



How to Eliminate Rodenticide Usage at a Pharmaceutical Facility Using IoT Rodent Control Devices

An Example of a Successful Deployment of the VLINK™ Pest Network

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December 2022

Abstract

Using rodenticides to maintain biosecurity against rodents has historically been an accepted program at pharmaceutical facilities across the globe. Environmental groups are increasing pressure to reduce or eliminate rodenticide usage and the topic continues to be under review by the Environmental Protection Agency (EPA) (Sweeney 2021). As such, industry leaders and managers of bio-secure facilities are faced with the difficult task of maintaining the highest standard without their most commonly used tool available to them today. Facility Managers are now shifting their focus to leveraging the power of IoT connected devices to increase biosecurity and reduce rodenticide usage. This digital transformation has allowed facility managers to fully leverage the value-added benefits of remote monitoring solutions: data transparency, real-time activity monitoring, accurate quality reporting and increased safety and security. Of most significance, using advanced technology in this study resulted in the removal of 220 pounds of rodenticide from use at one of these facilities.

Problem Statement

Biosecurity is critical to protect millions of dollars' worth of research & development and manufacturing assets at pharmaceutical and biopharmaceutical facilities. During different stages of new product developments, areas must be kept sterile and completely clear of any type of environmental contaminates. Every precaution must be taken to ensure that these areas are kept safe and secure from rodents. Current rodent control device placement protocols were created over fifty years ago based off rodent foraging behavior and were intended to create a tiered system of protection based of spacing intervals (Frye et al. 2019). This strategy heavily relies on the placement and usage of rodenticide as a control measure. The original intent of rodenticide usage was to monitor populations of rodents on the exterior and not as a method of control. Several recent research studies have indicated that small traces of rodenticide are being found in the bloodstream of predator species across the United States (Gomez, et al 2022). Ingestion, inhalation or dermal absorption of rodenticide can be toxic. Even at nonlethal dosages effects of rodenticide can also modify behavioral changes in avian species which can change behavior leading to the death of the predator (Murry 2017). This has preempted a campaign to introduce a non-toxic approach for rodent monitoring and removal from bio-secure facilities. With mounting pressure from external groups to eliminate rodenticide usage, facility managers are driven to use alternatives that could potentially endanger their onsite research. Most current methods are very labor intensive and require daily or weekly monitoring of rodent control devices. These changes can double the cost that companies will spend on their monthly rodent control programs. With mounting pressure and increasing costs, pharmaceutical companies have turned to focusing on leveraging today's IoT technology to solve the problem of elimination of rodenticide while maintaining the biosecurity that is expected at these facilities.

A pharmaceutical client of Woodstream Corporation, where biosecurity is of the utmost importance, contacted the company to install and deploy the VLINK™ Pest Network of connected rodent control devices. The goal was to reduce and/or eliminate rodenticide usage at their facilities around the globe.

With few efficacious outdoor alternatives available, VLINK Mouse and Rat Tunnel Traps are an excellent option for rodent control and monitoring.

Background

Rodents, specifically the House Mouse *Mus musculus*, is widely regarded as the second most successful species on our planet. Rodents are second only to humans who have spent many centuries trying to manage them in an appropriate manner. There are several species of rodents that fall into the category of commensal rodents. To be a commensal rodent means to “share one’s table” without returning anything of worth. There are several species of commensal rodents spread throughout the world which include Norway Rats, Roof Rats and the House Mouse. Rodents have had quite some time to evolve as the perfect adversary for humans. A typical mouse is about 2.5-3.5 inches long with a tail that is about 3-4 inches in length with a total weight of 0.5 to 1 ounce. Mice are notorious for being able to squeeze into very small diameter holes. Standard pest control practices today have proven that a mouse can squeeze through a hole that is 0.375 x 0.5 inches. Rodents are equipped with two incisors that are capable of chewing through almost anything. These teeth will constantly grow, and a rodent must constantly gnaw them together to keep their teeth at a reasonable length. A rodent will use these teeth to gain entrance to an area in search of food, water, shelter, and warmth.

