Dairy Herd Health and Management

A guide for veterinarians and dairy professionals

By Jos Noordhuizen
Edited by Helen Warren

About the author

Jos Noordhuizen was born on April 9th, 1947 in the Netherlands. He got his DVM diploma from Utrecht Veterinary Faculty in January 1975, after which he was appointed for 3 years in the Clinic of Obstetrics & Gynaecology of that Faculty, where he practiced Herd Fertility Schemes on dairy farms. After having spent some time in private food animal practice, he went back to Utrecht where he got his PhD on the subject Herd Health & Production Management on Dairy Farms in 1984.

In 1988 he was appointed professor in animal husbandry at the Wageningen Agricultural University. Later In 1997 he was invited for the chair of professor in ruminant health at the Utrecht Faculty where he stayed until 2005. He was guest professor in veterinary schools in Gent (Belgium), Nantes (France) and Lyon (France).

He is currently adjoint professor at Charles Sturt University, School of Animal & Veterinary Science (Australia) and consultant at VACQA-international (Portugal).

He has supervised over 35 PhD projects, published over 300 papers in scientific and practice journals, edited 4 books on various veterinary and dairy farming topics, organized several international courses, was invited for giving seminars all over the world, and participated in joint development projects in Costa Rica, Thailand, Vietnam and Sweden.

Jos was member of the Dutch National Health Council, appointed by HM The Queen, member of the scientific committee for health and welfare of the European Commission in Brussels, founder and president of the Dutch Association for Veterinary Epidemiology & Economics, cofounder of the European College of Bovine Health Management, and member of several international associations and congress organisation committees. He currently lives with his wife in Normandy (France).

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About the Book
This publication takes a new approach to the subject of Dairy Herd Health and Management. The author's 35 plus years experience in the area has lead to the conceptualisation and collection of different topics to better support dairy herd health and management programmes.

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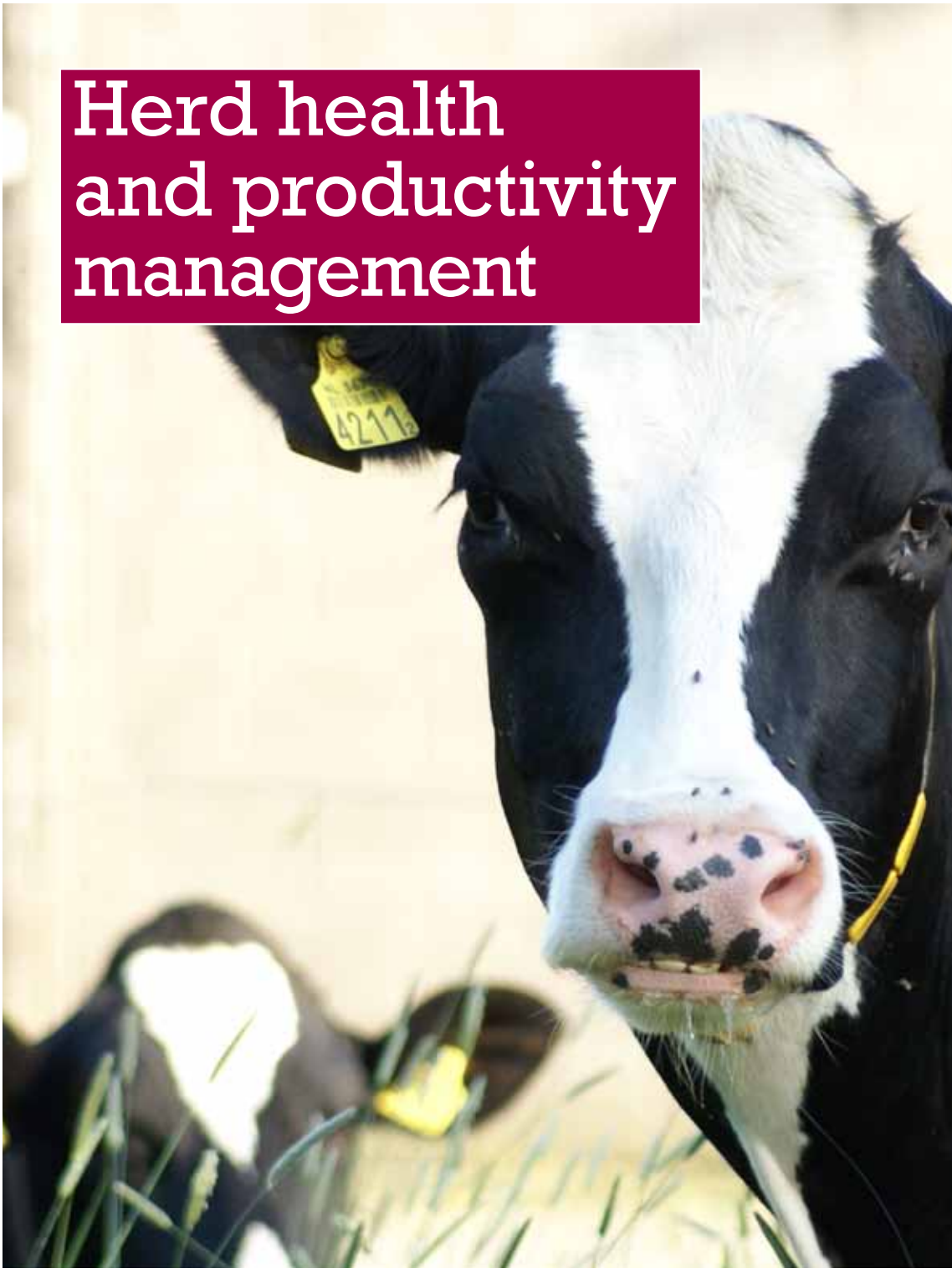
Sections

