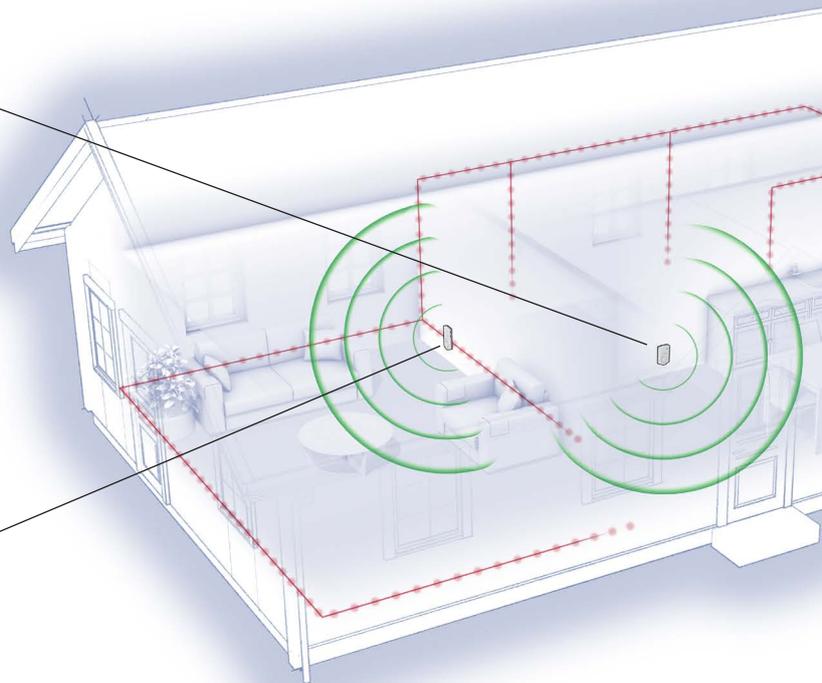


Ultrasound and
Extremely Low Frequency Magnetic Field

Repelling effect on mice and rats

12-12.U/ELMF-01_M



www.silverline.se

Poison Free Pest Control

Repelling system against mice and rats



Silverline
Mus & Råttfritt 200-80™

Silverline
Mus & Råttfritt 50™

Mice and rats

In Europe mainly the house mouse, but also different kinds of the field mouse, and the common rat, can be found indoors in buildings when they seek shelter among humans.

Mice prefer to stay inside walls, floors and ceilings and other concealed spaces, while rats prefer humid environments such as basements and drains.

Mice habits of gnawing on anything, including electrical cables, and their soil, may cause serious problems. Being omnivores and the fact that they reproduce fast, the population increase rapidly when they have established.

The rats dig and gnaw out wide tunnel systems where they have settled down. They live together in large ranked groups, reproduce very fast and carry lots of diseases.

Crucial to repel

Mice are able to get through very small holes, appr. 6-7 mm, and a rat would need a 20 mm hole only. It is very difficult to make them leave the area when they have settled down, therefore it is very important to stop them from nesting.

Communicate using ultrasound

All Silverline repellers emit an adapted ultrasound. Since both mice and rats communicate using ultrasound, the repellers disturb their natural way of communicating. A Silverline repeller would certainly stop them from establish in a building. Once inside the building it would take some days for them to leave and escape from the ultrasound as the Mus & Råttfritt is plugged in.

Disturbing pulses

Mice often use electrical cables and ducts inside walls and ceilings as pathways, and they would even gnaw on them. To boost the repelling effect, the Silverline Pest Control gardenSystem® features products generating pulses distributed through the electrical cables. The pulses affect the electromagnetic field that always radiate from electrical cables when they distribute current to connected equipment. The pulses make the electromagnetic field intense to vary. These variations of the electromagnetic field affect the spatial memory and learning of the mice, and therefore they are repelled from the electrical cables and the pulses.

Ultrasound and Extremely Low Frequency Magnetic Field (ELFMF) repelling effect on mice and rats

Ultrasound

During the past 30 – 40 years, numerous investigations and theory has been put through in order to show the repelling effect of acoustical energy on rodents. Ultrasound is characterized by sound waves with a frequency above 18 kHz not audible to humans. Nevertheless the sound is very disturbing to rodents, affecting their normal behavior, such as not be able to detect danger which strain them to leave the area where the ultrasound is present.