Humans have developed several different ways for managing rodent populations. The most recognizable is the spring based snap trap invented in 1894. Since that time, there have been hundreds of traps designed for rodent management. Snap traps, live capture traps, glue boards, and rodenticides are the primary methods of rodent control for consumers and professionals (Exhibit A). Globally, the estimated 2027 revenue for chemicals (rodenticide) is \$1.5B and \$1B for mechanical solutions (Exhibit B). While any combination of these devices can be effective, they also have their own unique challenges. Snap traps are unable to be placed around children or pets as they may be activated and cause unintentional harm to the non-targets. Glue boards are widely regarded as the most inhumane way of capturing and removing rodents. Rodents can be captured for days before expiring on the glue. Live traps, while effective, can also pose a humaneness factor. When a trap is not checked for days, it can often lead to a more inhumane elimination than a glue board. Rodenticide carries the highest risk of all the current control methods today. Rodenticide levels have been found as the cause of death in several non-target species (Gomez, et al 2022). Rodenticide usage can also increase the rise of genetic resistance among rodent populations which can lead to rodenticide being ineffective as a control method. One common factor that is shared by all these methods is that they all require labor hours to set and check devices on a regular basis. This is often done by a trained Pest Control Operator (PCO). A PCO can spend many hours each month inspecting rodent devices to examine for rodent activity. In pharmaceutical manufacturing where biosecurity is crucial, they must maintain the highest level of service from their PCO. A PCO will have many different sites to visit and may not be available every day to check or inspect traps. In critical areas, the absence of checking traps and bait boxes can now increase risk of contamination or destruction. As our world continues to evolve, so should our rodent control programs. With the development of IoT (Internet of Things), thousands of devices can connect and report their findings in an instant. The VLINK™ Pest Network has taken all the difficulties of managing biosecurity and created the first IoT instant alert rodent traps that are not only non-toxic but also able to dispatch the rodents humanely and effectively.

Exhibit A

Category Share - PCO Market

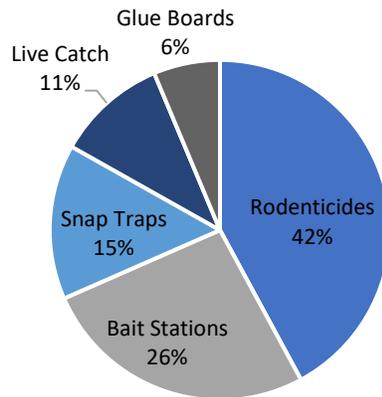


Exhibit B

TYPE	2019	2020	2021	2022	2023	2024	2025	2026	2027	CAGR (2020-2027)
Chemical	901.7	968.8	1037.6	1108.3	1180.6	1254.8	1330.8	1421.9	1519.2	6.60%
Mechanical	662.2	702.0	741.9	781.7	821.4	861.1	900.5	948.7	999.3	5.20%
Biological	524.0	566.7	611.0	656.8	704.1	753.1	803.6	863.9	928.7	7.30%
Others	299.2	321.3	343.9	367.1	390.8	415.2	440.1	469.9	501.8	6.30%
Total	2387.1	2558.7	2734.2	2913.6	3096.7	3283.7	3474.5	3703.8	3948.2	6.39%

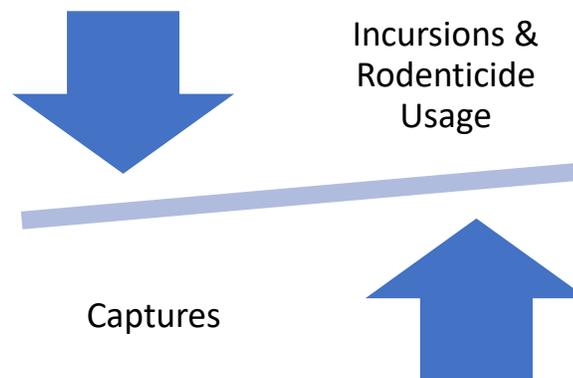
Solution

The VLINK Pest Network was created on the legacy of 120+ years’ experience of rodent trapping know-how. VLINK Mouse and Rat Tunnel Traps use the most effective and innovative way to eliminate a rodent by utilizing an electric shock to humanely dispatch the rodent while keeping it hidden within the device. The VLINK trap is also fully equipped to send information immediately to the VLINK desktop and mobile application. This instant alerting is crucial to maintaining bio-secure areas with alerts being sent approximately 1-2 minutes after the rodent has been eliminated and contained within the trap. These alerts can be sent to multiple people all over the world in a matter of minutes. VLINK is also designed to be robust and reliable in all types of weather and environmental conditions, allowing the device to be used outdoors and indoors. The VLINK Pest Network also tracks and stores all the important information pertaining to the facility’s rodent pressure. The software tracks and stores all rodent capture information in one place for Facility Managers to know exactly where and what areas of their facility are being pressured by rodents. Utilizing this data is incredibly important to maintaining an assessment-based program to identify risk as soon as possible to prevent any losses from occurring. The shift from an inspection-reaction based approach to an assessment-based data driven approach will shorten the reaction time needed to respond to a possible incursion of rodents.

