

Use of vaccines in rabbits kept as companion animals based on an analysis of clinical cases at the Clinic of Infectious Diseases, Faculty of Veterinary Medicine, University of Life Sciences in Lublin in 2011-2020

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Summary

Vaccinations for pet rabbits using biological preparations registered in Poland provide protection against three clinical entities: myxomatosis, rabbit haemorrhagic disease types 1 and 2 (RHD1 and RHD2). This article presents an analysis of the number of vaccinations performed in rabbits in the years 2011-2020 at the Clinic of Infectious Diseases of the Faculty of Veterinary Medicine, University of Life Sciences in Lublin. Among the total number of 3304 rabbits admitted to the clinic, 574 visits were for vaccinations, which indicates that the owners of these animals are interested in specific prevention of myxomatosis and RHD. Detailed analysis of the clinic's records makes it possible to identify certain tendencies, e.g. those associated with the choice of biological preparations or the percentage of immunized animals in different years.

Vaccination of rabbits is not difficult for the veterinarian from a technical point of view, it provides excellent protection against lethal infectious diseases, and it can be a source of income for veterinary clinics. For this reason it is worth disseminating knowledge on the vaccination programme for rabbits kept as companion animals among owners of these animals.

Keywords: rabbits, vaccinations, myxomatosis, rabbit haemorrhagic disease

Vaccination of rabbits kept as companion animals is an important means of combating fatal diseases in these animals: myxomatosis and rabbit haemorrhagic disease types 1 and 2 (RHD1 and RHD2) (7). Myxomatosis is induced by the Myxoma virus of the genus *Leporipoxvirus* and the family *Poxviridae* (2). Infection takes place via vectors: mosquitoes (*Aedes*, *Anopheles*, *Culex*, and *Simulium*), stable flies (*Stomox calcitrans*), and fleas (*Spilopsyllus cuniculi*), while the main source of infection is sick individuals and asymptomatic carriers. The virus is excreted in urine, saliva, faeces, and secretions from the nose and eyes of infected individuals (2, 8).

The incubation period of myxomatosis is 5-14 days. The peracute form of the disease, which is rare, is characterized by sudden deaths. In the acute form, 3-4 days after infection swellings appear on the head, eyelids, and external sexual organs. Subsequently, 6-8 days after infection, purulent or mucopurulent discharge from the eyes is observed. As the disease process develops, severe dyspnoea and emaciation appear, while appetite is unaffected. Purulent blepharitis, conjunctivitis and swelling of the eyelids lead to blindness and deformations around the muzzle, lips, ears and nose. Death occurs within 7-14 days. The chronic form occurs in rabbits that have survived the

acute form. It is characterized by gelatinous swellings on the ears, nose, and paws, with hot, painful swelling in the perineum, limbs, anus, and sexual organs, and testicular inflammation in males. The lesions may resolve spontaneously (4, 5).

Rabbit haemorrhagic disease (RHD1 and RHD2) is caused by an RNA virus of the family *Caliciviridae*, genus *Lagovirus* (6). Infection can take place directly, through contact with an infected rabbit, or indirectly, through contaminated litter, water, clothing, or cage equipment. The incubation period lasts from 1 to 3 days for RHD1 and 3-9 days for RHD2 (1, 3). The disease can take several forms:

- peracute form: mainly in RHD1; death takes place within 12-36 h after onset of fever;
- acute form: appetite loss, depression, swelling of the eyelids, and neurological disorders such as agitation, ataxia, or paralysis of the limbs. Other symptoms may include dyspnoea, cyanosis, tearing, bleeding from the nose, and death;
- subacute form: clinical symptoms similar to the acute form, but milder.

The acute and subacute form are more common in the case of RHD2 (1).

Specific immunoprophylaxis of myxomatosis and RHD in Poland involves the use of monovalent (myxomatosis) and polyvalent vaccines containing antigens of the myxomatosis and RHD1 viruses. Depending on the preparation used, vaccine immunity can last 6 or 12 months.

The aim of the study was to analyse the frequency of administration of vaccines against myxomatosis and RHD in rabbits kept as companion animals.

