited	D	fipronilum	fipronilum 402 mg, E 320 0.804 mg, E 321 0.402 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 4.02 ml.
68918	Combotec Spot-On Chat et Furet ad us. vet., solution pour spot-on	Biokema S.A.	15.03.2023	14.03.2028	B	fipronilum, (S)-methoprenum	fipronilum 50.0 mg, (S)-methoprenum 60.0 mg, povidonum K 17, polysorbatum 80, ethanolum 96 per centum, E 320 0.10 mg, E 321 0.05 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per 0.5 ml.
68919	Combotec Spot-On Chien S ad us. vet., solution pour spot-on	Biokema S.A.	15.03.2023	14.03.2028	B	fipronilum, (S)-methoprenum	fipronilum 67.0 mg, (S)-methoprenum 60.3 mg, E 320 0.134 mg, E 321 0.067 mg, ethanolum 96 per centum, polysorbatum 80, polyvidonum K 17, diethylenglycoli monoethylicum aetherum, ad solutionem per vase.
68919	Combotec Spot-On Chien M ad us. vet., solution pour spot-on	Biokema S.A.	15.03.2023	14.03.2028	B	fipronilum, (S)-methoprenum	fipronilum 134.0 mg, (S)-methoprenum 120.6 mg, E 320 0.268 mg, E 321 0.134 mg, ethanolum 96 per centum, polysorbatum 80, polyvidonum K 17, diethylenglycoli monoethylicum aetherum, ad solutionem pro vase.
68919	Combotec Spot-On Chien L ad us. vet., solution pour spot-on	Biokema S.A.	15.03.2023	14.03.2028	B	fipronilum, (S)-methoprenum	fipronilum 268.0 mg, (S)-methoprenum 241.2 mg, E 320 0.536 mg, E 321 0.268 mg, ethanolum 96 per centum, polysorbatum 80, polyvidonum K 17, diethylenglycoli monoethylicum aetherum, ad solutionem per vase.
68919	Combotec Spot-On Chien XL ad us. vet., solution pour spot-on	Biokema S.A.	15.03.2023	14.03.2028	B	fipronilum, (S)-methoprenum	fipronilum 402.0 mg, (S)-methoprenum 361.8 mg, E 320 0.804 mg, E 321 0.402 mg, ethanolum 96 per centum, polysorbatum 80, polyvidonum K 17, diethylenglycoli monoethylicum aetherum, ad solutionem per vase.