Extremely Low Frequency Magnetic Fields repelling effect on rodents

Exposure to Extremely Low Frequency Magnetic Fields (ELFMF) with 4 μ T intensity and 10 - 30 Hz frequency, has proven to cause behavioral and cognitive disturbances and interfere with brain activity which in turn affects spatial memory and learning with rodents. This effect can be exploited in manners of repelling rats and mice.

Ultrasound and ELFMF combined as pest repeller

A combination of ultrasound with a frequency above 18 kHz and an ELFMF with 4 μ T intensity at 10 – 30 Hz frequency as a pest repelling unit, makes a powerful protection against having rodents established indoors.

Silverline Pest Control *gardenSystem*[®]

Silverline Pest Control *gardenSystem*[®] offers a complete guard against having rodents established indoors - Poison free. Our repelling system features products that emits adapted ultrasound and the effective combination of ultrasound and electromagnetic pulses distributed through the electrical wiring.

Result of research and development

Many species can hear sound frequencies inaudible to humans (Brown and Pye 1975; Heffner and Heffner 2007); rodents, for example, are very sensitive to ultrasound (Olivier et al. 1994).

Experimental studies show that mice actively try to avoid the ultrasound by keeping as far away from it as they can. The studies also show the amplifying effect of electromagnetic pulses.

The behavioral and cognitive disturbances and interference with brain activity produced by extremely low-frequency magnetic fields (ELFMF), effects spatial memory and learning on mice. The protocol from the study will also show how mice respond to exposure from extremely low-frequency magnetic fields, and in what way it is possible to achieve a repelling effect on pest species with the actual units tested.

The Silverline product range Mus & Råttfritt is a result of research and development including the facts from many laboratory tests, where the effect of rats and mice exposed to ultrasound and ELFMF is recorded.

Ultrasound and Extremely Low Frequency Magnetic Field

Repelling effect on mice and rats

12-12.U/ELMF-01

To investigate the repelling effect of our Pest Control products we decided to run a study on mice. The result was recorded in the document 12-12.U/ELMF-01*. The study was designed to provide information as to the repelling effect of the units tested, where the majority of the tested population was repelled. This was carried out by using sets containing two choice boxes connected by a tube.

Our study will show the effect of Mus & Råttfritt 50 and Mus & Råttfritt 200-80. As a comparison a non-Silverline product was also tested. As reference a control group was also observed.

Mus & Råttfritt 50 is designed to generate ultrasound with a 20-40 kHz frequency at 95 dB sound pressure.

Mus & Råttfritt 200-80 generates ultrasound with a 18-40 kHz frequency at 100 dB sound pressure and a low frequency pulse.

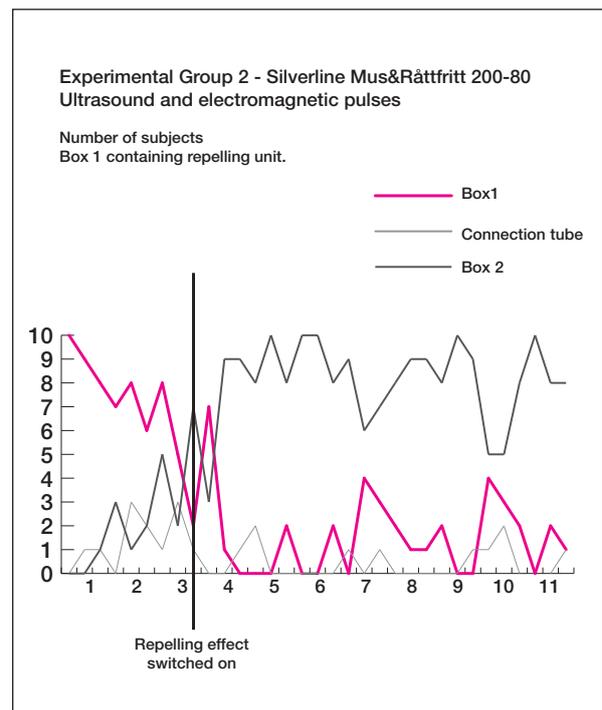
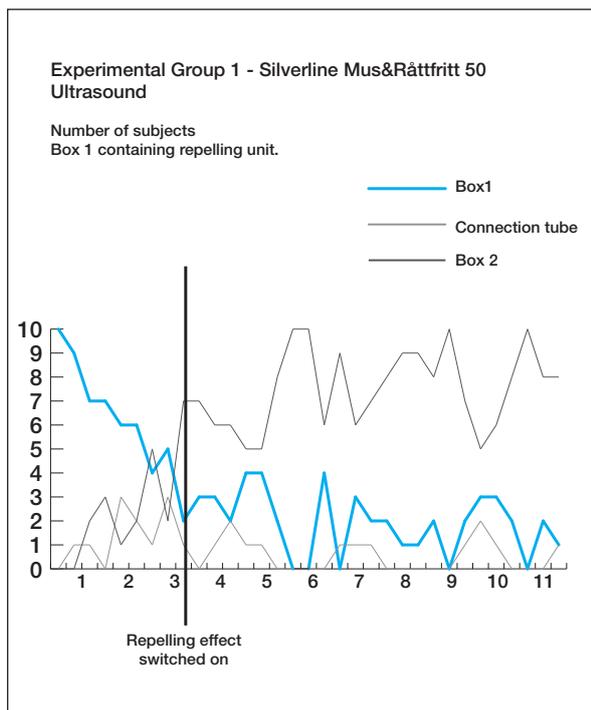
The non-Silverline product generates ultrasound with a 30-60 kHz frequency at approximately 95 dB sound pressure and a low frequency pulse.

