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RESEARCH ARTICLE

Risk identification & Risk management versus Vaccination on Dairy Farms: a true controversy?
(With special attention to professional communication and risk communication)

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ABSTRACT

In this paper, two main domains of veterinary preventive medicine are addressed: applying vaccines and implementing risk identification & risk management plans. Both should go together on food animal production farms because they appear to be mutually beneficial. Moreover, the potential risk of economic losses is drastically lowered. Both domains are briefly highlighted. A dairy farm is used for illustration purposes. Professional communication plays a paramount role in increasing the compliance of the farmer to these plans. Professional communication is incomparable with emergency risk communication such as should be implemented in highly contagious, notifiable diseases in large regions or such as in a Covid epidemic. Therefore, a discussion text has been added as an Annex I to compare the emergency risk communication outcomes related to Covid-19 in humans in France with the criteria of emergency risk communication addressed in the context of dairy cattle production. Guidelines to set up emergency risk communication plans are provided in an Annex II.

Introduction

Food animal production farms these days cannot function without vaccines (Noordhuizen⁵). The most important representatives of these farms are the intensive poultry, pig farms and beef cattle farms around the world and to a lesser extent dairy cattle production. Vaccination plans are part of veterinary preventive medicine and cover a wide spectrum of micro-organisms, such as viruses, bacteria, and endo- or ectoparasites.

Preventive medicine, however, should also cover risk identification and risk management. This is a highly relevant domain given that most diseases and disorders in, for example, dairy cattle herds, have a multifactorial background. In this background, next to infectious microorganisms, risk factors from the cows' environment such as housing, barn climate, feed, and at the cow level such as the level of genetic disease resistance, metabolism, age, milk production level may play a substantial role in the occurrence of these diseases (Noordhuizen & Wentink⁴; Noordhuizen⁵). Veterinary preventive medicine in practice should address both domains: the animal health promotion through vaccination and through risk identification & management, both applied in a well-balanced manner. Moreover, professional communication is paramount when applying risk management plans. This paper addresses these domains, with the example of dairy cattle for illustration purposes. Moreover, an Annex I on risk communication examples during the Covid-19 epidemic in France is added to facilitate the comparison of these examples with the formal

criteria for appropriate emergency risk communication. Annex II comprises the Best Practice guidelines for designing risk communication plans as described by Covello¹. Hence, the objectives of this paper are to (1) present the major features of vaccination programs, (2) present the major features of risk identification and risk management, (3) how to balance the previous two domains in a justified manner, and (4) elucidate the relevance of professional communication and risk communication in the domains addressed.

Veterinary preventive medicine -- Vaccines

Veterinary herd health and productivity management advisory programs are being applied on dairy farms worldwide for several decades. Key issue is the management advice and for that purpose, the dairy farms are visited frequently (weekly or monthly for example) by the veterinarian following a prefixed time-schedule. During the application of such a program for dairy farms, the veterinarian addresses different domains of dairy farming, like reproductive performance, milk production & nutrition, animal health and welfare status, all linked together by farm management. Part of the latter is the design of vaccination plans, which may cover a broad spectrum of micro-organisms.

For example, for dairy cattle farms such plans may comprise, starting at young calf level and related to the age of the calves, the different vaccines as named in Table 1.

Table 1. An example of a youngstock vaccination plan on a dairy cattle farm (Noordhuizen⁶).

Age (days)	Type of vaccine
15	Pasteurellosis
30	Clostridium perfringens (enterotoxaemia)
45	Pasteurellosis
60	Clostridium perfringens (enterotoxaemia)
75	Anti-parasiticum
90	Anti-parasiticum
120	Infectious Bovine Respiratory Disease (herpes virus), Parainfluenza 3 and Bovine Virus Diarrhea (BVD)
150	Infectious Bovine Respiratory Disease (herpes virus), Parainfluenza 3 and Bovine Virus Diarrhea (BVD)
180	Brucellosis (Brucella abortus)
195	Brucellosis (Brucella abortus)

The contents of a vaccination plan depend on the farmer and the veterinarian. A farmer may assess the economic losses of a certain disease and

calculate the costs-benefits of vaccination against this disease. The outcome may force him to ask the veterinarian for such a vaccination plan. On the

other hand, even when the farmer does not ask for a vaccination plan, the veterinarian may esteem such a plan beneficial for the cattle and the farmer and he discusses his proposal with the farmer. Yet another possibility is that a farmer asks for such a plan, while the veterinarian is not truly convinced that this farmer or his cattle would really need it. It is the field of potential tension between farmer and veterinarian, where professional communication plays a key role (Kleen & Rehage²; Kleen, Atkinson & Noordhuizen³; Noordhuizen⁵; Pun¹⁰). After all, it is the farmer who decides.

