

## Conclusion

The strong commitment to protect the ozone layer by European governments has resulted in the complete phase out of methyl bromide (MB) use in flour mills and food processing plants. Following the phase out, the industry has successfully adapted and maintained its production capacity, hygiene standards and economic viability. This has been achieved through increased focus on sanitation and utilizing alternatives control procedures such as fumigation with ProFume and heat. ProFume has been adopted by the industry with 255 fumigations of flour mills or food processing plants in 2008 in Europe. Product performance has been shown to be effective through monitoring studies of insects and commercial user satisfaction.

Dow AgroSciences is committed to secure and maintain the legal right to sell and where possible to extend registrations in areas of use whilst ensuring the high Stewardship standards are maintained. This will able this valuable fumigant to continually be available for years to come for control of SPIs in the food industry and to eradicate wood destroying pests.

Questions and answers during presentation: Q Could the decrease in insect population in the studies presented be explained by natural decline of population ?

A: When we consider the dates of application: except the mill in Germany that was treated with heat in November, (but it reached the pre-treatment level in February) all other application shown took place in summer (July, August), in the peak of insect reproduction, so the very low level of insect catches following application can only be explained by effectiveness of the treatment. ® Trademark of Dow AgroSciences LLC

### Literature

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## 05 - Rodents – health risk and control measures

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### Abstract

Rodents beside damages they make to stored products and any food also cause health risk to humans and domestic animals. Hazard can be direct or indirect.

Direct hazards to humans are rodent attacks, revulsion, shock or fear due to rodent presence, rodents' parts found in food, damaged wires gnawed by rodents that can be cause of fire or hurt one.

Indirect hazards include transmission of parasites or pathogens like *Salmonella enteritidis* and *S. typhimurium* or fleas transmit plague or murine typhus from infected rodents on humans. Unstable damaged bags and scattered grains may be hazardous to workers in storages.

Different methods might be used to prevent damages or health risk caused by rodents. Beside sanitation measures and rodent proofing important role has application of rodenticides especially at present high populations of rodents. Anticoagulants chlorophacinone, coumatetralyl, warfarin called first-generation compounds, brodifacoum, bromadiolone, difenacoum, difethialone and flocoumafen placed in the second-generation of rodenticides are used for rodent control in most European countries. In some cases carbon dioxide, phosphine and hydrogen cyanide are used for rodent control.

### Introduction

Rodents, *Rattus norvegicus*, *Rattus rattus* and *Mus musculus* due to their life beside people often are called commensal rodents. They make damage in and outside of buildings, living under bushes in gardens or inside everywhere where there is any kind of food.

The damage they cause is dangerous to humans living or working in buildings. To prevent damages and to protect people it is necessary to provide rodent control.

Damages and danger: Rodents get access to the storehouse with different commodities or by entering the storage from the field. The establishment of rodent populations depends on the availability of food, harbourage and climatic conditions.

Rodents cause damage to wooden, metal or concrete objects and they gnaw wires. Besides doing damage they eat and pollute agricultural products and processed food. They pollute much more of the products with urine, feces or fur by movement and feeding than by eating part of the grain. Due to their activities also humans are in danger.

Rodents cause financial losses in millions by damaging stored products as well as buildings and equipment.

Health aspect: Rodents can directly or indirectly transfer different diseases on humans and domestic animals and endanger human lives.

Direct hazard: Direct hazard to humans is consequence of rodent activity in buildings including any storehouse.

Rodents do damage to packed commodities in storehouses, where damaged piles may become instable and threaten workers. Scattered grain may make floors slippery and lead to accidents. Presence, as well as appearance and running of rodents in the storehouse can cause shock or fear to people, high blood pressure, heart problems, broken legs or hands due to the fast reaction etc.

Rodents often gnaw power wires causing interruption of power supply or even fires. People unintentionally touching broken wires can be injured.

Rodent remnants like urine, feces or body parts make food or some commodities useless and dangerous for human consumption. Companies might have problems if rodent parts are found in processed food losing image on the market.

The psychological effect has seeing rodent parts, teeth, hairs or droppings or traces of rodent bites in any kind of food. The consequence might be by refusing buying these products.

Indirect hazard: Indirect hazard is due to the transmitting disease from rodents to humans.

Rodents move mostly on dirty places, disposal sites, sewage and eat food rests. They can be transmitter of parasites or pathogens like Salmonella enteritidis and S. typhimurium.

The most famous is transmission of plague by fleas that caused thousands of deaths in the medieval times. In ports if rats were running out it was known that plague started. To prevent spreading of plague in Dubrovnik, in Croatia, in 14 century quarantine was introduced for all sailors and travellers.