Herd health and productivity management



Herd health and productivity management (HHPM) has become a core business of modern veterinary practices in developed countries. The unit of concern is the herd as opposed to the sick cow. This is because the farmer earns his income through healthy cows and loses money via sick cows. HHPM comprises the various, most important farming areas. For each area, a basic monitoring protocol exists. However, at the same time, individual area specificities should be taken into account. This chapter provides various practical methods used to detect strong points and points for improvement, organise a farm visit and interpret farm performance. Problem analysis requires a different type of protocol, where a stepwise procedure helps the farmer to understand where he stands in relation to average benchmarks and other units. Performance parameters are always compared with reference values.

Transition period score sheet

Adapted from GD Deventer NL 2008

Table 1.3 General score sheet to assess the level of disease resistance in cows during the transition period

Farmer name	Name of veterinarian	Date of visit	
		YES	NO
Nutrition	The average BCS of dry cows is > 3.5		
	A significant decrease in dry matter consumption by dry cows is observed		
Early lactation	Loss of >1 BCS point in the first 6 weeks after calving		
	Rumen Fill score after calving is < 3		
Minerals, Vitamins	Dry cows and/or heifers receive a total mixed ration (TMR)		
		SCORE	
Stress factors	Most calvings take place isolated and outside the herd (score 4)		
	Forage component at the end of the dry period or the day of calving differs by > 50% of the forage type in early lactation (e.g. low energy/ high fibre versus high energy + fibre)(score 2)		
	At the end of the dry period, the cow has not been adapted to at least 2 kg of concentrates (score 2)		
	The neonate calf is not separated from its dam within 6 hrs of birth (score 2)		
	There are too few cubicles for all cows in the herd (score 6)		
	There is not enough space at the feed table (score 4)		
	There are cow comfort problems on this dairy farm (score 4)		
	TOTAL		
		YES	NO
Herd health	Prevalence of infectious diseases is rather high (> 15% of cows in the herd are affected		
	Prevalence of other disorders (eg. mastitis, lameness, metabolic disorders) is rather high (> 15% of cows in the herd)		

If "**YES**" has been entered under one or more of the given situations above, this can be indicative of a reduction in disease resistance. In this case, a more in-depth analysis should be carried out to try to find the cause(s) of this reduction.

A score of **6 or higher under 'Stress factors'** indicates reduced **disease resistance**.

High prevalence of the diseases and disorders noted above can indicate a lowered disease resistance in the herd.

