Automatic and permanent rodent-monitoring - a proper method to evaluate rodenticide effects?

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Abstract

During an evaluation trial to test the efficiency of a rodenticide product we compared the standard feeding census method with a new activity monitoring tool. This tool uses wireless motion sensors to register movements of free ranging rats or mice. With both methods a survival rate after the treatment was calculated and the results (less than 3% survival) matched closely. The permanent monitoring, however, gave an additional benefit as the animal behavior could be observed throughout the whole trial, especially the time delay between treatment and effect.

Keywords: EPPO guideline, monitoring, *Mus musculus*, *Rattus norvegicus*, registration, rodenticide, rodents

Introduction

For the registration of rodenticides in Europe, efficiency tests according to the guideline of the European and Mediterranean Plant Protection Organisation (EPPO) have to be conducted. The EPPO-guideline to test against synathropic rodents (Anonymous 2004) asks for proper methods to determine the percentage mortality following a treatment. The most widespread method is the feeding census. To do so, feeding points using un-poisoned broken wheat or rolled oats have to be established. A feeding census should be done twice, one census before treatment and one census after treatment. The guideline allows alternative methods mentioning live-trapping as one possibility. However, pre- and post-treatment census methods do not allow a permanent observation of the rodent population during the treatment, furthermore they might have a misleading effect on animal behaviour, e.g. bait or trap shyness. Other methods like tracking plates are less accurate. Therefore, we compared the new automatic monitoring device with the most reliable census, the feeding census, during an efficacy test with a rodenticide product.

Materials and methods

The field trial was conducted at the research centre Neu-Ulrichstein, near Homberg (Ohm), Hessia, Germany. At the site of the research centre an abandoned pig stable was infested with a minimum of 80 Norway rats. No rat control has been conducted for the last four or five years. The rats concentrated their activities in the basement of the building, where left over cereals and rare human activities provided perfect conditions for rats. Two weeks before the application, a feeding census was conducted. As a second, independent, method to observe the effects of the rodenticide, the new electronic device was used. The Rodent Monitoring Tool (by Erminea GmbH, Germany) consists of movement sensors wireless connected to a base station to collect the data. During the trial four movement sensors were used to observe the rat population. The position of each sensor was near by, but not on top of the four feeding trays. Movement data were recorded to a digital storage card and sent via e-mail for daily monitoring. The monitoring tool was programmed with a delay time of five to six minutes after recording a movement. With such a delay a maximum of eleven records per hour was possible. To match the feeding census data a 24 h-average of movement records was calculated for each census day. A single rodenticide treatment with coumatetralyl was chosen for an optimal assessment of the product efficiency.The post-treatment feeding census was performed 21 days after the treatment and covered 48 hours. In contrast to the two disjunctive feeding counts, the activity monitoring was done permanently for 44 days covering pre- and post treatment census feeding.

Results

During two days pre-treatment census, an average of 2,339 g of rolled oats was taken. Assuming that rats consume between 20 and 40 g per night, at minimum 80 Norway rats were present. The automatic monitoring system allowed a permanent recording of the rat activity (Figure 1). To compare permanent activity with the feeding census, averages were calculated for each census day. During the pre-treatment period an average of 2.47 movements per hour was measured. A single rodenticide treatment was applied at the 22nd of October. First dead rats were found three days after. 21 days after the treatment a post treatment feeding census was started and only 69 g oats per day were consumed. Taking pre- and post census data, we calculated the survival rate of 2.95 %. The recorded activity at the same days was 0.06 hourly movements. The activity values were taken as well to calculate a survival rate of 2.43 %.

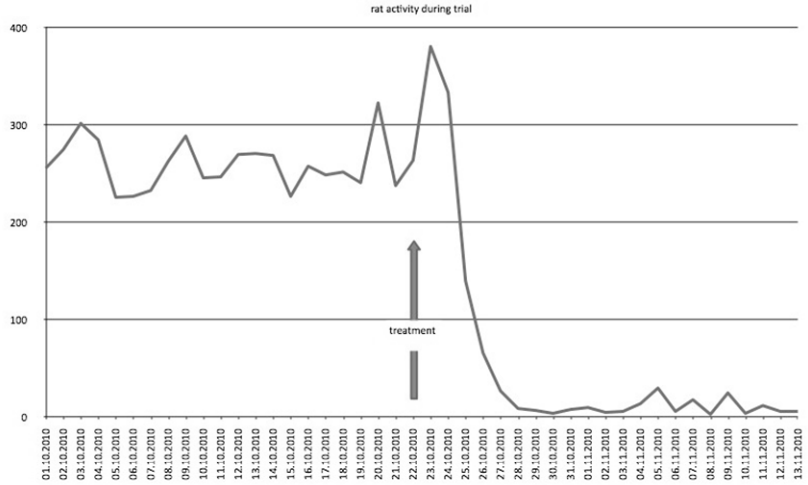

Fig. 1 The permanent activity recording allowed monitoring the rat population not just at some days before and after the treatment, but throughout the whole trial. After the treatment the activity increased slightly and then dropped drastically to almost zero.

Discussion

Both census methods applied during this trial were suitable to evaluate the rodenticide effects of the tested product. In fact both very different methods resulted in similar survival rates of less than 3%. As the feeding census is a well established and accepted method, the permanent monitoring can now be seen as a suitable tool too. The feeding census allows an estimate of the number of animals using the bait stations by the amount of taken food. The activity monitoring on the other hand is a non-invasive tool that does not influence the animal behaviour. Therefore, it could be used during the whole trial even while the treatment was applied. In the current trial the recorded activity and the discovery of dead rats showed that the rodenticide effect occurred within three to five days after treatment. Immediately after the treatment the activity increased and then dropped drastically. A similar pattern was found in a second trial to test a rodenticide product on house mice in a pig stable (unpublished data). This test, however, had to be abandoned as the monitoring tool detected a second activity increase eight days after the treatment which turned out to be an invasion of Norway rats. However, the short activity increase after rodenticide treatments is an interesting pattern and needs further investigation. The combination of feeding census and the Erminea Rodent Monitoring Tool provides an estimation of the rodent density as well as of diurnal activity patterns. They deliver an estimation of rodent control efficacy by two independent estimations. As rodenticide evaluation tests are usually conducted with two independent census methods, we consider the combination of both methods to be very reliable and useful.

References

Anonymous 2004 Guidelines for the efficacy evaluation of plant protection products. EPPO vol. 5, 1/114(2): Field tests against synanthropic rodents (*Mus musculus*, *Rattus norvegicus*, *R. rattus*) EPPO guideline