It would be highly advisable that a veterinarian checks what the results of vaccination are, using parameters such as monthly and yearly disease incidence, milk production level and deviations, the occurrence of other –not vaccine-related– disorders, total costs-benefits assessments. Unfortunately, this is not a common rule everywhere and, hence, there is room for improvement in the field.

Veterinary preventive medicine -- Risk identification & Risk management

As stated above, risk identification & risk management are the second domain of veterinary preventive medicine. In the author's experience this domain is largely neglected in the veterinary and dairy world. In fact, this domain should be part of any veterinary herd health program for dairy farms, irrespective of whether vaccines are being applied or not. The implementation of Biosecurity Plans on a dairy farm is a practical example of this domain (Towery¹¹, 2001; Noordhuizen⁵).

The reason for combining the two domains is simple: by implementing risk management plans within a veterinary herd health program, the operational level of the latter is complemented by the first, more tactical in nature. Given the multifactorial nature of animal diseases, implicating many contributory risk factors, this approach is crucial. Table 2 presents some major risk factors associated with the prevalence of Bovine Virus Disease (BVD).

Table 2. An overview of some major risk factors associated with BVD in dairy cattle

New (potentially infected) cattle enter the dairy herd without checking	Calving of a cow (<i>potential infection transfer</i>)
No quarantine facilities are present on the farm	Infection transfers are possible in the sick-cow pen
No prior BVD testing is done	Waste milk (<i>antibiotics</i>) is fed to calves
Contaminated feed and water sources; infected semen or embryos	People, cars/trucks, equipment, tools are possible sources of infection transfer

At the same time, implementing risk management plans is commonly far less costly than vaccination and yields positive results. An illustration of the latter statement is presented in Fig. 1. This Figure deals with the results of different strategies for

reducing the prevalence of Bovine Virus Diarrhea (BVD) (Viet et al¹²). The strategies are: Wait-and-See; Preventive measures; Test & Cull; Biosecurity and Preventive measures combined with Test & Cull (Viet et al¹²).

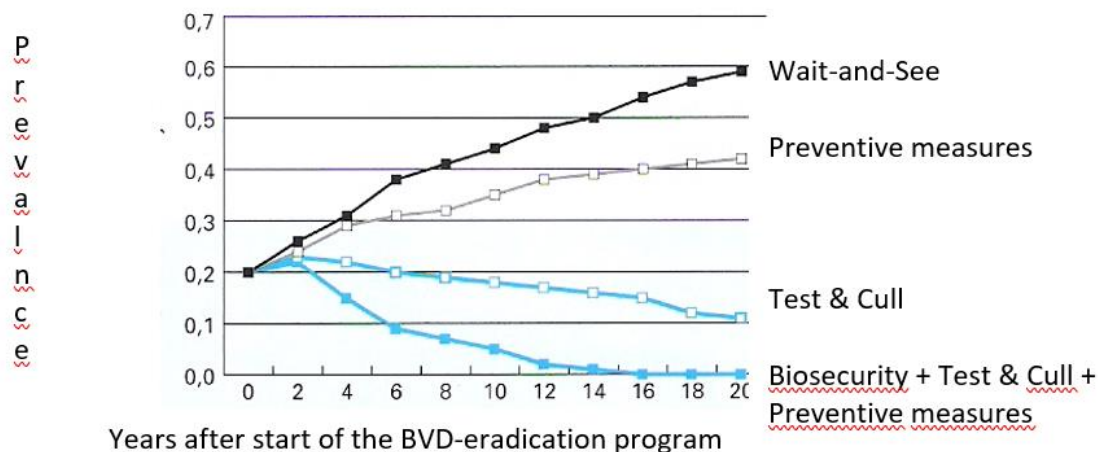


Fig. 1. Example of results of different risk management strategies for eradicating Bovine Virus Diarrhea at regional level in relation to the duration of the program (Viet et al.¹²)

From the graphs in Fig. 1 one can read that the infectious disease BVD can be eradicated by combining different strategies and even without vaccination.