Key factors for large dairy farms

From Dossier Grands Tropeau.
December 2007
L'Eleveur Laitier,
153. Jean-Luc Ménard

Factor 1 - Buildings

- Barn/shed climate = ventilation without obstacles
- Ventilated walls or half-open walls are okay
- Side doors standing open is rather bad for optimal ventilation
- Mobile wall sections over the whole length are fine for flexibility

The milking parlour can be placed:

1 Parallel to the cow houses
2 Perpendicular to cow houses
3 At the end of the cow house

Factor 2 - Specialisation tasks for animal groups on the farm

- Cows - dry
- Cows - in lactation
- Heifers
- Calves
- Combinations of the preceding

} Organisation & specialisation of tasks
Herd divided in groups:
2 x lactation
1 x dry group
(at least part of the year)

Factor 3 - Cow Comfort

- Straw yard
- Cubicles+mattress
- Combinations

} Workload and -time (Cows forced to pass crossings need time)
Availability of straw
Cow circulation & traffic
Risk of mastitis

Waiting area

1.2 m^2 /cowL = 12 m^2 / 10 cow
When cows enter in different, subsequent, smaller groups 6 m^2 / 10 cow are only needed for the waiting area.

Provide one calving pen / 20 cows (when calvings are concentrated).

Cubicle size

To calculate the correct cubicle size, use the largest 30% of the herd or group as a guideline.

Size needed at the shoulder rail = 0.5 m width /cow
Size needed at the feed table = 0.75 m width / cow

Feed bunk for ad lib consumption

1 place / 2 - 3 cows
Push the forage to the cows or use a mobile feed table.

Biosecurity on farms

Biosecurity = a programme to reduce or prevent the introduction from external sources of infectious diseases, as well as the spread of such diseases once they have entered the farm.

Introduction

Infectious diseases can have a great impact on the economic performance of a farm and may also induce stress in the farmer. Examples of such diseases are: salmonellosis, BVD, IBR, brucellosis, tuberculosis, paratuberculosis (Johne's disease). As well as animal and farmer welfare, these diseases have wider implications for the overall standing and image of the dairy industry, including damage to public image, loss of market position and decreased slaughter value. Moreover, in the EU the farmers are held responsible for the products (milk; meat) they put on the market, including the safety of those products. Hence, they are held responsible for any sort contamination (microbiological; chemical etc).

The production process influences the health and welfare of the cattle in the herd, as well as public health. After all, the farmers represent the first link in the dairy food chain! The negative effects of infectious diseases can have implications for both the short- and long–term and depend on, for example, the type of disease/pathogen ,the level of commitment by farmers to address these diseases/pathogens and the concerns of consumers.

Given the important consequences of infectious diseases, the development and implementation of biosecurity programmes should be a high priority among farmers.

Vaccines and antibiotics have been the number 1 choice to prevent, control or reduce the incidence of infectious diseases. However, for certain diseases, they are unavailable or are not sufficiently effective; sometimes, if available, they are poorly administered. In other situations there is limited option for using vaccines (e.g. the EU).

For poorly administered vaccines, one can develop technical working instructions (a kind of 'best practice') including the correct procedure for administering medicinal drugs, as well as correct stock handling, dosage, withdrawal time, etc. Such working instructions must be strictly complied with. Even instructions for the correct use of antibiotics must be strictly adhered to in order to prevent contamination of milk or meat and to minimise resistance development and residues. It is important to remember that vaccines and antibiotics do not replace good biosecurity, even when required for reducing the prevalence of a certain disease (eg. BVD; IBR).

Components of a biosecurity programme

The components of a biosecurity programme are management instruments (Good Dairy Farming Code of Practice). Some of the areas of concern and relevance for veterinarians are listed in Table 2.1

How to design a biosecurity programme

There are five steps to take when designing a biosecurity programme for use on farm:

1. Conduct a written, critical inventory of infectious diseases that are relevant to the farm. Take into account the geography, soil type, housing, animals, people and visitors, transportation means.
2. With the farmer, identify the most important infectious diseases already present in the herd.
3. Identify the most important infectious diseases that are not yet present on the farm but present a threat.
4. Conduct a Diagnostic Herd Evaluation (animals, environment, data) to determine the level of risk for the transmission of selected disease pathogens. Formulate goals for the biosecurity programme : for example a 5% reduction in the prevailing clinical mastitis incidence per year; or, the elimination of IBR from the dairy herd in 3 years.
5. Illustrate the biosecurity programme and implement it. Work together with the other people working on/for the farm, including professional consultants to try to ensure compliance. The programme must be updated at least annually.

