Veterinary vaccines: oil-based adjuvants increase the risk of complications in the event of accidental injection in humans

In humans, accidental injection with veterinary vaccines carries a greater risk of inflammatory and/or infectious complications if the vaccine contains oil-based adjuvants, which are added to increase vaccine efficacy. A prospective study of calls recorded by French poison control centres between May 2016 and September 2018, based on a specific follow-up questionnaire, was used to quantify the risks of complications, surgery or sequelae in the presence of an oil-based adjuvant, considering associated factors (injection of the hand or another site, use of a manual syringe or a jet injector). Farmers, breeders or veterinarians are advised to wear protective gloves when vaccinating animals, to prevent these accidents.

Farmers, breeders or veterinarians may accidentally prick themselves when vaccinating an animal from their herd or farm, or during a consultation. As part of their medical teleconsultations, French Poisons Control Centres (PCCs) receive about 80 calls a year from people presenting with symptoms after being injected with a veterinary vaccine, and wishing to know the risks associated with the injection and the appropriate medical care.

The puncture and the injection of a large or small quantity of vaccine can cause complications in the injured area (finger, hand, other site), as well as possible persistent impairment. Studies have shown that certain vaccine components may increase this risk: this is the case with the oil-based adjuvants or excipients contained in veterinary vaccines [1, 2].

To improve knowledge of this phenomenon in France, ANSES and the PCCs’ network set up a prospective national study to describe the circumstances of the injection, the clinical signs observed at the time of the call and subsequently, as well as the care provided to patients.

Accidents mainly occurring in the workplace

Data collection took place from 1 May 2016 to 30 September 2018 and included 199 people; an average of seven per month with no particular seasonality, as veterinary vaccinations are prescribed throughout the year.

The individuals involved were between 9 and 87 years of age, with half of them being under 36 years of age. As expected, this was a problem of the adult working population, since 85% of patients were between 20 and 60 years of age. Seventy-one per cent of these accidental injections concerned men (142 versus 57 women).

Three-quarters of the cases (76%) were agricultural employees or farmers, 18% were retired farm workers or family members of a person working in this area. There was a relatively small number of veterinarians, with just 4% of cases, while in the remaining 2% the status of the individual was unknown.

1. Vaccine adjuvants are substances added, together with antigens, to increase the intensity of the immune response, reduce the vaccine dose and number of injections, and increase the stability of the vaccine.
Lastly, almost one in two cases (48%) occurred in Pays-de-la-Loire or Brittany; these two regions have large numbers of pig and poultry farms (sources: AGRESTE and IFIP, the French Pork and Pig Institute).

Nearly 90% of the individuals had injected themselves during their occupational activity. Two situations involved confusion between medicinal products: a 9-year-old child was administered the vaccine intended for his rabbit, which had mistakenly been brought to the general practitioner by his father; and a home nurse gave a patient a veterinary vaccine that had been stored in the refrigerator next to the patient’s injection treatment.

Most accidents occurred while vaccinating livestock: poultry (34%), pigs (28%), cattle (14%) (Figure 1).

**Syringe injections and oil-based vaccines in the majority**

Veterinary vaccines can be injected either by automatic syringes injecting the unit dose under pressure (“jet injectors”) or by conventional syringes activated manually by the operator. High-pressure injections have been reported as causing complications and, in particular, injuries to the tendons of the hand [3].

In this study, the accident resulted from a syringe injection in 69% of cases and a high-pressure injection in 17% of cases. In the remaining 14% of cases, the individual had been pricked without any vaccine being injected, although diffusion of the product at the injection site was possible.

In the overwhelming majority of cases (86%), the needle that had pricked the person had just been used to vaccinate other animals and was no longer sterile. This may increase the risk of infection.

Lastly, in 59% of cases the vaccine in the injection contained an oil-based adjuvant.

**The hand injected in two thirds of cases**

The accidental injection was most often into the hand (68%), with the thumb (20%) or index finger (18%) being the most common sites (Figure 2).

In nearly a third of cases another site was involved: the arm, the leg, or the abdomen (Figure 2). This is because for livestock (poultry, pigs, cattle, etc.), depending on the size of the animal, there may be two operators: one who holds the animal and the other who administers the injection. If the animal moves, one of the operators may then be pricked in the thigh or arm.
What were their effects on health?

Inflammatory signs at the puncture site, either at the time of the call or occurring within 72 hours, were reported in almost all cases (93%). Individuals experienced pain and/or swelling and/or local redness.

While these inflammatory signs were all initially mild, more serious inflammatory and/or infectious complications were observed in 9.5% of cases (n=19). These concerned phlegmons (diffuse infection of a tissue, tendon or muscle, which can develop into an abscess), arthritis (joint inflammation) or tenosynovitis (tendon inflammation). In 17 cases these complications were observed in the hand, in one case they were in the forearm, and in the last case the knee. As with the site of the accidental injection, the grip involving the thumb and index finger used to hold the animal was the most frequently affected (10 cases).

Nearly one-third (29%) of accidental injections in the workplace resulted in an absence from work, which ranged from 24 hours to 4.3 months and was less than one week in 40% of cases.

More than three-quarters (78%) of those injected were given antibiotic therapy and 8% had taken non-steroidal anti-inflammatory drugs, on prescription or as self-medication.

Oil-based adjuvants increase the need for surgery

Fifteen per cent of injuries required surgery, mainly of the hand (86%), with 75% being operated within 72 hours of the injection.

The risk of surgery was more than five times higher with injections involving oil-based vaccines compared with non-oil-based vaccines, and almost three times higher with injections into the hand than with other sites (statistically significant increases, Figure 3), taking into account the circumstances of the injection.

Six months later, 10% of individuals had suffered sequelae

Specifically for this survey, the PCCs contacted individuals again up to six months after the accident to find out how their symptoms had progressed. Twenty patients, half of whom had undergone surgery, had sequelae at the end of follow-up.

These mainly concerned stiffness or difficulty bending the finger, tingling in one finger, persistent pain or residual nodules in the injection site, whether in the hand, forearm or knee. No other complications were observed.

There were higher, but not statistically significant, risks of complications (2.5-fold increase in risk) and sequelae (2.7-fold increase in risk) with oil-based versus non-oil-based vaccines (Figure 3).
Call a Poison Control Centre in the event of accidental injection with a veterinary vaccine

This study, based on data collected prospectively at the national level, reinforces the hypothesis that in the event of accidental injections in humans, veterinary vaccines containing oil-based adjuvants are more likely to cause inflammatory and/or septic complications – some of which may require surgery and/or cause sequelae – than vaccines that do not contain them. These adjuvants cause tissue necrosis if the wound is not treated promptly.

The precautions to be taken by the person administering the vaccine and the action to be taken in the event of accidental injection are stated in the package leaflet. This is why, in the event of accidental injection with a veterinary vaccine, it is advisable to keep all the references concerning the vaccine (name, box, leaflet, etc.) and to immediately call a PCC or consult a doctor, mentioning the precautions stated in the leaflet. The PCC will be able to identify the risks associated with the vaccine type. It may also advise a medical consultation to ensure appropriate care in the first few hours after the injection. This should limit the occurrence of any complications. Prescription of antibiotic therapy will be at the discretion of the doctor treating the patient [4].

The wearing of protective gloves that are flexible and resistant to needle puncture should be encouraged too, in order to avoid these accidents and their complications.

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References