Risk identification and risk management can be applied at the level of an individual farm, but also at regional level and even nation-wide. The latter often relates to avoiding trade barriers, for example when a certain country does not wish to import dairy products or live cattle from a country with a BVD-prevalence. Several European countries have successfully implemented nation-wide BVD-control and monitoring follow-up programs for that reason. These programs are usually made compulsory for dairy farmers. Such programs require appropriate emergency risk communication.

Major steps in developing risk identification & risk management plans

Risk Identification has its origin in epidemiology: hazards (infectious diseases) are to be identified, as well as their associated risk factors or risk conditions. But it goes beyond that, because also non-infectious diseases, impaired welfare and public health issues may be addressed (Noordhuizen & Wentink⁴; Noordhuizen⁵).

When developing a risk identification and risk management plan, there are seven major steps to follow. These steps are described in Table 3.

Table 3. Developing a risk identification/management plan for a dairy cattle farm: seven major steps (after Noordhuizen⁵).

Major steps in developing a risk identification/management plan	
1	—Conduct a critical inventory of infectious diseases prevalent on the farm, considering the geography, soil type, water streams, housing system, animals, people, visitors to the farm, transports. Identify risk factors and their priority and feasibility of control.
2	—Identify the most important risk factors associated with the identified diseases, and their priority as well as the feasibility of their control.
3	—Identify the important threats of infectious disease to the farm, together with the farmer. Identify the risk factors and their priority and control feasibility.
4	—Conduct a clinical inspection of the herd and its environment incl. management, as well as the farm data to determine the transmission risks of pathogens. Formulate goals: for example, less than 10% of mastitis cases in the cows. Or, eliminating <i>Salmonella</i> sp. prevalence from the herd in 3 years' time.
5	—Write down on paper, in a concise manner, the results of the preceding steps
6	—Design an Action Plan with priorities and secondary measures; implement it. Apply appropriate professional and risk communication from veterinarian to farmer.
7	—Evaluate each period (3 or 6 monthly) the effects of the action plan; adjust when deemed necessary.

The steps 6 and 7 in Table 3 represent the risk management plan. Note that every step in Table 3 needs to be discussed with the farmer because compliance is the key for success of implementing a risk management plan.

An adequate *professional communication* (step 6) is another key for success, focusing specifically to increase or maintain the compliance of the farmer to the plan.

Professional communication comprises verbal and non-verbal skills. The verbal skills comprise manner of speech, tone of voice, volume of

speech, non-dominance in speech, simple wording. Non-verbal skills include a positive attitude, interpersonal skills, body language, facial expression, understanding, explaining, farmer education (Pun¹⁰). Both types of skills support the contents of the technical message (advice) itself and are often reported as being more important than that message itself (Kleen et al.³). Long-lasting trust is one key to positive results of communication. Sharing personal experiences and emotions can assist in achieving this trust. In all cases, the veterinarian needs to invest time, both

in the human aspects and technical aspects of his professional communication. Among the communication strategies for a veterinarian are ample discussion with the farmer about pending or prevalent herd problems, jointly concluding a plan of action, a short-written report, and a follow-up.

The veterinarian should act as a coach to the farmer, to guide him along the path to success (Noordhuizen & Edmondson⁷). Discussions between both take place at the level of equality: each has his own knowledge and skills as input.

In all circumstances, the risk management plan must be practical, easy to understand, concise in format and flexible to changing conditions.

In case of highly infectious (notifiable) diseases prevalent in a region, a thorough *emergency risk communication* (ERC) plan must be developed.

ERC must deal with people's perceptions, their emotions such as fear and uncertainty, their confinement stress, and the credibility of information and its providers. That is why other professionals, not comparable to professional communication, are necessary for ERC. Covello¹ has designed seven Best Practices with guidelines for designing an ERC plan. The headings of these Best Practices are named in Table 4.

Table 4. The headings of the best practices for ERC (Covello¹)

Best practice 1	Accept and involve stakeholders
Best practice 2	Listen to the people
Best practice 3	Be truthful, honest, frank and open
Best practice 4	Coordinate, collaborate and partner with other credible sources
Best practice 5	Meet the needs of the media
Best practice 6	Communicate clearly and with compassion
Best practice 7	Plan thoroughly and carefully

Annex II provides the respective elements for each Best Practice. These elements may also serve as criteria for evaluating the quality and effects of ERC in case of an epidemic such as in the case of Covid-19 among humans. Too often, authorities appear to apply communication based on marketing principles. Marketing-style communication is not compatible at all with ERC. In the case of Covid-19 epidemics, the results of implementing marketing-style communication proved to be deleterious.