Areas of concern

Adapted after the text issued by AFIA – BAMN publications, Dorann Towery, 1501 Wilson Boulevard, Suite 1100, Arlington, Virginia 22209, USA (2001).

Table 2.1 Areas of concern & relevance to veterinarians involved in a dairy farm biosecurity programme

New additions	**Cattle, semen, embryos** Note that e.g. Neospora and BVD can be introduced by healthy animals. Moreover, healthy animals can introduce diseases with a long incubatuon period (paratuberculosis).	Check all animals. Test for relevant diseases. Sample milk for bacteriological testing. Vaccinate twice before transportation. Quarantine the animal for 3 weeks before mixing with the herd. Buy semen or embryos or sires from certified traders or with active disease control programmes
Forages and concentrates; water	**Concentrates** **Salmonella spp.** can be found in feedstuffs and in pasture. **Forages** **Salmonella spp.** can be found in forages irrigated with contaminated water. Incorrect harvest or feed stocking may introduce clostridium bacteria. **Water** Water sources can be contaminated and introduce **E. coli** or **Salmonella spp.**, as well as **Cryptosporidium parvum**.	Test water for bacteriological, chemical and nutritive contamination. Ask cattle and feed traders to show the quality assurance for their feeding programme, their stock and their delivery. Prevent faecal and urinary contamination of feedstuffs and water.
Contact between animals	Fences, shows and expositions, errant animals, putting sick animals in the barn, calving pen. Contact between groups of different ages.	Minimise contact between different animal groups. Consider cattle returning from shows or markets as new additions (see above). Minimise contact with non-resident cattle.
Wildlife and other vectors	**Squirrels, rats, mice, foxes** **Salmonella, Brucella, Leptospires.** **Insects** Anaplasmose, Blue Tongue **Rats, mice** **Salmonella, E.coli**	Prevent contact with wildlife. Use pesticides and traps close to feed. Exercise control measures for insects and birds, on and around animals.
Animal health management	**Procedures -**Comply to the Good Medicine Application Code of Practice Note that practices like de-horning, vaccination and implanting could cause disease transmission.	Use disposable utensils. Disinfect other utensils between use on different animals. Use vaccines according to prescription.
Noxae	**Vehicles, persons**	Wash trucks and vehicles after use. Dedicate a special site for dead cattle. Provide strict hygiene instructions for visitors.

Biosecurity checklist

Table 2.5 Biosecurity checklist for farms			
Section 1 General issues FARMER STATEMENTS			
Best management practices checklist	YES	NO	Veterinarian remarks on farmer statement
I routinely meet milk quality standards (SCC, bacteria, etc)			
My milk and dairy beef buyers offer quality premiums			
I believe it is more profitable to keep diseases off my dairy than to fight them on my dairy			
I agree that taking profit by doing things right the first time is a critical part of biosecurity			
Biosecurity requires some method of permanent animal ID. I have such an ID method in place.			
I can readily track and validate to others the quality represented in my animals			
I have been able to consistently produce and sell more milk per cow per year			

Section 2 Keeping infectious diseases off the farm			
General control practices			
I never purchase or keep animals for or from others			
My vet talks to the seller´s vet prior to my buying animals			
My cattle do not attend shows or use community pastures and they are not placed in performance evaluation centres			
My cattle rarely share fence lines with neighbouring cattle			
I purchase and never borrow or use loaner bulls from other farms			
I always buy animals from a paratuberculosis-free certified farm			
I always know the health status of animals brought into my herd			
I never bring in animals without knowing their vaccination history			
I do not buy animals from a herd that has mixed origin cattle			
I limit my purchases to open heifers			
I ask for DHIA somatic cell count information from the seller´s herd when buying cows			
I transport animals in my own clean vehicle			

Calf rearing

“The rearing of young stock on a dairy farm can be considered as an individual business enterprise. This chapter addresses many issues of rearing. First attention is given to, particular events in specific rearing periods together with specific risks followed by checklists for evaluating rearing management quality. Also included are several protocols for IgG testing, checking calves for respiratory disease, diarrhoea and rehydration, as well as heart girth measurement, ration composition, housing of calves, proper dehorning, hygiene, BVD control, biosecurity and for estimating estimation of losses related to mortality.”