Material and methods

In our own practice, we most often use a monovalent vaccine against myxomatosis that induces immunity lasting 6 months and a mono- and polyvalent vaccine against myxomatosis and RHD that induces immunity lasting 12 months. The vaccines are described below.

The Myxoren vaccine from Bioveta is a monovalent vaccine for immunizing rabbits against myxomatosis. It contains attenuated Myxoma virus strain CAMP V-219, min. $10^{3.3}$ TCID₅₀, max. $10^{5.8}$ TCID₅₀. The vaccine is administered subcutaneously in the amount of 1 ml of solution. The vaccine can be administered once from the age of 10 weeks, or from the age of 4 weeks, in which case the vaccination must be repeated after 6 weeks. In both cases – vaccination at over 10 weeks of age and between 4 and 10 weeks – the animals must be revaccinated every 6 months.

The Pectorin Mormyx vaccine from Bioveta contains an inactivated RHD virus strain CAMP V-351 (liquid component) and attenuated Myxoma virus strain CAMP V-219 (freeze-dried component). The manufacturer recommends vaccinating animals at 10 weeks of age or older. However, in difficult epizootic situations requiring earlier immunization, they can be vaccinated as follows. Rabbits aged

4-6 weeks should be given a monovalent vaccine against myxomatosis – Myxoren, and at 10 weeks they should be vaccinated with the Pectorin Mormyx vaccine. Animals aged 6-10 weeks should be vaccinated with Pectorin Mormyx, and after 4 weeks they should receive the same vaccine again. Full immunity is achieved on the 9th day in the case of myxomatosis and on the 10th day in the case of RHD. Immunity lasts 6 months for myxomatosis and 12 months for haemorrhagic disease. In farmed animals, vaccination should be repeated every 6 months. Sick or weak rabbits should not receive the vaccines. The vaccines should not be administered to animals in their last week of pregnancy due to the risk of abortion during vaccination.

The Nobivac Myxo RHD vaccine from Intervet contains live myxomatosis virus with a vector of RHD virus strain 009. The manufacturer recommends vaccinating rabbits from 5 weeks of age. Immunity is formed after 3 weeks and lasts for one year. Only healthy rabbits should be vaccinated. Rabbits that have previously received another vaccine against myxomatosis and those that have been naturally infected with myxomatosis may not produce an adequate immune response against haemorrhagic disease following vaccination with this product. The withdrawal period is 0 days. The Nobivac Myxo RHD Plus vaccine from Intervet contains live Myxoma vectored RHD virus strains 009 and MK1899. The manufacturer recommends vaccinating rabbits from 5 weeks of age. Immunity is formed after 3 weeks and lasts for one year. Only healthy rabbits should be vaccinated. High levels of maternal antibodies against the Myxoma virus and/or the RHD virus can potentially limit the product's effectiveness. In this case, to ensure the full duration of immunity, animals should be vaccinated from the age of 70 weeks. Rabbits that have previously been vaccinated with a different myxomatosis vaccine or have been naturally infected with myxomatosis three times may not produce an adequate immune response against haemorrhagic disease. The vaccine can be administered to pregnant rabbits, and the withdrawal period is 0 days.

The Pectorin vaccine from Bioveta is a monovalent vaccine used to immunize rabbits against RHD1. It contains inactivated RHD calicivirus, strain CAMP V-351, min. 128 HAU – max. 1024 HAU. The vaccine should be administered from 10 weeks of age, but in certain situations (epizootic risk) it can be used from 6 weeks of age. In both cases, animals must be revaccinated after 4 weeks. The vaccine provides immunity for 12 months, so it must be administered every year. This vaccine has not been used at the Clinic of Infectious Diseases, although it is used at other veterinary clinics in farmed and pet rabbits.

The choice of vaccines for patients depends on their availability on the market (a vaccine against RHD2 has only recently been made available), the vaccination regime adopted (using annual or semi-annual vaccines), and owner preferences.

A retrospective study covered the period from 2011 to 2020. Only cases of rabbits kept as companion animals were analysed. In the case of animals vaccinated against RHD and/or myxomatosis, we determined their percentage among all rabbits reported to the clinic, the total number

of vaccinations performed in each year of the experiment, and the type of vaccine used, applying the following nomenclature: 'semi-annual' vaccines, providing 6-month immunity against myxomatosis, and 'annual' vaccines, providing year-long immunity to this disease. The data were collected in tabular form and used to create graphs.

