Research and Development

Final Project Report

(Not to be used for LINK projects)

Project title	Vaccine use in organic cattle and sheep systems: Development of a decision support tool based on risk assessment
DEFRA project code	**OF0310**
Contractor organisation and location	VEERU
The University of Reading
READING
Total DEFRA project costs	£ 68.348
Project start date	01/04/02
Project end date	15/09/03

Executive summary (maximum 2 sides A4)

This project's aim was to support a consistent approach to decision making on vaccine use among organic dairy, beef and sheep farmers and their advisers, including their veterinarians, by developing a decision support tool on vaccine use in order:

   a) to help organic livestock producers and their veterinarians to assess an individual farm situation in relation to a specific disease risk, to implement specific risk management measures and to communicate the decision with adequate precision to the certification bodies; and

   b) to provide certification bodies with baseline information on risk factors and risk management measures and their significance, so that the could judge veterinary/farmer decisions on vaccine use adequately.

The project focused on 10 cattle and 14 sheep diseases that are routinely vaccinated against in the UK.

A web-based, interactive decision support tool (DestVAC, www.destvac.reading.ac.uk) was created using ASP.NET and SQL Server Database. The tool allows farm specific exploration of risk factors and risk management measures, access to additional information on vaccines, exposure and financial impact of disease at farm level. The tool also allows the user to produce reports on individual farm assessments or exploratory scenario building for submission to certification bodies as part of a health plan.

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Scientific report (maximum 20 sides A4)

Justification for the project

According to the EU Regulation 1804/99, disease prevention on organic farms should be based on

a) selection of appropriate breeds and strains (e.g. vitality, resistance to disease);
b) application of husbandry practices that encourage strong resistance to disease and the prevention of infections;
c) encouragement of natural immunological defence of the animal (e.g. using high quality feed, allowing regular exercise and access to pasturage); and
d) avoidance of overstocking and health problems resulting from overstocking.

The UK national organic standards (UKROFS, 2001) further state that statutory health plans for organic farms must "allow for the evolution of a farming system progressively less dependant on allopathic veterinary medicinal products". While vaccines are classified as allopathic veterinary medicinal products, the UKROFS standards permit their use "where there is a known disease risk".

In practice, most of the organic sector bodies, certifying livestock farms, require justification of vaccine use either in a written health plan or by a separate application. The definition of a "known disease risk" has, however, caused problems both in situations where veterinary opinion has not been considered adequate by the certification body, or where a producer has decided to discontinue all vaccine use without implementing any other disease control measures. This has occasionally lead to accusations of poor welfare on organic farms as a result of disease outbreaks that could potentially have been prevented by immunisation (Veterinary Record, 7th of April 2001). According to the managing director of the Scottish Organic Producer Association (SOPA), Chris Atkinson (personal communication), the certification bodies have struggled to find a balance between "routine" vaccine use and farm system redesign that would lead to reduced dependency on vaccines, without jeopardising animal welfare. The certification bodies also find it difficult to assess vaccine use decisions taken by the producers in the absence of information on the potential risk factors relevant to each farm. According to Mr Atkinson, this information is seldom provided by the veterinary certificates of vaccine use.

This project's aim was to support a consistent approach to decision making on vaccine use among organic dairy, beef and sheep farmers and their advisers, including their veterinarians, by developing a decision support tool on vaccine use in order:

c) to help organic livestock producers and their veterinarians to assess an individual farm situation in relation to a specific disease risk, to implement specific risk management measures and to communicate the decision with adequate precision to the certification bodies; and
d) to provide certification bodies with baseline information on risk factors and risk management measures and their significance, so that the could judge veterinary/farmer decisions on vaccine use adequately.

The ultimate aim of the project was to help to ensure that animal welfare is promoted on organic livestock farms in relation to vaccine use and that organic farming systems are developed towards reduced dependency on conventional veterinary medicinal inputs. This aim is believed to support the viability of organic livestock production in the UK, as organic livestock products are often chosen by consumer for their perceived high welfare standards and the producers can ill afford to loose this reputation

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Scope of the project

The project focused on those diseases that are routinely vaccinated against in the UK cattle herds and sheep flocks.