Rearing periods - birth to 2 months

From Boersema JSC. 2006.
MSc thesis University Utrecht NL

Table 3.1 Potential risk factors in calves

Disorders	Potential risk factors identified from the literature
Disorders around birth	Bull calf – More muscular breed sire used – Posterior position at birth (milk fever in dam; severe stress; low vitality)– 1st parity
Diarrhoea in 1st week of age	Inappropriate or lack anti-scours vaccination (resistant bacteria; GVP not applied) – Poor hygiene at calving (too many calving cows in the same pen; calves born on slatted floor; lack of attention from farmer; lack of time) – Poor housing hygiene (lack of attention from farmer) – Poor colostrum quality (unhygienic collection; low IgG level; unhygienic feeding; poor storage practices; using colostrum frozen more than 1 year ago; dilution with water; poor thawing practices) – Too long an interval between birth and the calf's 1st meal – calf does not receive first colostrum milked– Insufficient quantity at each meal – Group housed too early (too little space; no individual pen) – Inside housing – No preventive antibiotics administered – No free-choice salt provided – additional teats are removed too early – Large herds – Too little attention from care-taker – Sudden changes in feeding practice – No routine monitoring visits by veterinarian – Heat stress in calves
Diarrhoea in older calves	Use of maternity pen as sick pen – No individual calf hutches – Poor rearing hygiene practice (improper housing and feeding; damp bedding material) – Milk replacer fed without antimicrobials or the equivalent – Sick calves not isolated – Drinking water pH >8 – Roughage from pasture where manure was spread without ploughing in – Sudden changes in feeding or ration – lack of attention from care-taker
Navel disorders	Infected navel (dirty calving pen; dirty calf hutch; no navel disinfection applied; navel suckling by others; calf born on slatted floor) Navel hernia (genetic cause? sex effect? twin birth) – Navel cord too short (poor manipulation during birth eg C-section; posterior position at birth)
Poor weight gain	Infection in calf (navel disorder; diarrhoea; respiratory) – Feeding poor quality colostrum (see under diarrhoea in 1st week of age) or hay – Feeding poor quality milk replacer (inappropriate composition; poor quality water used at mixing; milk powder not stored dry; incorrect preparation or supply (temperature; poor mixing; dirty conditions; inappropriate feeding temperature) – Stressful calf-handling – poor water quality – Too much hay or grass given – Ad libitum milk replacer given (hampers intake of hay = poor rumen development = stress and susceptibility after weaning) – inappropriate concentrate composition – Feeding mastitic or antibiotic-contaminated milk – Stress/infection at dehorning (poor dehorning practice; incorrect timing of dehorning; stressful handling; too small headspace in feed rack) – Lack of concern of care-taker
Respiratory disorders	Poor barn climate (temperature, humidity, draughts; not adapted to climatic changes) – Housing older calves with younger, or too many age groups mixed – Ammonia level in air too high – Lack of attention from care-taker – Season – Poor colostrum management – Poor record keeping – Animal stocking density too high – BVD infection present in herd – Poor bedding material quality – New cattle purchased – Grazing in summer – History of disease (diarrhoea; respiratory)

Claw trimming

Functional (preventive) claw trimming

Trimming should never be carried out in the month prior to calving.

However, cows may be trimmed on the day of drying off and then again at two to three months after calving (when they are through the high risk period and will more easily recover from any claw lesions).

A second option is to trim all cows twice a year (or more if needed), taking care not forget groups of animals, such as the pregnant maiden heifers

With this option, ensure all cows are trimmed in one day or, at the most, over two consecutive days.

A third option would be to trim cows on an individual basis, for example, cows with highly sensitive claws.

Curative claw trimming

It is essential to trim claws of cows that show poor hind leg conformation, lameness or hoof deformities. Delaying trimming, in this situation, will exacerbate the situation and could result in problems with remaining claws, either by infection or by mechanical overload.