10 mice were used for each set with 5 mice placed in each box simultaneously. To let the mice acclimatize, no unit was switched on for the first 36 hours. After 36 hours the units in Set 1 - 3 was switched on and the subjects were observed at 9 am, 1 pm and 5 pm each day for 11 days in all sets. Observations were made in numbers of subjects in each of the sections Box 1, Connection tube and Box 2. Proper attention was placed on humidity, temperature, food and water source. Artificial light was used during 9 am and 5 pm.

An observation of the measurements will show that the majority of the population spent the greatest amount of time in Box 2 in each set, with a rounded average decibel measuring of 12.1 dB in set no 1, 22.0 dB in set no 2, 19.0 dB in set no 3 and 13.4 dB in set no 4 (ambient sound only).

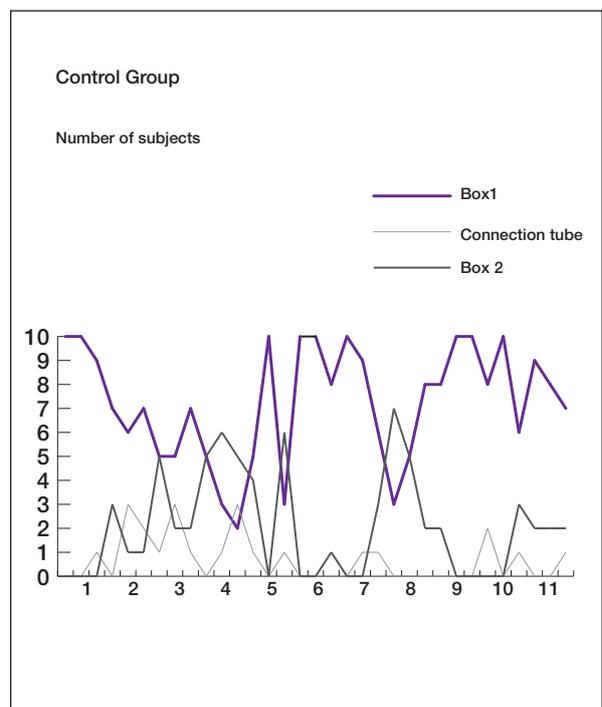
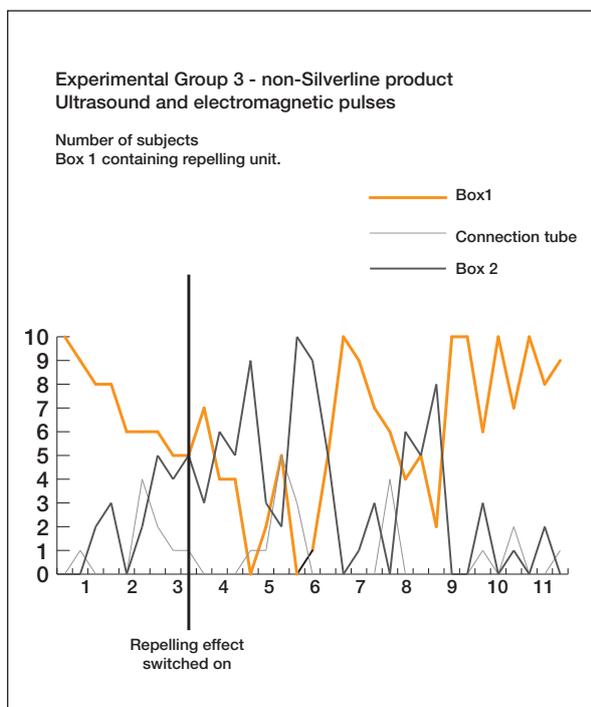
**Separate document available*