The number of patients in the years 2011-2015 and in the years 2016-2020 and the total number of vaccinations performed in those years were analysed using PQStat statistical software version 1.6 and tested by the Student's t-Test, n represents the ratio of the total number of visits to the number of vaccinations performed. Significance of differences was determined for significance levels of $p < 0.05$.

Results and discussion

During the 10-year period (2011-2020) the Clinic of Infectious Diseases of the Faculty of Veterinary Medicine in Lublin admitted a total of 3304 rabbits kept as companion animals, among which 574 (17.3%) were brought to the clinic for immunization. Analysis of the number of vaccinations performed in each year shows an increase in the number of immunizations. This trend began to be evident in 2014 and persisted until 2020. During the same period, there was a marked increase in the number of patients of this species (Fig. 1). The ratio of immunizations to the total number of patients admitted was varied between years (Fig. 2). Vaccinations of rabbits were the reason for veterinary consultations in 5.1% to 24.5% of all visits. Although a clear trend cannot be identified, as the values presented in the graph vary widely between years, apart from two years (2012 and 2013) vaccinations were always the cause of more than 10% of veterinary visits for rabbits.

Changes were observed over the years in the type of vaccine used to immunize rabbits (Fig. 3). In 2019 and 2020 far more rabbit owners chose vaccines providing immunity for 12 months. The number of immunizations using semi-annual vaccines did not change significantly between years of observations, fluctuating from 2014 to 2020 between 15 and 33 (but the total number of patients increased during this period, from 230 in 2016 to 1168 in 2020). However, increased interest in vaccines inducing 12-month immunity was observed. In 2014 there were just 33 vaccinations performed using these vaccines, while in 2020 there were 194. It should be noted that in 2020 the first vaccinations against myxomatosis and RHD were performed using a polyvalent vaccine that additionally contains RHD2 viral antigen, which accounted for 23.7% of all vaccines used.

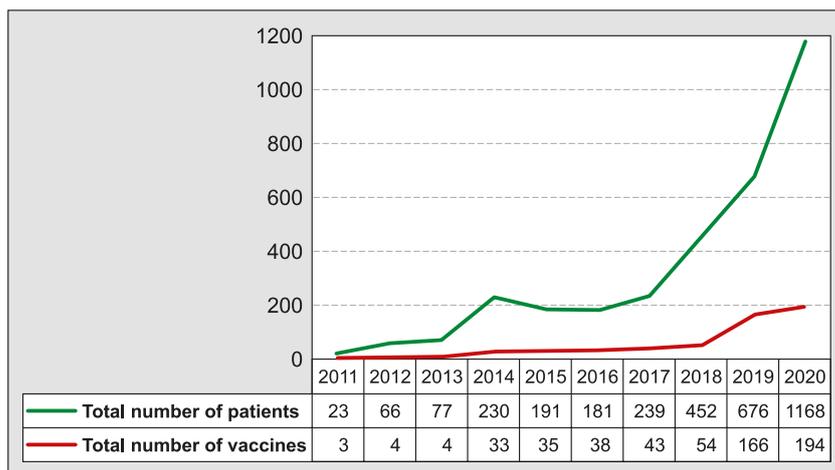


Fig. 1. Number of rabbit patients kept as companion animals admitted to the Clinic of Infectious Diseases of the Faculty of Veterinary Medicine, University of Life Sciences in Lublin in 2011-2020 and the number of vaccinations performed in this group of animals

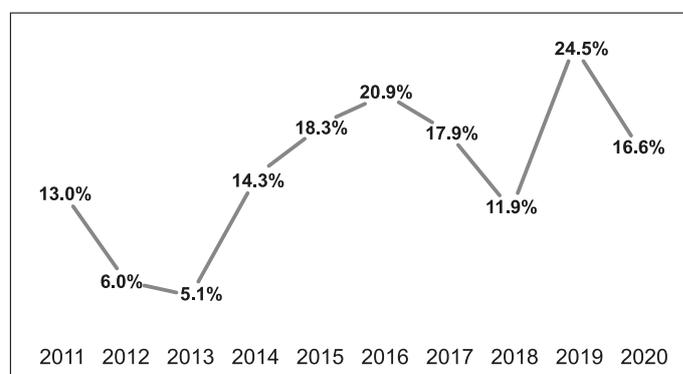


Fig. 2. Percentage of vaccinations among all veterinary visits for rabbits kept as companion animals in 2011-2020. Based on the clinical records of the Clinic of Infectious Diseases of the Faculty of Veterinary Medicine, University of Life Sciences in Lublin