Claw trimming should only be carried out using the appropriate tools and facilities. There exist several simple claw trimming facility options:

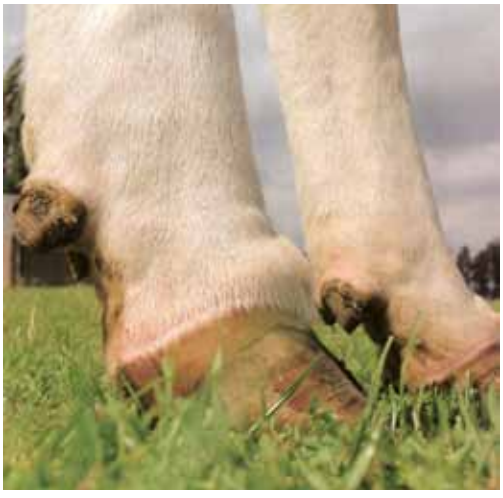
- Mobile - these may be placed behind your car
- Installation in a cubicle
- Fully equipped, stand-alone devices that can be placed anywhere on farm.

The following gives an example of a list of animals selected for claw trimming, together with the reason for selection, as part of the routine Herd Diagnostic Evaluation during a farm visit:

Table 4.1 Example of cow selection for claw trimming

Cow ID	Reason for trimming
5671	front claw deformation
5670	hind claw too long
3145	front claw show some deformity
1352	all 4 feet too high and too long
8330	overgrowing soles
1806	lesion on hind claws?
8340	lesions on hind claws?
8329	all 4 feet too high and too long
5648	front claws too long
5693	front claws too long

This list indicates a lack of good claw management, demonstrating the need for routine claw trimming and inspection i.e. a functional (preventative) trimming plan.



Farm visit protocol to address claw problems

1 On arrival, get a general impression regarding the farm and its installations

2 Follow the rules of Good Hygiene Practice (change boots and clothes; wash hands)

3 Report to the farmer (or manager, employee, family)

4 Ask the farmer whether there are lameness problems in his herd of cows or calves

5 **If no**, execute the Diagnostic Herd Evaluation routines (→ continue with **step 8)**

6 **If yes**, ask for the details about the lameness cases (clinical diagnoses; predominant diagnosis; current treatment practices; whether preventative functional claw trimming is carried out and, if so, what the protocol is e.g. twice a year by a professional trimmer) and whether the farmer carries out trimming; if yes, when, why and how. Once you have sufficient detail, then proceed with the rest of the anamnesis: breed of cow; average age of cows or calves; milk production level; reproductive problems (heats; pregnancy repeat breeders) calving problems; other diseases.

7 Ask for details regarding: use of a foot bath (dimensions; frequency; products; contents; renewal); presence of a water bath to clean claws first.

8 Clinical inspection of the animals (Notation= GOOD–AVERAGE–POOR)

9 Body condition scores at early, mid-, late lactation and dry cows; rumen fill scores; faecal consistency scores; undigested fibre in the faeces scores; locomotion scores; specific behaviour; poor posture of hind legs; social interactions, including agonistic and antagonistic behaviour; hock lesions; other signs.

Inspection of housing, climate, hygiene and rations (Notation= GOOD–AVERAGE–POOR).

Characteristics of the barn (temperature/ ventilation; humidity; draughts; open sidewalls; dirt; moulds).

Characteristics of the waiting area, exercise area; milking parlour (presence of a working manure scraper [type of system; frequency of operation; efficacy]).

Characteristics of the rations (type of ration [complete or not]; feedstuffs; origin and quality; formulation of rations [by whom; ration limited or ad libitum]; risk of acidosis; conditions in front of the feed rack; position of feed rack).

General hygiene in the barns, the cubicles, the passage ways, waiting area, milking parlour. Cleanness of the cows (scoring thighs and udders).

10 Synthesis of the inspection = summarising strong points and points for improvement → work hypothesis and herd probability diagnosis. Or =summarise lameness problems, including prevailing risk factors.

11 Create a plan of action with advice and/or interventions for the short-term (maximum of five recommendations) and for the mid-to-long-term. Ensure you discuss the draft version of the report with the farmer before producing a final version. Deliver the final version (maximum of one page of A4) to the farmer within five days.

12 Produce a calendar indicating when the next farm visit is required to evaluate progress following the advice given in the preceding report.