Number of subjects during the observation period



The Mus & Råttfritt 50 unit and the Mus & Råttfritt 200-80 unit showed significant repelling effect.

When the repelling units were switched on after three days it was clear to see that the mice avoided staying in Box no. 1. The major part of the mice preferred to stay in Box no. 2.

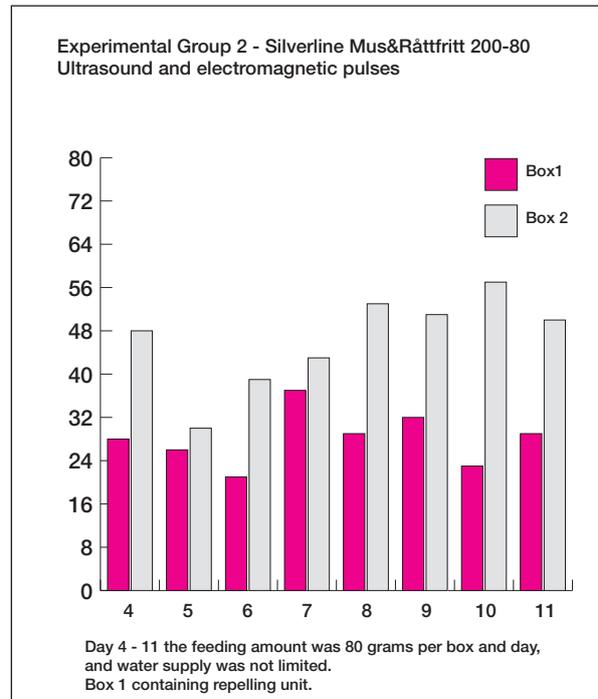
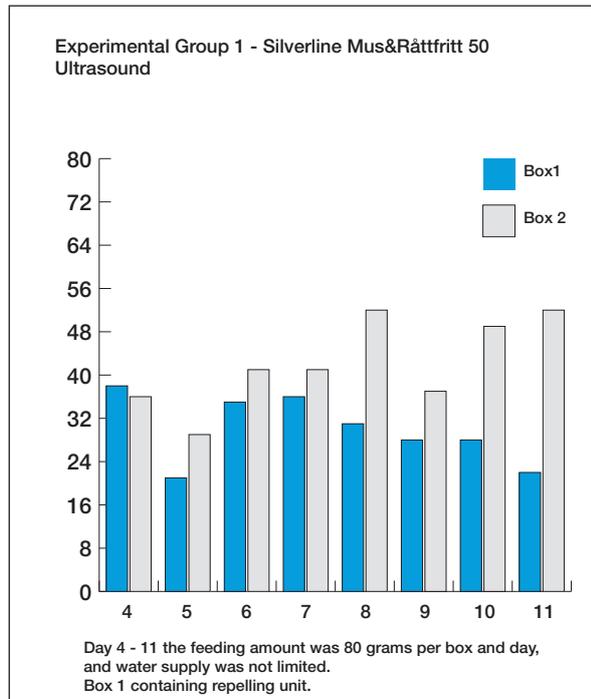


The non-Silverline product showed significant less effect. There were mice even in Box no. 1 where the repeller was installed.