56044	Frontline Combo Spot-on cats and ferrets ad us. vet., solution	Boehringer Ingelheim (Switzerland) GmbH	23.05.2003	Unlimited	B	fipronilum, (S)-methoprenum	fipronilum 50.0 mg, (S)-methoprenum 60.0 mg, ethanolum, polysorbatum 80, povidonum, E 320 0.10 mg, E 321 0.05 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.5 ml.
56045	Frontline Combo Spot-on dogs S ad us. vet., solution	Boehringer Ingelheim (Switzerland) GmbH	22.05.2003	Unlimited	B	fipronilum, (S)-methoprenum	fipronilum 67.0 mg, (S)-methoprenum 60.3 mg, ethanolum, polysorbatum 80, povidonum K 17, E 320 0.13 mg, E 321 0.07 mg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 0.67 ml.
56045	Frontline Combo Spot-on dogs M ad us. vet., solution	Boehringer Ingelheim (Switzerland) GmbH	22.05.2003	Unlimited	B	fipronilum, (S)-methoprenum	fipronilum 134.0 mg, (S)-methoprenum 120.6 mg, ethanolum, polysorbatum 80, povidonum K 17, E 320 0.27 mg, E 321 0.13 mg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 1.34 ml.
56045	Frontline Combo Spot-on dogs L ad us. vet., solution	Boehringer Ingelheim (Switzerland) GmbH	22.05.2003	Unlimited	B	fipronilum, (S)-methoprenum	fipronilum 268.0 mg, (S)-methoprenum 241.2 mg, ethanolum, polysorbatum 80, povidonum K 17, E 320 0.54 mg, E 321 0.27 mg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 2.68 ml.
56045	Frontline Combo Spot-on dogs XL ad us. vet., solution	Boehringer Ingelheim (Switzerland) GmbH	22.05.2003	Unlimited	B	fipronilum, (S)-methoprenum	fipronilum 402.0 mg, (S)-methoprenum 361.8 mg, ethanolum, polysorbatum 80, povidonum K 17, E 320 0.80 mg, E 321 0.40 mg, diethylenglycoli monoethylicum aetherum, ad solutionem, per vase 4.02 ml.
65581	Frontect XS ad us. vet., solution for dropping for dogs	Boehringer Ingelheim (Switzerland) GmbH	29.05.2015	Unlimited	B	fipronilum, permethrinum	fipronilum 33.8 mg, permethrinum 252.4 mg, E 321 0.563 mg, N-methylpyrrolidonum 196.9 mg, triglycerida media, ad solutionem per vase 0.5 ml.
65581	Frontect S ad us. vet., solution for instillation for dogs	Boehringer Ingelheim (Switzerland) GmbH	29.05.2015	Unlimited	B	fipronilum, permethrinum	fipronilum 67.6 mg, permethrinum 504.8 mg, E 321 1.125 mg, N-methylpyrrolidonum 393.7 mg, triglycerida media, ad solutionem per vase 1.0 ml.
65581	Frontect M ad us. vet., solution for instillation for dogs	Boehringer Ingelheim (Switzerland) GmbH	29.05.2015	Unlimited	B	fipronilum, permethrinum	fipronilum 135.2 mg, permethrinum 1009.6 mg, E 321 2.250 mg, N-methylpyrrolidonum 787.4 mg, triglycerida media, ad solutionem per vase 2.0 ml.
65581	Frontect L ad us. vet., solution for dropping for dogs	Boehringer Ingelheim (Switzerland) GmbH	29.05.2015	Unlimited	B	fipronilum, permethrinum	fipronilum 270.4 mg, permethrinum 2019.2 mg, E 321 4.500 mg, N-methylpyrrolidonum 1574.8 mg, triglycerida media, ad solutionem per vase 4.0 ml.
65581	Frontect XL ad us. vet., solution for dropping for dogs	Boehringer Ingelheim (Switzerland) GmbH	29.05.2015	Unlimited	B	fipronilum, permethrinum	fipronilum 405.6 mg, permethrinum 3028.8 mg, E 321 6.750 mg, N-methylpyrrolidonum 2362.2 mg, triglycerida media, ad solutionem per vase 6.0 ml.
65118	Effitix Spot On Dogs XS ad us. vet., solution for instillation	Virbac (Switzerland) AG	17.06.2014	Unlimited	B	fipronilum, permethrinum	fipronilum 26.8 mg, permethrinum 240 mg, E 320 0.088 mg, E 321 0.044 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.44 ml.
65118	Effitix Spot On Dogs S ad us. vet., solution for instillation	Virbac (Switzerland) AG	17.06.2014	Unlimited	B	fipronilum, permethrinum	fipronilum 67 mg, permethrinum 600 mg, E 320 0.22 mg, E 321 0.11 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 1.1 ml.