Concluding remarks

The potential role and power of risk identification & risk management in disease control is largely underestimated in dairy veterinary practice. One reason is maybe that it is so easy to apply a vaccine: just by injection. One nearly does not need to think, while in risk management one needs to think. The domains of vaccination and risk management are complementary and therefore should need more attention and implementation as is shown in Fig.1. Currently, the (veterinary) literature shows ample publications about risk identification & risk management. Veterinarians and farmers should benefit from this evolution. The COVID-19 situation of 2020-2021 points to the absolute need of combining the two

forenamed domains. This is even more so, when vaccines are not (sufficiently) available or not fully protective, and strong emphasis must be put on risk management. Public health authorities should be much better prepared for this, including a sound formation of official people in the domain of emergency risk communication. In the Annex-I, examples of actions taken for COVID-19 and their related communication, as well as the comments by Noordhuizen & VanDijke⁸ on these actions, are listed. These comments are based on formal criteria for emergency risk communication (Covello¹). It shows that, in this example, there is enormous room for improvement in emergency risk communication in a Covid-19-like situation. Using marketing style communication for risk communication is dramatic, fully counterproductive, and dangerous. Covello¹ presented Best Practices with guidelines for developing and applying Emergency Risk Communication (Annex II). It is beyond the scope of this paper to fully elaborate the implementation of these guidelines and emergency risk communication. Note that there are courses for training the officials in emergency risk communication, especially in the USA and the UK. See the internet.

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ADDITIONAL MATERIAL

ANNEX I. Derived from Noordhuizen & van Dijke⁸ on the COVID-19 handling in France during the period January—April 2020 (*Published on ResearchGate, December 7, 2020*)

Which action was taken?	Communication	Comments
Announcement of the pandemic by the President	"We are at war!"	Creates fear, hence counterproductive. People are not soldiers with weapons!
Announcement by the Minister of Public Health	"Mouth masks are useless"	But what is useful then?
Announcement by the Minister of Public Health	"Mouth masks are not available at all"	Are they useless or useful?
Announcement by the Minister of Public Health	"Mouth masks are useful"	Time is lost for proper and reliable information
Creation of a Scientific Committee by the President	In the beginning not at all, later the chairman makes statements under strict supervision of the president	Most members have no competence in Corona virus or mass disease outbreaks. There are no members with epidemiological mathematical modelling competence on board
Several Ministers talk on TV, even when Public Health is not their domain	Communication varies and sometimes is corrected by the President the next day	There is not one spokesperson for Covid-19. Who can people trust?
Several TV stations invite self-named specialists	Media are looking for scoops and debates	This leads to even more confusion among people
The written Press issues different stories on the COVID-19 situation	There is no operational plan for informing all media equally	This leads to confusion and decreasing trust in the government
A lot of figures on infected and dead people are presented each day; action plans are not addressed	Non-stop show of statistics of dead people, infected people	Number of infected persons + rate of death is not very informative for people. They want useful information, not fear.
Public Health Service has 7 layers of decision-making	The President decides. All other layers should follow but have no experience	Layers are accusing each-other of failures made. Too fragmented organization.
There is no updated epidemic disease scenario-book	Finally, it is admitted that "existing scenarios have never been updated"	There was a good scenario for SARS but not updated in 12 years
Appointing test-facilities	"There are not enough test facilities, sorry"	Outstanding veterinary labs are not allowed to do PCR-testing
Vaccination is not compulsory	"But it is in the Constitution"	Reasons why are unclear (president fears to lose voters?)

ANNEX II. Cardinal Guidelines for Emergency Risk Communication (adapted from Covello¹ by the author)**BEST PRACTICE 1: Accept and involve stakeholders**

- Show respect for people affected by risk management decisions by involving them early: that is, before crucial decisions are made.
- Involve all parties which have an interest or stake in a particular hazard or risk.
- Include in the decision-making process the broad range of factors involved in determining public perception of risk concern and outrage.
- Use a wide range of communication channels to engage and involve stakeholders.
- Adhere to the highest ethical standards and recognize that people hold you professionally and ethically responsible.
- Strive for mutually beneficial outcomes.