The following diseases, for which vaccines are available, were considered in cattle:
- leptospirosis (Leptospira hardjo);
- infectious bovine rhinotracheitis;
- bovine viral diarrhoea ;
- enzootic pneumonia in young dairy calves (RSV, PI3, Pasteurella haemolytica);
- enzootic pneumonia in older calves;
- enteritis in calves (rotavirus, coronavirus, E.coli K99);
- lungworm (Dictyocaulus viviparus);
- ringworm (Trichophyton verrucosum);
- blackleg (Clostridium chauvoei); and
- salmonellosis (Salmonella dublin, Salmonella typhimurium).

The following diseases werer considered in sheep:
- clostridial infections:
  - tetanus
  - bacillary haemoglobinuria
  - black disease
  - blackleg
  - braxy
  - lamb dysentery
  - pulpy kidney
- footrot;
- orf;
- louping ill;
- ovine abortion;
- EAE;
- toxoplasmosis; and
- pasteurellosis.

Watery mouth (acute *E. coli*-infection) in lambs was excluded during the project, as the manufacturer withdraw efficacy claim against this disease from their vaccine specification. Paratuberculosis in cattle (Johne's disease) was excluded to avoid confusion. It was considered that vaccine use has a distinctly different role in the control of this disease, when compared to other diseases included in the tool.

Materials and methods

Evidence-based risk assessment concerning vaccine use and immunisation policies is often difficult at farm level. Local disease situations may not be well known, traditions and financial constraints are often the main determinants in shaping these policies (Barrett, 2001). Poor understanding and implementation of herd and flock health security (biosecurity) on British cattle and sheep farms, as recognised by the DEFRA SCG (Anon, 2000a; Anon 2000b), further complicates an objective risk assessment exercise on immunisation. There are, however, existing models of risk assessment on farms in regard to vaccine use and disease control on cattle and sheep farms in the form of commercial animal health accreditation schemes (eg Premium Cattle Health Scheme, Maedi Visna Accreditation Scheme). Quantifiable risk assessment and risk modelling are also commonly used to assess the need for statutory immunisation or prophylaxis policies (Morris *et al.*, 2001).

Risk assessment

The project was initiated by an assessment of the VIDA database in order to determine whether there was scope for quantifiable risk assessment, regionally or nationally, in the case of any of the diseases

listed. It was concluded that the absence of denominator data on the VIDA database would make it impossible to introduce quantifiable risk assessment into the tool by using national data. Literature sources of quantifiable epidemiological data on the listed diseases in the UK were reviewed. It was concluded that due to the variable quality and nature of the existing data, this information would be presented as additional decision support information in the tool, rather than part of the risk assessment. A short review of existing information was created, and in cases where this was possible, this information page was linked to an existing, DEFRA-funded decision support tools on the web: Compendium for Animal Health and Welfare in Organic Farming (www.organic-vet.reading.ac.uk) and Economics of Livestock Diseases (www.reading.ac.uk/livestockdisea).

Hazard characterisation for the user was provided by a link to the existing DEFRA-funded support tool (www.organic-vet.reading.ac.uk).

In the absence of quantitative epidemiological data, it was decided to assess exposure at individual farm levels by qualitative farm-specific risk factor assessment. This was based on
- an extensive review of literature re. risk factors for each disease and creation of lists of risk factors for each disease;
- review of disease specific lists of risk factors by animal health experts within the Scottish Agricultural College (SAC) for deletion/addition/modification and ranking (ranking from 1 to 3; 1 = serious risk, 2 = intermediate risk and 3 = minor risk);
- review of the risk factor lists and ranking by a workshop (18/11/02) by a group of experts, veterinary surgeons, farmers and representatives of vaccine manufacturers and certification bodies; and
- a final peer review of listings and rankings by the SAC experts.

Information for risk management at farm level was provided for by a similar process whereby risk management measures were reviewed, ranked and peer reviewed.