65118	Effitix Spot On Dogs M ad us. vet., solution for instillation	Virbac (Switzerland) AG	17.06.2014	Unlimited	B	fipronilum, permethrinum	fipronilum 134 mg, permethrinum 1200 mg, E 320 0.44 mg, E 321 0.22 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 2.2 ml.
65118	Effitix Spot On Dogs L ad us. vet., solution for instillation	Virbac (Switzerland) AG	17.06.2014	Unlimited	B	fipronilum, permethrinum	fipronilum 268 mg, permethrinum 2400 mg, E 320 0.88 mg, E 321 0.44 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 4.4 ml.
65118	Effitix Spot On Dogs XL ad us. vet., solution for instillation	Virbac (Switzerland) AG	17.06.2014	Unlimited	B	fipronilum, permethrinum	fipronilum 402 mg, permethrinum 3600 mg, E 320 1.32 mg, E 321 0.66 mg, alcohol benzylicus, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 6.6 ml.
65692	Effipro Duo Spot-on Dog S ad us. vet., solution for dropping	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 67 mg, pyriproxifen 20 mg, E 320 0.134 mg, E 321 0.067 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.67 ml.
65705	Effipro Duo Spot-on cat S/M ad us. vet., solution for instillation	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 50 mg, pyriproxifen 60 mg, E 320 0.1 mg, E 321 0.05 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 0.5 ml.
65692	Effipro Duo Spot-on Dog M ad us. vet., solution to be dripped on	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 134 mg, pyriproxifen 40 mg, E 320 0.268 mg, E 321 0.134 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 1.34 ml.
65705	Effipro Duo Spot-on cat L/XL ad us. vet., solution for instillation	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 100 mg, pyriproxifen 120 mg, E 320 0.2 mg, E 321 0.1 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 1 ml.
65692	Effipro Duo Spot-on Dog L ad us. vet., solution to be dripped on	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 268 mg, pyriproxifen 80 mg, E 320 0.536 mg, E 321 0.268 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 2.68 ml.
65692	Effipro Duo Spot-on Dog XL ad us. vet., solution to be dripped on	Virbac (Switzerland) AG	07.06.2016	Unlimited	B	fipronilum, pyriproxifen	fipronilum 402 mg, pyriproxifen 120 mg, E 320 0.804 mg, E 321 0.402 mg, diethylenglycoli monoethylicum aetherum, ad solutionem per vase 4.02 ml.
62811	Seresto ad us. vet., collar against ectoparasites for dogs > 8 kg	Elanco Animal Health AG	12.03.2013	Unlimited	B	imidaclopridum, flumethrinum	imidaclopridum 4.500 g, flumethrinum 2.025 g, dibutyl adipate, propylenglycoli octanoas et decanoas, epoxidised soybean oil, acidum stearicum, E 171, E 172, polyvinyl chloride, pro praeparatione.
62811	Seresto ad us. vet., collar against ectoparasites for cats and dogs ≤ 8 kg	Elanco Animal Health AG	12.03.2013	Unlimited	B	imidaclopridum, flumethrinum	imidaclopridum 1.250 g, flumethrinum 0.563 g, dibutyl adipate, propylenglycoli octanoas et decanoas, epoxidised soybean oil, acidum stearicum, E 171, E 172, polyvinyl chloride, pro praeparatione.
56909	Advantix 40 ad us. vet., spot-on solution to be dripped onto the skin for dogs (< 4 kg)	Elanco Animal Health AG	13.02.2004	Unlimited	B	imidaclopridum, permethrinum	imidaclopridum 40 mg, permethrinum 200 mg, N-methylpyrrolidonum 194 mg, triglycerida media, acidum citricum, E 321 0.4 mg, ad solutionem per vase.
56909	Advantix 100 ad us. vet., spot-on solution to be dripped onto the skin for dogs (> 4-10 kg)	Elanco Animal Health AG	13.02.2004	Unlimited	B	imidaclopridum, permethrinum	imidaclopridum 100 mg, permethrinum 500 mg, N-methylpyrrolidonum 484 mg, triglycerida media, acidum citricum, E 321 1 mg, ad solutionem per vase.

56909	Advantix 250 ad us. vet., spot-on solution for dropping onto the skin for dogs (> 10-25 kg)	Elanco Animal Health AG	13.02.2004	Unlimited	B	imidaclopridum, permethrinum	imidaclopridum 250 mg, permethrinum 1250 mg, N-methylpyrrolidonum 1210 mg, triglycerida media, acidum citricum, E 321 2.5 mg, ad solutionem per vase.
56909	Advantix 400 ad us. vet., spot-on solution to be dripped onto the skin for dogs (> 25-40 kg)	Elanco Animal Health AG	13.02.2004	Unlimited	B	imidaclopridum, permethrinum	imidaclopridum 400 mg, permethrinum 2000 mg, N-methylpyrrolidonum 1936 mg, triglycerida media, acidum citricum, E 321 4 mg, ad solutionem per vase.
51793	exspot ad us. vet., solution for application to the skin for dogs	MSD Animal Health GmbH	07.10.1993	Unlimited	B	permethrinum	permethrinum 715 mg, 1-methoxy-2-propanolum, per vase.

11.7 Tick model (Federal Office of Public Health FOPH) (swisstopo/ FOPH)



model
(Federal Office of Public Health BAG)

https://s.geo.admin.ch/90inv14odyg8

Maximum status
Early summer/
15-20 C/ Humidity 80%

The conditions on which the model is based correspond to early summer weather: mild and humid weather conditions with temperatures of 15 to 20 degrees Celsius and a relative humidity of 80 %. The tick bite risk is the product of tick risk and exposure. Tick activity is seasonal; it starts in early spring at temperatures from seven degrees Celsius and increases steadily in spring and early summer until the first summer heat. Tick activity collapses at temperatures above 30 degrees Celsius and bright sunshine. In autumn, the probability of tick bites increases again. At temperatures below seven degrees Celsius, the risk of tick bites decreases as the ticks reduce their bodily functions in order to survive the winter in a dormant state.