BEST PRACTICE 2: Listen to the people

- Before acting, find out what people know, think, or want done about risks. Use techniques such as interviews, facilitated discussion groups, information exchanges, availability sessions, advisory groups, toll-free numbers, surveys.
- Let all parties with an interest or a stake in the issue of concern be heard.
- Let people know that what they said has been understood and tell them what actions will follow.
- Acknowledge the validity of people's emotions.
- Emphasize communication channels that encourage listening, feed-back, participation and dialogue.
- Recognize that competing agendas, symbolic meanings and broader social, cultural, economic, or political considerations may complicate risk communication.

BEST PRACTICE 3: Be truthful, honest, frank, and open

- Disclose risk information as soon as possible. Fill information vacuums.
- If information is evolving or incomplete, emphasize appropriate reservations about its reliability.
- If in doubt, lean toward sharing more information, not less. Or else people may think that something significant is being hidden or withheld.
- If you don't know or are unsure about an answer, express willingness to get back to the questioner with a response by an agreed-upon deadline. Do not speculate.
- Discuss data and information uncertainties, strengths, weaknesses (including those identified by other credible sources)
- Identify worst-case estimates as such and cite ranges of risk estimates when appropriate.
- Do not minimize or exaggerate the level of risk; do not over-reassure neither.
- If errors are made, correct them rapidly.

BEST PRACTICE 4: Coordinate, collaborate and partner with other credible sources

- Coordinate all inter- and intra-institutional communications.
- Devote efforts and resources to the slow, hard work of building partnerships and alliances with other organizations.

- Use credible and authoritative intermediaries between you and your target audience(s).
- Consult with others to decide who is best able to take the lead in responding to questions or concerns about risks. Document and date these decisions.
- Cite credible sources that believe what you believe. Issue communication with or through other trustworthy sources.
- Do not attack individuals or organizations with a higher perceived credibility.

BEST PRACTICE 5: Meet the needs of the medias

- Be accessible to reporters; respect their deadlines.
- Prepare a limited number of key messages before media-interactions. Take control of the interview and repeat your key messages several times.
- Keep interviews short. Agree with the reporter in advance about the specific topics to address and stick to that topic during the whole interview.
- Say only what you want the media to repeat. Everything you say is on the record.
- Tell the truth, do not speculate.
- Provide background materials about complex risk issues.
- Provide information which is tailored to the needs of each type of media.
- If you don't know the answer to a question, focus on what you do know and tell the reporter what action you will take to get an answer.
- Be aware of and respond effectively to media pitfalls and trap-questions.
- Avoid saying "no comment".
- Follow up on stories with praise or criticism, as warranted.
- Work to establish long-term relationships with editors and reporters.

BEST PRACTICE 6: Communicate clearly and with compassion

- Use clear, non-technical language, adapted to the target audience.
- Use graphics and other pictorial material to clarify your messages.
- Personalize risk data. Use stories, narratives, examples, and anecdotes to make technical data come alive.
- Avoid embarrassing people.
- Respect the unique communication needs of special and diverse audiences.
- Express genuine empathy. Acknowledge and say that any illness, injury, or death is a tragedy to be avoided.
- Avoid using distant, abstract, unfeeling language when discussing harm, deaths, injuries, and illness.
- Acknowledge and respond in words, gestures, and actions, to emotions that people express (anxiety, fear, anger, outrage, uncertainty, helplessness)
- Acknowledge and respond to the distinction that the public considers as important in evaluating risks.
- Use risk comparisons to help put risks in a perspective; make sure those comparisons consider the distinctions the public considers important.
- Identify specific actions that people can take to protect themselves and maintain control of the actual situation.
- Always try to include discussion of actions that are underway or can be taken.
- Be sensitive to local norms such as speech and dress.
- Only promise what you can deliver, then follow through.

- Understand that truth is earned. Do not ask or expect to be trusted by the public.

BEST PRACTICE 7: Plan thoroughly and carefully

- Start with clear, explicit objectives (providing information, or establishing trust, or encouraging appropriate actions, or stimulating emergency responses, or involving stakeholders in dialogue, or partnership, or joint problem solving).
- Identify important stakeholders and subgroups within the audience; respect diversity and design communication for specific stakeholders.
- Recruit spokespersons with effective presentation and personal interaction skills.
- Train staff, including technical staff, in basic, intermediate, and advanced crisis communication skills. Recognize and reward outstanding performances.
- Anticipate questions and subjects of concern.
- Prepare and pre-test messages.
- Carefully evaluate risk communication efforts and learn from mistakes.
- Share what you have learned with others.

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Covello¹*