In addition to the increase in the number of patients, the number of rabbits vaccinated has also increased. In the period 2011-2015, the ratio of visiting animals to vaccinated animals was 7.43. On the other hand, in the years 2016-2020, this coefficient decreased to

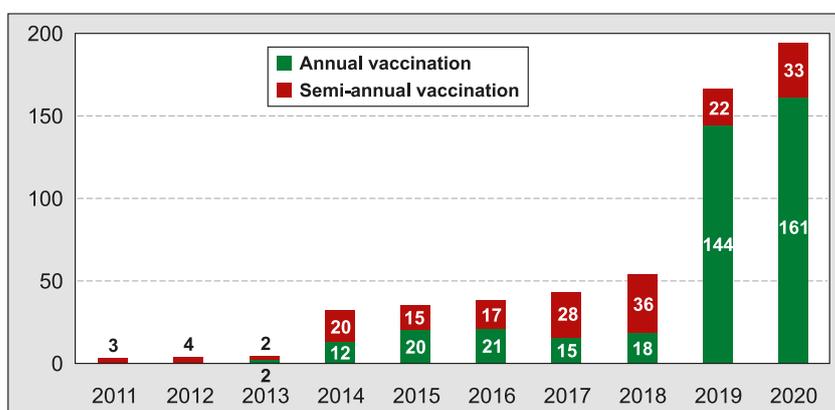


Fig. 3. Ratio of annual vaccines to semi-annual vaccines used to immunize rabbits kept as companion animals in 2011-2020. Based on the clinical records of the Clinic of Infectious Diseases of the Faculty of Veterinary Medicine, University of Life Sciences in Lublin

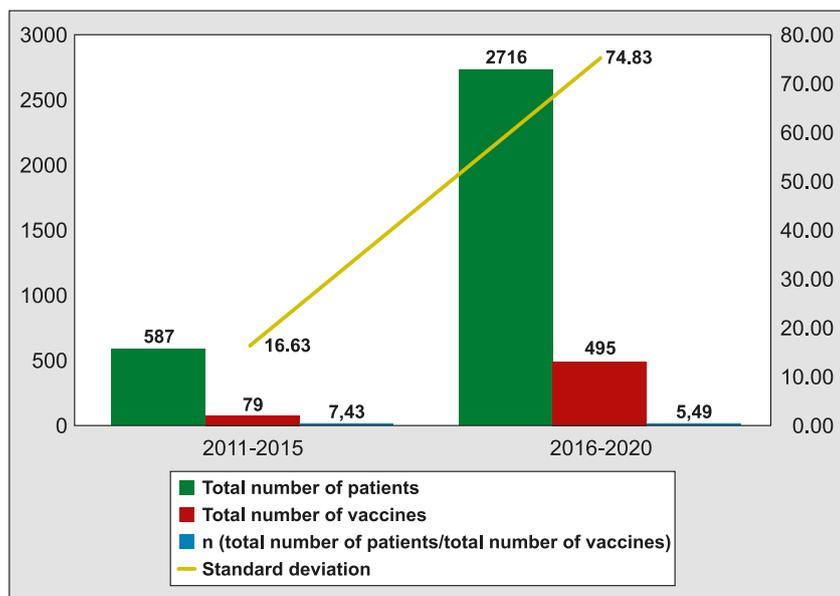


Fig. 4. The number of patients in the years 2011-2015 and in the years 2016-2020 and the total number of vaccinations performed in those years. The *n* represents the ratio of the total number of visits to the number of vaccinations performed. This ratio decreased in 2016-2020, which proves the increase in the number of vaccinations in those years

5.49, which proves an increase in the number of vaccinated rabbits. Statistical analysis showed a statistical existence between 2011-2015 and 2016-2020 (Fig. 4).