11.8 Tick-borne diseases pets Switzerland

Disease	Triggering pathogen	Host	Vector	Geographical distribution in Europe	Expression of clinical signs in dogs and cats	Vaccination possible	Occurrence Switzerland	Switzerland/ Regions	Incidence/ Switzerland Cases per year
DISEASES CAUSED BY PROTOZOA									
Piroplasmosis (babesiosis, cytauxzoonosis)	*Babesia canis*	Dog, Wolf	*Dermacentor reticulatus*	Western, Southern and Central Europe to the Baltic States	Dog: moderate to severe; mild course with vaccination	YES	**YES, rare**	Western Switzerland, individual hotspots in German-speaking Switzerland	Unknown (Germany: incidence 0.000125)
	Babesia vogeli	Dog	*Rhipicephalus sanguineus*	Southern Europe according to the distribution area of the vector	mild to moderate		**NO** (vector occurring*)		unknown
	B. gibsoni and B. gibsoni-like babesiae	Dog, Wolf	*Haemaphysalis* spp, *Dermacentor* spp.	Sporadic and rare in Europe	Moderate to difficult		Rare, individual cases described		unknown
	Babesia annae	Dog, Fox	*Ixodes* hexagonus**	North-west Spain, Portugal, Croatia	Moderate to difficult		**NO** (possibly for wild animals)		
	Cytauxzoon felis and *Cytauxzoon manul*	Lynx and other wild felids, cat	*Dermacentor* spp.** *Rhipicephalus* sanguineus** *Ixodes* ricinus**	South-West Europe, Germany	Moderate to difficult		Very rare -individual cases described-		unknown
Hepatozoonosis	*Hepatozoon canis***	Dog	*Rhipicephalus sanguineus*	Southern Europe	Mostly mild infection; subclinical		**NO** (vector occurring*)		unknown
	Hepatozoon spp.	Cat	unknown	Spain	subclinical		**NO**		
DISEASES CAUSED BY NEMATODES									
Filariasis	*Acanthocheilone-ma (Dipetalonema)spp. Cercopithifilaria* spp.	Dog, Cat	*Rhipicephalus* sanguineus***	Southern Europe	low		**NO** (vector occurring*)		unknown

* The occurrence of the tick says nothing about the actual infection of ticks with the pathogen in Switzerland, nor about the incidence of cases. The experts consulted (Parasitological Institute of the University of Zurich) were unable to provide any precise information on the incidence of such cases in Switzerland (need for research)

** Transmission of Hepatozoon spp. occurs through oral ingestion of an infected tick, not through a tick bite.

Disease	Triggering pathogen	Host	Vector	Geographical distribution in Europe	Expression of clinical signs in dogs and cats	Vaccination possible	Occurrence Switzerland	Switzerland/ Regions	Incidence/ Switzerland Cases per year
DISEASES CAUSED BY BACTERIA									
Bartonellosis	*Bartonella henselae, Bartonella vinsoni, Bartonella* spp.	many animals, dog, cat, human	Presumably also ticks	All of Europe	usually subclinical infection, chronic endocarditis		**Yes, rarely** Connection with ticks unclear		unknown
Borreliosis (Lyme disease)	*Borrelia burgdorferi* Complex (in Switzerland mainly *B. afzelii* and *B. garinii*)	many animals, especially rodents, dogs, cats, humans	*Ixodes ricinus I. hexagonus I. persulcatus*	All of Europe	mostly subclinical, in dogs if clinically typically disturbed general condition and lameness	YES	**YES**		unknown
Ehrlichiosis (monocytic)	*Ehrlichia canis*	Dog (cat)	*Rhipicephalus sanguineus*	Southern Europe according to the distribution area of the vector	Moderate to difficult		**YES**		unknown
Neoehrlichiosis	*Neoehrlichia mikurensis*	Rodent, human, dog	*Ixodes ricinus*	Europe	unknown		**Yes, rarely**		unknown
Anaplasmosis (granulocytic anaplasmosis)	*Anaplasma phagocytophilum*	many animals, dog, cat, human	*Ixodes ricinus, (I. triangulice ps)*	All of Europe	Mild and subclinical infections, mostly moderate symptoms with apathy		**Yes, rarely**		unknown
Anaplasmosis (infectious cyclic thrombocytopenia)	*Anaplasma platys*	Dog	*Rhipicephalus sanguineus*	Southern Europe according to the distribution area of the vector	usually asymptomatic		**Yes, rarely**		unknown
Infections caused by rickettsia (Mediterranean spotted fever, MSF)	*Rickettsia conorii*	Dog	*Rhipicephalus sanguineus*	Southern Europe according to the distribution area of the vector	Subclinical infection or moderate symptoms with apathy		**Yes, rarely**		unknown
Tularemia	*Francisella tularensis*	Hare, rabbit, mouse, cat	*Ixodes* spp. *Dermacentor* spp. *Haemaphysalis* spp. *Rhipicephalus sanguineus*	mainly in Southern Europe but also in Switzerland	Subclinical infection, occasionally moderate to severe symptoms in young cats		**Yes, rarely**		unknown

The occurrence of the tick says nothing about the actual infection of ticks with the pathogen in Switzerland, nor about the incidence of cases.
The experts consulted (Parasitological Institute of the University of Zurich) were unable to provide any precise information on the incidence of such cases in Switzerland (need for research).