Database creation
Using information from the risk factor and risk management measure assessment described above, an SQL Server -database was created. This database also included information on vaccines, hazard characterisation and exposure.

Tool building
An interactive, web-based tool to query the SQL Server-database and to provide access to other additional information was built by using ASP.NET (see flow-chart at the end of the report).

User assessment
User assessment was carried out during two workshops (18/11/02 and 04/05/03). Feed-back from these was incorporated where appropriate.

Results
The results have been built into a web-based decision support tool available at www.destvac.reading.ac.uk . The tool allows farm specific exploration of risk factors and risk management measures, access to additional information on vaccines, exposure and financial impact of disease at farm level. The tool also allows the user to produce reports on individual farm assessments or exploratory scenario building for submission to certification bodies as part of a health plan.

Conclusions
It is evident that the lack of national disease prevalence/incidence data for all of the diseases dealt with in this project is a major hindrance to the development of evidence based decision making on vaccine use on organic farms. This absence of data obviously also reduces the value of any decision support tools offered. In the absence of quantitative analysis, the current tool has shifted the emphasis of decision making from assessment of exposure to risk reduction at farm level by system and husbandry redesign, in accordance with the organic principles. It is, therefore, believed that the tool will be useful

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both to organic farmers, their veterinary surgeons and to the organic certification bodies in moving the animal health management on organic farms from input substitution towards true system redesign.

References:

Anon (2000) a Zoonotic infections infections in livestock and the risk to public health. Proceedings of the first meeting organised by DEFRA, Edinburgh, 28 June 2000. http://www.maff.gov.uk/animalh/diseases/vtec/index.htm

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Barrett, D. C. (2001) Biosecurity and herd health – a challenge for the 21st century. Cattle Practice. 9:2, 97-103.

Morris, R.S., Wilesmith, J. W., Stern, M.W., Sanson, R. L. and Stevenson, M.A. (2001) Predicitve spatial modelling of alternative control strategies for foot-and-motuh disease epidemic in Great Britain, 2001. Veterinay Record 149:137-144.

Roderick, S., Hovi, M. and Short, N. (1999). Animal health and welfare issues on organic livestock farms in the UK. In: Farm Animal Welfare: Who Writes The Rules? (ed. A.J.F Russel, C.A Morgan, C.J Savory, M.C Appleby and T.L.J Lawrence) British Society of Animal Science. Occasional Publication No.23.

Roderick, S., Hovi, M. (1999) An assessment of animal health and welfare research priorities in organic livestock production in the UK. A Report to Ministry of Agriculture, Fisheries and Food, UK. Pp.112.

UKROFS (2000) Standards for organic livestock and organic livestock products, pp42.

(see following page for the flowchart of the decision support tool)

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DestVAC – flowchart:

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                          ⬡ Farm assessment ⬡
                                   │
                                   ▼
                        ◇ Disease situation on the
                                farm? ◇
                    │                          │
                    ▼                          ▼
            ┌──────────────┐          ┌──────────────┐
            │   Disease    │          │   Disease    │
            │    absent    │          │   present    │
            └──────────────┘          └──────────────┘
                    │                          │
                    ▼                          ▼
            ┌─────────────────────────────────────┐
            │  Risk factor assessment: Choose farm │
            │        specific risk factors         │
            └─────────────────────────────────────┘
                              ▲│
                              ▼
            ┌─────────────────────────────────────┐
            │  Risk management measures specific to│
            │         risk factors chosen          │
            └─────────────────────────────────────┘
                              ▲│
                              ▼
            ┌─────────────────────────────────────┐
            │  Other risk management measures      │
            │      specific to the disease         │
            └─────────────────────────────────────┘
                              ▲│
                              ▼
```

Information: Vaccines

Information: Exposure

Information: Impact

Information: No risk

◇ Decision on vaccine use ◇

┌──────────────┐   ┌──────────────┐
│ Will use   │   │ Will not use │
│   vaccine   │   │   vaccine   │
└──────────────┘   └──────────────┘

(Produce a report)