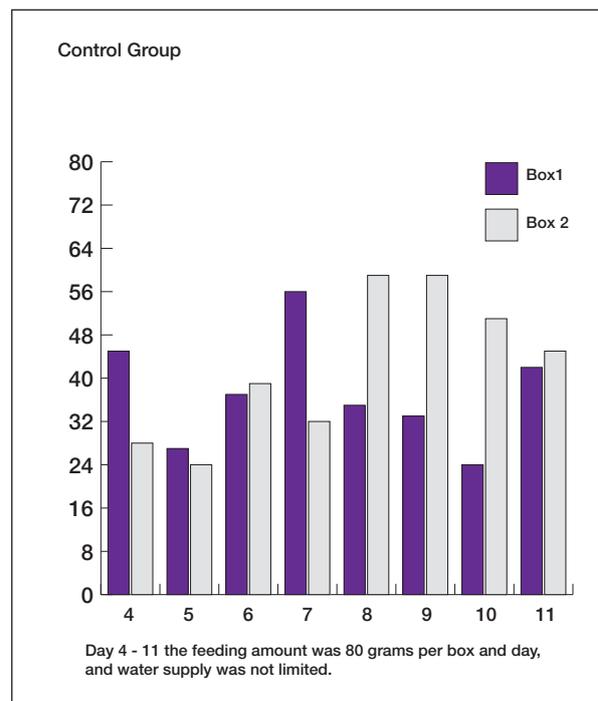
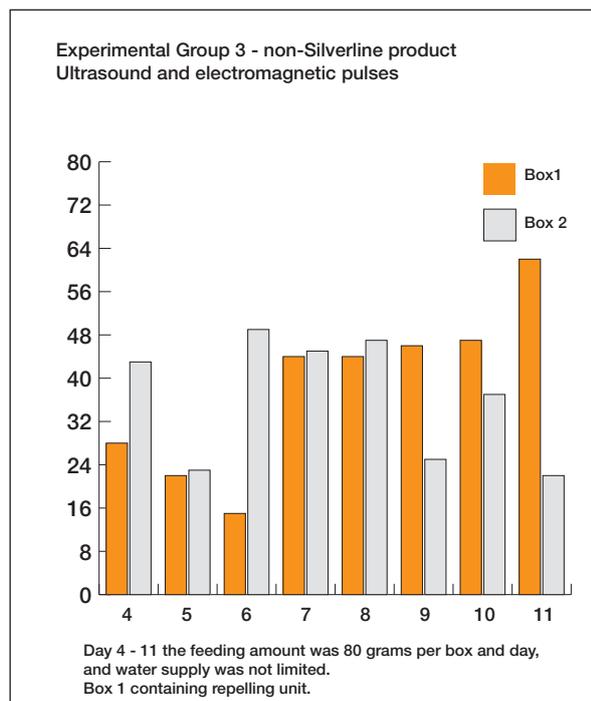
Food consumption during the observation period

Food and water supply was equal in all boxes. Each morning water supply was secured, and the food consumption was calculated by weighing the amount of food refilled to achieve the same amount as the morning before.

During day 1 - 3 all test subjects were given free amount of food in all boxes. Day 4 - 11 the feeding amount was 80 grams per box and day. Water supply was not limited.



The Mus & Råttfritt 50 unit and the Mus & Råttfritt 200-80 unit showed significant repelling effect. The mice preferred to eat in Box no. 2 which had no repeller installed.



In the non-Silverline product experiment, food consumption increased after some days in Box no. 1 where the repeller was installed.

Final statement

The experimental design gives the observer information on repellency at which certain test subjects will be repelled. Using assumed attenuation factors for ultrasound and empirical data, we can, with some degree of confidence, make statements about the effectiveness of the units for its purpose.

The Mus & Råttfritt 50 unit and the Mus & Råttfritt 200-80 unit showed significant repelling effect.

Mice showed avoidance behavior rapidly. This avoidance was seen both in terms of where the population stayed during the observation periods, and via active monitoring such as weighing food consumption.

The non-Silverline product showed somewhat less repelling effect than the Silverline products. The mice showed slight avoidance after some time.