Disease	Triggering pathogen	Host	Vector	Geographical distribution in Europe	Expression of clinical signs in dogs and cats	Vaccination possible	Occurrence Switzerland	Switzerland/ Regions	Incidence/ Switzerland (pets) Cases per year
DISEASES CAUSED BY VIRUSES	***Viral diseases*** *(TBE, louping ill) are very rare in pets and are* ***not*** *considered* ***relevant*** *by parasitologists in Switzerland (Kroeber, pers. comm.).*								
Early summer meningo encephalitis	TBE virus (flavivirus)	many animals, rodents, dog	*Ixodes ricinus* *I. persulcatus*	Central, Eastern and Northern Europe	Neurological clinical symptoms, can be moderate but also severe, sporadic severe cases in dogs	**Human: YES** **Pet: NO**	**YES, very rare in pets**		unknown
Louping-ill disease	Louping-ill virus (Flavivirus)	many animals, especially sheep, dogs	*Ixodes ricinus*	Great Britain, Ireland	Neurological clinical symptoms, can be moderate to severe, but are not frequently described		**NO**		

Compiled on the basis of the list ESCCAP Guideline 3, Ectoparasites, page 8 https://www.esccap.ch/demo/wp-content/uploads/2022/02/ESCCAP-CH_GL3_Ekto_rev_d_def_180222.pdf

Additional information Switzerland by mail from: Institute of Parasitology, University of Zurich, Winterthurerstr. 266A, 8057 Zurich

Precise information on the incidence of the various diseases could not be provided. In the comments, the experts often noted "cases have been published" or "this tick occurs in Switzerland". Information on regionalisation was also only provided in fragments.

Further information: ***2.4.2 Occurrence of tick-borne diseases in*** pets ***in Switzerland***

11.9 Repellents - Repellent examples

Repellents have been scientifically proven to be effective (see 15.5Repellents for controlling ectoparasites). Their odour keeps ticks away and they are explicitly recommended by the FOPH for tick repellents in humans (Kik, Antibrumm etc.).

11.9.1 Examples of ingredients / proof of efficacy

Active ingredient	Scientific proof of
Natural oils	
Coconut oil	Better than DEET Repellent Compounds Derived from Coconut Oil https://pmc.ncbi.nlm.nih.gov/articles/PMC6145915/
Geraniol	Efficacy of 1% geraniol (Fulltec) as a tick repellent https://pubmed.ncbi.nlm.nih.gov/19839268
Lavender oil	Repellent effects of the essential oil of Lavendula angustifolia against adults of Hyalomma marginatum rufipes https://pubmed.ncbi.nlm.nih.gov/18237038/
Citronella oil	Lemongrass essential oil and DEET inhibit attractant detection in infected and non-infected *Ixodes scapularis* ticks
Neem Neem tree Margosa extract	ANTI-TICK PROPERTIES/REPELLENCY OF NEEM, AZADIRACHTA INDICA ON RHIPICEPHALUS SANGUINEUS (ACARINA) UNDER LABORATORY CONDITIONS https://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=1507&context=jbm
Cinnamon oil	Repellent effects of Chinese cinnamon oil on nymphal ticks of Haemaphysalis longicornis, Rhipicephalus haemaphysaloides, and Hyalomma asiaticum
Chemical repellents	
DEET	Field and Laboratory Evaluations of the Efficacy of DEET Repellent against Ixodes Ticks LINK
Icaridine	Icaridin (Review) https://www.sciencedirect.com/topics/medicine-and-dentistry/icaridin

In practice, combinations of these ingredients are often used to enhance the effect-examples:

Product	Active ingredients	Duration of action	Manufacturer/ distribution (example)
 Optipet collar	Margosa extract, lavandin oil	4 months	microspot.ch, coop bau+hobby, BRACK.CH, LEShop.ch MIGROS
 meikocare Spot-on	Icaridin, lemon eucalyptus oil and geraniol	4 weeks	DO IT+GARDEN MIGROS Make it. Love it.
 Vinx Bio Spot On Dog	Neem oil and citronella	3- 4 weeks	iPet

12 Bibliography

12.1 Documents Environmental hazard Switzerland (German)

Fact sheet: Insect decline in Switzerland and possible consequences for society and the economy/ Scnat 2019)

FOEN: Underwater biodiversity: many fish species are in danger https://www.bafu.admin.ch/bafu/de/home/themen/wasser/dossiers/magazin2023-3-focus/artenvielfalt-unter-wasser-viele-fischarten-sind-in-gefahr.html and SRF 1.8.2020 Swiss fish under pressure and Switzerland. Fishing statistics

FOEN: Red List of breeding birds https://www.bafu.admin.ch/dam/bafu/de/dokumente/biodiversitaet/uv-umwelt-vollzug/rote-liste-brutvoegel.pdf.download.pdf/rote_liste_der_brutvoegel.pdf and NZZ 13.10.2022

Micropollutants in watercourses (admin.ch); studies ("Insecticides in Swiss watercourses" and "Low concentrations with high impact").