Myxomatosis, RHD1 and RHD2 are dangerous viral diseases with high mortality (4, 5). Vaccinations are the most effective method for preventing their development (7, 9).

Recent years have seen increased interest in rabbits as pets. The owners of these animals very often spend their free time with them outdoors, in parks and gardens where they are more exposed to contact with the aetiological agents of the diseases discussed here. For this reason, the interest in preventive vaccinations against myxomatosis and RHD is to be welcomed.

An increase in the number of vaccinations has been observed beginning in 2014. In 2019 and 2020 there was a more perceptible increase in the number of immunizations (Fig. 1), which most likely coincided with the onset of RHD2 and the appearance of a great deal of information on social media on the possibility of vaccinating rabbits. It should be stressed, however, that in 2017-2020 there was an overall increase in the number of patients of this species (Fig. 1), and the percentage of vaccinated rabbits among all admitted rabbits fluctuated between years, so that no clear trend can be identified from the results (Fig. 2).

During our practice we have often encountered scepticism among pet owners regarding the effectiveness and safety of vaccinations for rabbits. Some rabbit owners had a negative attitude towards this type of procedure due to cases of disease (myxomatosis) in animals that had previously been immunized, or cases of symptoms reminiscent of myxomatosis immediately

after vaccination. First of all, it should be stressed that the Myxoma virus is an RNA virus, and the effectiveness of vaccinations may depend on the strain of the pathogen that is currently present in a given area (7). As regards myxomatosis following vaccination, the authors have observed 26 such cases in their practice, and these followed the use of the 'annual' vaccine containing attenuated Myxoma virus. The symptoms generally involved slight swelling of the eyelids and single sites of swelling on the ears. Following administration of anti-inflammatory drugs and immunostimulants (inosine pranobex), the lesions resolved fairly quickly. The symptoms observed may have been due to the body's reaction to the biological preparation. The manufacturer provides information about the possibility of this type of reaction in the vaccine leaflet.

In 2019 and 2020 increased interest in vaccines inducing immunity for one year was observed among rabbit owners. About two thirds of them were interested in this type of vaccine, regarding vaccination once a year as a good solution despite the higher cost of the procedure. 'Semi-annual' vaccines are cheaper (about 2-3 times at this writing), and for this reason are often recommended by organizations of public benefit involved in helping animals. Due to similar economic considerations, semi-annual vaccines are used by some breeders of purebred rabbits. As mentioned above, once vaccination with this type of vaccine is begun, the same preparation must be used continuously. There are also rabbit owners who prefer to use this type of vaccine. Therefore it can be assumed that they will continue to be used in the near future. It should be noted that there are no studies indicating that any of the preparations described is more effective than the others, and thus the task of the veterinarian is to present the available options to the pet owner in order to make the best choice in each case.

Protective vaccination of rabbits is a simple procedure that does not need to be performed in specialized veterinary surgeries. Veterinarians can actively promote vaccination of this group of animals, thereby helping to limit the occurrence of dangerous infectious diseases of which some rabbit owners are unaware (7).

Based on the data obtained in the study, a practical conclusion can be drawn regarding the approximate number of vaccines that can be used annually in a veterinary clinic treating companion animals. In planning purchases of vaccines, which have a relatively short shelf life, the owner of the clinic can assume

that vaccination may be the reason for 10% of visits of pet rabbits. In the study presented in this article, the percentage of vaccinations in the total number of rabbits admitted was over 17%. Thus the proposed assumption of 10% seems to be safe, as it is unlikely that the problems with which rabbit owners report to different veterinary clinics would differ significantly.

We realize that the analysis which is the subject of this article should be continued in subsequent years, and above all should include more veterinary clinics. It would be useful to determine whether the increase in the number of vaccinations is associated only with the overall increase in the number of patients or whether there will be a marked increase in interest in this type of procedure among rabbit owners. It should be stressed that students of veterinary medicine should be taught about vaccinations for rabbits as an element of prophylaxis for companion animals. It is also worth increasing awareness of preventive vaccines among rabbit owners. Our experience indicates that the veterinary clinic is where some owners of these animals learn about the possibility of vaccinating their pets.

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