Need for varying frequency

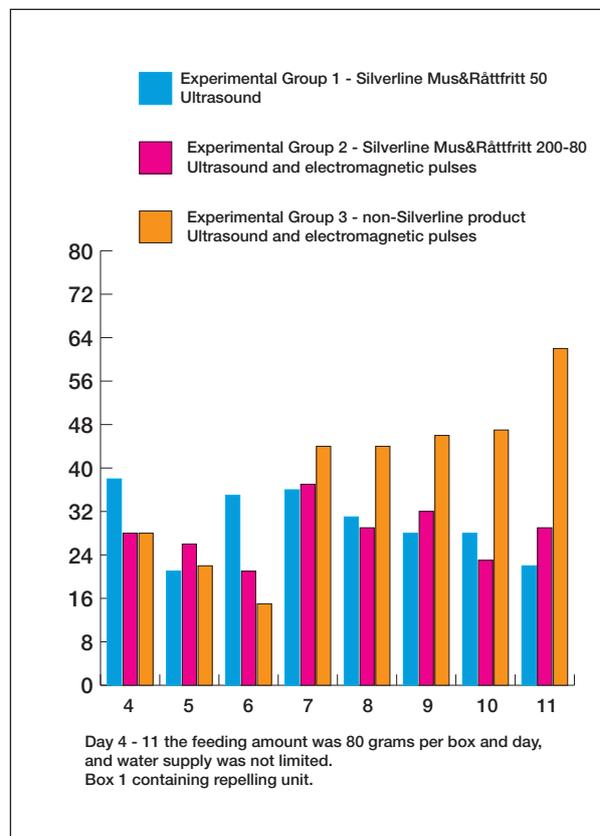
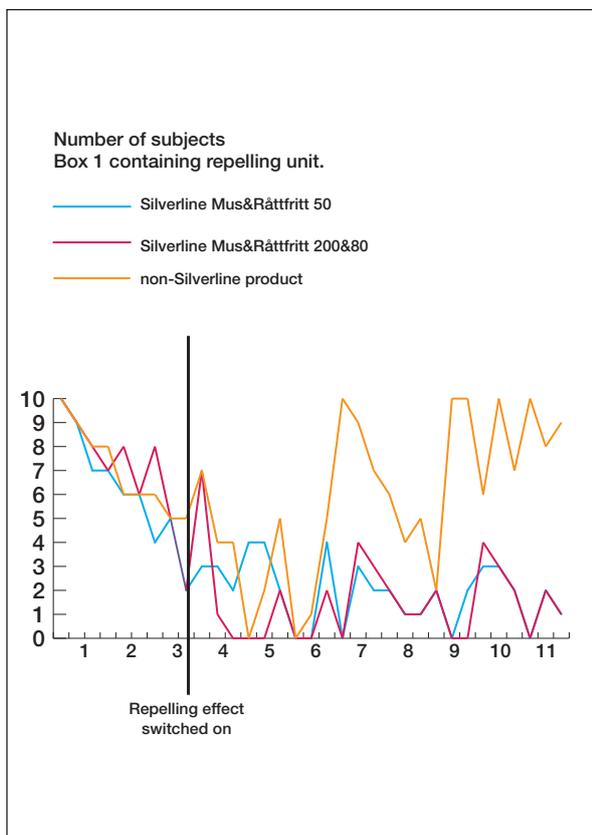
The fact that mice and other rodents after some days acclimatized to the ultrasound, the need for

the possibility to vary the frequency arise. Many products on the market today lack the possibility to vary the frequency, and therefore they are not that effective as pest repellers. The mice adapt to the ultrasound and stay instead of leaving the area. These products without the function to vary the frequency do not work for more than a couple of days, then the pest will return.

The ultimate method

The technique used in the Silverline electronic repellers will ensure a complete guard against having mice or rats established indoors. Exposing pests to ultrasound with varying frequency and electromagnetic pulses distributed through the electrical wiring, is the ultimate method to protect real estates and other properties from being damaged by rodents.

To ensure the leading market position, we will continue the research on mice and rat behaviour in order to develop improvements to our product range.



When comparing the three products you can see a clear difference. The non-Silverline product showed less repelling effect than the Silverline products. Mice showed slight avoidance after some time.

Silverline Pest Control *gardenSystem*® is the future Pest Control - Poison free. A repelling system that effectively repels mice and rats.

With more than 10 years of experience in mice and rats and their natural pattern of behaviour, we have a solid foundation of the development of our Silverline Pest Control *gardenSystem*® range. We have put together efficiency, functionality and user friendliness. Our product protects your home, garage, storage, country house, warehouse or other buildings from rodents.

All products within the Silverline Pest Control *gardenSystem*® range are manufactured to highest quality levels with all safety certificates for use within the EU.

Knowing that rats and mice slowly adapt to certain external disorder, we will continue the research on rodents' behaviour in order to develop improvements to our product range.



Miljöcenter