Red lists of mayflies, stoneflies and caddisflies - FOEN

Public overview, water protection in general: FOEN: Water quality: How are the streams and rivers in Switzerland? https://youtu.be/74YRrNbqfeU?

12.2 Environmental toxicity/ Scientific reports and media

12.2.1 Effects of insecticides in general

The rise of systemic insecticides and their environmental repercussions https://www.researchgate.net/publication/383673636_The_rise_of_systemic_insecticides_and_their_environmental_repercussions

A comprehensive review on environmental and human health impacts of chemical pesticide usage https://www.sciencedirect.com/science/article/pii/S2405665024001112

Contamination of the Aquatic Environment with Neonicotinoids and its Implication for Ecosystems https://www.scirp.org/reference/referencespapers?referenceid=3897497

12.2.2 Scientific reports Effects of flea/tick remedies

Potential role of veterinary flea products in widespread pesticide contamination of English rivers https://www.sciencedirect.com/science/article/abs/pii/S0048969720370911

To flea or not to flea: survey of UK companion animal ectoparasiticide usage and activities affecting pathways to the environment https://pmc.ncbi.nlm.nih.gov/articles/PMC10405796/

Down-the-drain pathways for fipronil and imidacloprid applied as spot-on parasiticides to dogs: Estimating aquatic pollution: https://www.sciencedirect.com/science/article/pii/S0048969724003103

High prevalence of veterinary drugs in bird's nests https://www.sciencedirect.com/science/article/pii/S

12.2.3 Aquatic toxicity

Fipronil

CQC (AA-EQS) and AQC (MAC-EQS) - Proposal by the Ecotox Centre for: Fipronil
https://www.oekotoxzentrum.ch/media/nksepguv/fipronil_eqs_dossier_stand-2021.pdf

Toxicity_of_the_Insecticide_Fipronil_and_Its_Degradates_to_Benthic_Macroinvertebrates_of_Urban_Streams (for Chironomus Dilutus)
https://www.researchgate.net/publication/259461867_Toxicity_of_the_Insecticide_Fipronil_and_Its_Degradates_to_Benthic_Macroinvertebrates_of_Urban_Streams

Impacts of the phenylpyrazole insecticide fipronil on larval fish
https://www.sciencedirect.com/science/article/abs/pii/S0048969712004986?via%3Dihub

EQS - Proposal of the Ecotox Centre for: Imidacloprid https://www.oekotoxzentrum.ch/media/urljbu2w/imidacloprid

Glycometabolic disorder induced by chronic exposure to low-concentration imidacloprid in zebrafish
https://pubmed.ncbi.nlm.nih.gov/38788955/

Integrate transcriptomic and metabolomic analysis reveals the underlying mechanisms of behavioral disorders in zebrafish (Danio rerio) induced by imidacloprid https://pubmed.ncbi.nlm.nih.gov/36731560/

Permethrin

CQC (AA-EQS) and AQC (MAC-EQS) - Proposal by the Ecotox Centre for: Permethrin
https://www.oekotoxzentrum.ch/media/q05b1p1n/permethrin_eqs_dossier_update_2022_corr_2023_corr2025.pdf

12.2.4 Media reports/ NGO

BBC **Spring Watch: The impact of flea treatments on UK rivers**

Flea-mergency. | The Rivers Trust https://www.wcl.org.uk/uk-falling-behind-in-fight-against-toxic-forever-chemicals.asp

Toxic chemical cocktails found at over 1,600 river and groundwater sites across England
https://www.wcl.org.uk/toxic-chemical-cocktails-in-rivers-across-england.asp

The high levels of toxic 'forever chemicals' in our fish could be harming us
https://inews.co.uk/news/environment/high-levels-toxic-chemicals-fish-harming-2785657

Toxic pet flea and tick treatments are polluting UK freshwaters | Imperial News | Imperial College London

Pet treatments could be harming freshwater life - Freshwater Biological Association (fba.org.uk)

Kent wildlife - Flea treatment is toxic to wildlife: Here are the facts
https://www.kentwildlifetrust.org.uk/blog/flea-treatment-toxic-to-wildlife#:~:text=Not%20all%20flea%20treatments%20are,interfere%20with%20your%20hormone%20system