A global pharmaceutical customer of VLINK has been able track and successfully manage the number of incursions at their facility since launching the system in 2020. Using 302 VLINK Mouse and Rat Tunnel traps (combined total) and 7 LoRa gateways to support connectivity, the multi-site facility has seen a yearly reduction of incursions of rodents at their facilities.

Factors that led to decrease in incursions and success with VLINK:

1. Using the instant alerting feature of the VLINK system, facility data was tracked and pinpointed specific locations where rodents may have entered. Appropriate actions were then carried out to provide the necessary exclusion measures to the areas to prevent further incursion. By using this approach, the facility was able further strengthen their rodent control program through a preventative approach rather than a reactive approach.
2. The ability to review and analyze actual capture data by visualizing the dispatched rodent is a benefit over using rodenticides as a method of control. Rodents will consume rodenticide and travel elsewhere before expiring, thus making it difficult or impossible to analyze efficacy and



data. The carcass can be removed from the VLINK trap and disposed of properly, which also helps to avoid attracting secondary insect pests that will feed off expired rodents. The ability to track rodent pressure and assign the pressure to an actual rodent capture is an important factor to properly assess the strength of the program in place. From 2021 through October 2022, the facility went completely rodenticide free, the number of total captures increased, and the total number of incursions have decreased. (comparison of kills by year does not take weather/seasonality into account).

3. Eliminating rodenticide usage was a primary goal of the organization. Historic usage at the facility was approximately 220 pounds of rodenticide per year. This amount of rodenticide not only required significant time to maintain, but also posed considerable risk to the environment and wildlife around the facility. The data clearly shows that rodenticide usage was not an effective method of control for the rodent population or serving as a monitoring tool for areas of high populations. Data collected was only gathered at time of inspection by the PCO and put into reports, which were not concurrent. Once VLINK was deployed, the facility eliminated the need for rodenticide as a control method for rodents and they have been able to track and identify areas where rodent pressure was high to eliminate the risk before it was a threat. Since the installation of the VLINK system a total of 750 rodents were eliminated and removed from the facility both outdoors and indoors without a single ounce of rodenticide.

Conclusion

With the introduction of a VLINK system pharmaceutical companies have proven that they do not need to rely on usage of rodenticide as a control measure for rodents. The VLINK system not only outperformed the rodenticide control method, but it also tracked and allowed for trending data to provide valuable insights regarding active rodent pressure at the facility. Several additional benefits also surfaced after switching to the VLINK system.

1. Using VLINK, external contractors do not need to gain access to secure areas of the building, ensuring valuable data and research is kept confidential. Security-cleared employees can be notified by the application to then proceed into the secure location and service the traps themselves.
2. Safety for employees and contractors was also improved by changing to VLINK. Before VLINK, traps or rodenticide stations had to be inspected and serviced on a regular basis. Several stations were placed in attics where there is a high risk of injury due to potential falls from those high areas. With VLINK in place, devices communicate when they need to be serviced and have greatly reduced the risk of having personnel unnecessarily check traps or stations.
3. With the exception of periodically changing the lure in the VLINK traps, the ongoing costs of the program is low compared to rodenticide usage. Purchasing over 220 pounds of rodenticide and relying on technicians to replace the product on a regular basis is costly. VLINK traps incur nominal connectivity fees that are far more cost effective than constant replenishment of rodenticides.

The VLINK system is truly a win-win for pharmaceutical companies looking to reduce or eliminate rodents from their facility without the compromise of higher PCO costs and increased risk of rodent incursions into bio-secure areas. This case study has proven that real-time data can meet the expectations of company stakeholders and environmental groups while also providing biosecurity that is critical to pharmaceutical research.

Citations

Gomez, E., Hindmarch, S., Smith, J., (2022) Conservation Letter: Raptors and Anticoagulant Rodenticides.

Frye, M., Gangloff-Kauffmann, J., (2019) Rodent Management at Food Distribution Centers.

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Sweeney, C., 2021 The Internet Has a Rat Poison Problem; Audubon Magazine Winter 2021