Also murine typhus from infected rodents can be transmitted on humans.

Control measures: There are non-chemical and chemical methods for rodent control.

Non-chemical measures include sanitation that consists of cleaning of the storehouses and surroundings, prevention of access to food and water for rodents and removal of shelter and harbourage, also, rodent proofing is often used method that includes closing of all openings around and beneath doors to prevent rodents from entering the storehouse. Door bottoms should be made of metal or covered with wire-mesh. Windows should be protected with wire nets. Holes around pipes, on floors and walls must be closed, whereas drains have to be tightly covered. Bottoms of the walls should be oblique, smooth and slippery to prevent climbing.

Rodent proof and tidy buildings with sealed walls, doors and protected other openings are the prerequisite for successful rodent control.

Physical methods - ultrasound, electromagnetic devices and traps as well as biological control that uses parasites, diseases and predators are not so common in use. The reasons are mostly poor efficacy or restricted places where it can be applied.

Chemical methods usually have to be applied once a rodent population has become established. The most popular chemical method is use of rodenticides of anticoagulant origin. They have to be applied following the directions for use to avoid danger to non-target species as well as to applicators and the environment.

Anticoagulants are the dominant rodenticides used for rodent control in European countries. They are divided in two groups:

Chlorophacinone, coumachlor, coumatetralyl and warfarin are placed in so called first-generation multiple dose compounds. They have to be consumed repeatedly, over several days, to be effective.

Brodifacoum, bromadiolone, difethialone, flocoumafen belong to the second-generation compounds. These anticoagulants can sometimes act on single day's in take.

In some cases carbon dioxide, phosphine and hydrogen cyanide are used for rodent control.

## Conclusions

Rodent control is vitally important due to direct and indirect danger rodents might cause to humans. Efficient rodent control is needed and is an integrative part of good agricultural and public health practice. Important is to perform proper sanitation, to exploit all available rodent proofing methods and remove all water and food sources for rodents. Rodent control has to be carefully planned. The most suitable rodenticide formulation has to be applied.

### Literature

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## 06 - EcO2 controlled atmosphere® & heat for stored product protection (incl. structural disinfestation)

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### Abstract

The EcO2 Controlled Atmosphere treatment (CA), based on low-oxygen in combination with increased temperatures (e.g. 35° Celsius), is commercially used world-wide to control insects in post harvest commodities, structures, silos, and container cargo (imported and exported and treated according Quarantine and Pre-shipment regulations). CA treatments have gained industry and government acceptance as the non-toxic fumigant technology for a variety of applications. EcO2 applies it in the market on a practical basis, making it available for the industry. Treatments are carried out by applying them in climate controlled rooms, silos, barges or containers with fixed or mobile installations. CA has shown to be effective in controlling eggs, larvae and pupae, present in different sorts of (dried) commodities.

CA treatments have many advantages over traditional fumigants, including no pest resistance, residue-free and safe. In addition, installations equipped to carry out CA treatments are yet available in 13 countries serving a wide variety of industries.

CA treatments are applied to control insects in a wide variety of post harvest commodities like dried fruits, nuts, spices, seeds, rice, grains, tobacco etc.

Keywords: Stored product pest control, controlled atmospheres, heat, disinfestations, post harvest, environmentally-friendly, Methyl bromide, Phosphine and Sulfuryl Fluoride.

### Introduction

#### EcO2 Controlled Atmosphere® (CA):

CA is based on the establishment of a low-oxygen environment which kills pests. The Dutch company EcO2 BV is using CA to control all stages of insects, rats and mice in food, associated products, artefacts, silos, food (processing) facilities, airplanes and barges.

CA is designed by EcO2 is established by means of the EcO2 converter which is able to create levels varies between 0% and 1.5% O<sub>2</sub>. It can be applied in airtight environments which will be designed on customs needs. Insects in all stages are eliminated (99,996% Lt) because of the lack of oxygen which causes the insect to dry out and suffocate.

The use of CA on post-harvest durables is growing rapidly and replacing Methyl Bromide and Phosphine more and more. The phase out of Methyl Bromide pushed the increase of world-wide Phosphine use. The product is easy to use and affordable although this product takes long exposure times to be effective. Unfortunately the product is meeting increased levels of pest resistance and requires more investments to be applied on an acceptable level. This is in line with chemicals such as Sulfuryl Fluoride that can not guarantee an effectiveness level of 99,9% Lt, take long treatment times, need elevated temperatures and considerable investments in fumigation rooms and information technology, and as latest research showed in the USA it is also an ozone depleted substance even 4800 times more than CO<sub>2</sub>.