Angling trust + Diverse NGO/ GB **Open letter calling on the UK Government to ban five toxic pesticides from being included in medicines for cats and dogs.**

Songbirds being killed by pesticides found in pet fur flea treatments
https://www.theguardian.com/environment/2025/jan/27/pet-fur-found-in-songbird-nests-contains-high-levels-of-pesticides-study-finds

12.3 Tick diseases/ Distribution of ticks Switzerland

Mapping to predict the distribution of ticks in Switzerland -Zeckenkarte Schweiz Tick map Swisstopo/ BAG
https://map.geo.admin.ch/#/map?lang=de&center=2655897.49,1191117.94&z=2&topic=ech&layers=ch.bag.zeckenstichmodell&bgLayer=ch.swisstopo.pixelkarte-farbe

The Swiss Tick Reference Centre consists of two contractual partners:

- Institut de Microbiologie du Centre Hospitalier Universitaire Vaudois (CHUV)
- ADMED Microbiology

12.4 Toxicity (human/animal) of the insecticides used in ectoparasiticides

12.4.1 Active ingredients used/ basic information

Fipronil: https:
Imidacloprid https://de.wikipedia.org/wiki/Imidacloprid https://www.vetpharm.uzh.ch/tak/05000000/00056045.03
Permethrin https://de.wikipedia.org/wiki/Permethri
Pyrethroids https://de.wikipedia.org/wiki/Pyrethroide
Isoxazoline https://de.wikipedia.org/wiki/Isoxazolin

12.4.2 Prohibitions in agriculture/ timing

Fipronil: Active substance withdrawal: 01.08.2019; sell-out period: none, as no plant protection products containing fipronil were approved in Switzerland at this time. The last product containing fipronil was withdrawn on 11.04.2013 (sell-out deadline: 11.04.2013, use deadline: 11.04.2014)

Imidacloprid: Withdrawal of active ingredient: 01.07.2021 Sell-out deadline: 31.12.2021 Use deadline: 01.06.2022

Permethrin: Withdrawal of active substance: 01.01.2007 Sell-out period: 31.12.2008 Use period: n.a.

12.4.3 Danger to humans

12.4.3.1 Fipronil

National Pesticide Information Centre, USA: Fipronil technical sheet
https://npic.orst.edu/factsheets/archive/fiptech.html

Human exposure to fipronil from dogs treated with frontline https://pubmed.ncbi.nlm.nih.gov/12361121/

Distribution of fipronil in humans, and adverse health outcomes of *in utero* fipronil sulfone exposure in newborns
https://www.sciencedirect.com/science/article/abs/pii/S1438463918308575

Proteomic analysis of fipronil-induced molecular defects in spermatozoa
https://www.nature.com/articles/s41598-024-57876-4

Fipronil disturbs the antigen-specific immune responses and GABAergic gene expression in the ovalbumin-immunised BALB/c mice https://pubmed.ncbi.nlm.nih.gov/38254069/

Effects of Fipronil on the EEG of Long Evans Rats
https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=230786

Chronic Administration of Fipronil Heterogeneously Alters the Neurochemistry of Monoaminergic Systems in the Rat Brain https://pubmed.ncbi.nlm.nih.gov/32784929/

The insecticide fipronil and its metabolite fipronil sulphone inhibit the rat alpha1beta2gamma2L GABA(A) receptor
https://pubmed.ncbi.nlm.nih.gov/18660823/

12.4.3.2 Imidacloprid

National Pesticide Information Centre, USA: Imidacloprid technical sheet
https://npic.orst.edu/factsheets/archive/imidacloprid.html

Impact of imidacloprid exposure on gestational hyperglycemia: A multi-omics analysis
https://pubmed.ncbi.nlm.nih.gov/38850706/

Exposure to multiple neonicotinoid insecticides, oxidative stress, and gestational diabetes mellitus: Association and potential mediation analyses https://pubmed.ncbi.nlm.nih.gov/37651928/

Multiple neonicotinoids in children's cerebro-spinal fluid, plasma, and urine https://pubmed.ncbi.nlm.nih.gov/35016674/

Imidacloprid as reproductive toxicant and endocrine disruptor: investigations in laboratory animals
https://intapi.sciendo.com/pdf/10.2478/aiht-2018-69-3144

Urinary neonicotinoid insecticides and adiposity measures among 7-year-old children in northern China: a cross-sectional study https://www.sciencedirect.com/science/article/abs/pii/S1438463923000792

Associations of neonicotinoids with insulin and glucose homeostasis parameters in US adults: NHANES 2015-2016
https://pmc.ncbi.nlm.nih.gov/articles/PMC8578312

Chronic low-dose exposure to imidacloprid potentiates high fat diet-mediated liver steatosis in C57BL/6J male mice
https://pmc.ncbi.nlm.nih.gov/articles/PMC8025430/

Cytotoxicity, morphological and ultrastructural effects induced by the neonicotinoid pesticide, imidacloprid, using a rat Leydig cell line (LC-540) https://pubmed.ncbi.nlm.nih.gov/37926370/

Human acute poisoning incidents associated with neonicotinoid pesticides in the U.S. Incident Data System (IDS) database from 2018-2022 - frequency and severity show public health risks, regulatory
https://ehjournal.biomedcentral.com/articles/10.1186/s12940-024-01139-2

Acute effects of the imidacloprid metabolite desnitro-imidacloprid on human nACh receptors relevant for neuronal signalling https://link.springer.com/article/10.1007/s00204-021-03168-z

12.4.3.3 Permethrin

Permethrin https://en.wikipedia.org/wiki/Permethri

Review paper: Permethrin-induced oxidative stress and toxicity and metabolism. A review
https://www.sciencedirect.com/science/article/abs/pii/S0013935116301621

12.4.4 Hazard to treated pets (fipronil/imidacloprid)

Veterinary Toxicology (Third Edition) Ch 42, Fipronil
https://www.sciencedirect.com/science/article/abs/pii/B9780128114100000428

A survey for small animal veterinarians regarding flea and tick control pesticide products
https://pmc.ncbi.nlm.nih.gov/articles/PMC3174502/

12.4.4.1 Examples EPA Incident Data System (IDS)

https://ordspub.epa.gov/ords/pesticides/f?p=359:1

Frontline (spot-on, fipronil, sometimes combined with S-methoprene, pyriproxyfen, depending on the product):
53045 reported cases of damage, including 1579 deaths in pets and 1257 cases in humans

Seresto (flea collar, imidacloprid + flumethrin)
111526 reported cases of damage, including 3309 pet deaths and 980 human cases

Permethrin (various products): around 74,000 cases in pets, 16,000 cases in humans

12.5 Repellents for the control of ectoparasites

12.5.1 Reviews

Efficacy of plant-derived compound compared to ectoparasiticides: A literature
https://huveta.hu/bitstream/handle/10832/3903/521362278.pdf

Efficacy and Safety of Natural Essential Oils Mixture on Tick Infestation in Dogs. Adv Anim Vet Sci 8:.
https://doi.org/10.17582/journal.aavs/2020/8.4.398.407

Preventing tick attachment to dogs using essential oils
https://www.sciencedirect.com/science/article/abs/pii/S1877959X17305708

Comparative studies of the repellency of different dodecanoic acid-formulations against Ixodes ricinus ticks
https://pubmed.ncbi.nlm.nih.gov/18397516/

Global Lyme Alliance Practice Effective Tick Prevention
https://www.globallymealliance.org/tick-repellent/

Essential oil pharmaceuticals for killing ectoparasites on dogs https://pubmed.ncbi.nlm.nih.gov/38311320/

Efficacy and Safety of Natural Essential Oils Mixture on Tick Infestation in Dogs. Adv Anim Vet Sci 8:.
https://doi.org/10.17582/journal.aavs/2020/8.4.398.407

Efficacy of Tagetes minuta (Asteraceae) essential oil against Rhipicephalus sanguineus (Acari: Ixodidae) on infested dogs and in vitro. Exp Appl Acarol 70:483-489. https://doi.org/10.1007/s10493-016-

Synergism of thymol, carvacrol and eugenol in larvae of the cattle tick, Rhipicephalus microplus, and brown dog tick, Rhipicephalus sanguineus. Medical and Veterinary Entomology 30:377-382. https://doi.org/10.1111/mve.12181

A Dietary Plant Extract Formulation Helps Reduce Flea Populations in Cats: A Double-Blind Randomised Study. Pharmaceuticals 16:195. https://doi.org/10.3390/ph16020195

Repelling properties of some plant materials on the tick *Ixodes ricinus* L.
https://www.sciencedirect.com/science/article/abs/pii/S0944711305000954

The repellent efficacy of eleven essential oils against adult *Dermacentor reticulatus* ticks
https://www.sciencedirect.com/science/article/abs/pii/S1877959X17300778

Synergism of thymol, carvacrol and eugenol in larvae of the cattle tick, Rhipicephalus microplus, and brown dog tick, Rhipicephalus sanguineus. Medical and Veterinary Entomology 30:377-382. https://doi.org/10.1111/mve.12181

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