Points for improvement

FIELD SHEET

	Strong points	Points for improvement
Animal inspection		
Inspection of barns, hygiene and rations		
Synthesis & conclusions (formulate your reasoning and hypothesis here)		
Advice & proposed Interventions		

Hint! The titles given in the above field sheet can be used as headings in the farm visit report!

Protocol No 1 for problem analysis of claw lesions

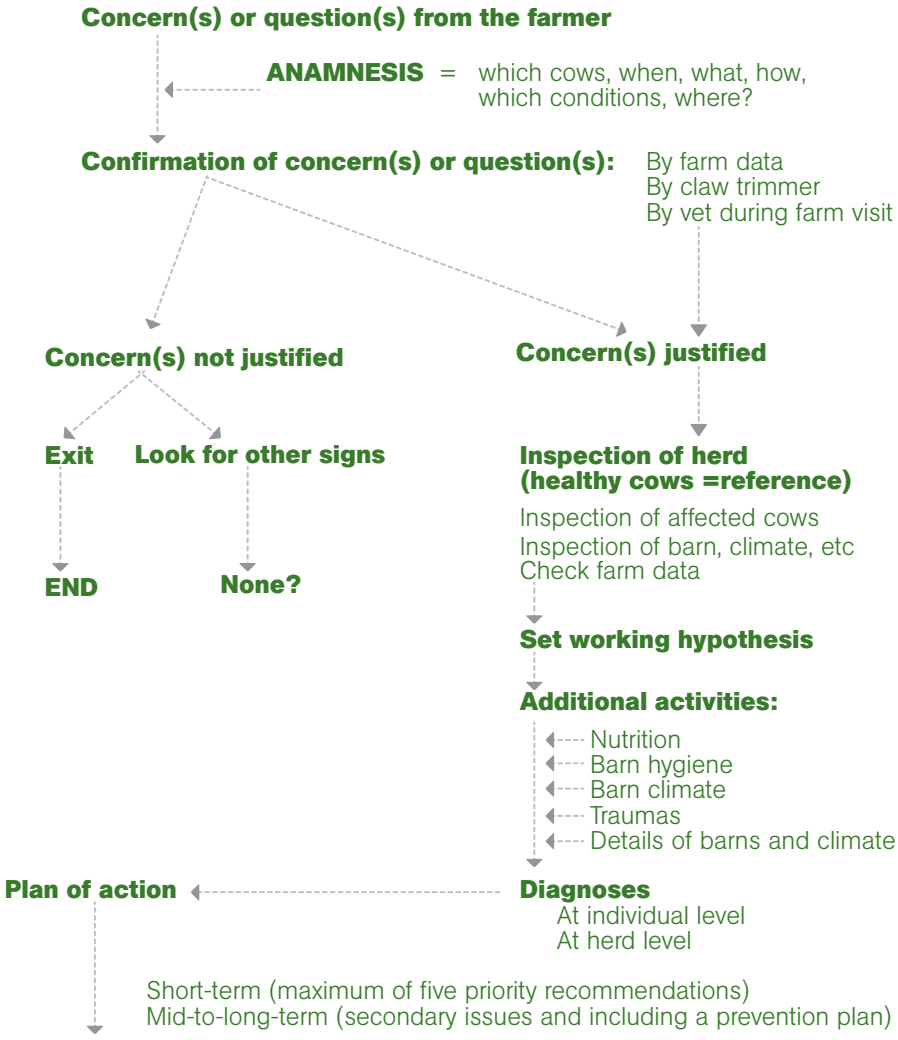


Figure 4.3 Protocol 1 for analyzing herd claw problems

Welfare - frequency of lameness

Eighty dairy farms, with either a loose housing system with straw yards or as tied stalls, were assessed for the prevalence of lameness. There was a large variation in lameness prevalence between the two systems.

Results

1. Farmers do not know the lameness risk factors very well
2. The rate of lameness detection is abnormally low, 8% observed versus 27 to 34% in reality
3. Treatments for lameness are either too late or non-existent
4. The fact that herd claw trimming is rarely executed makes the situation worse
5. The barn surfaces are not very well and there is a lack of cow comfort
6. The steps (cubicles; drinking places) are too high (> 20 cm is bad) and sometimes there are even two steps
7. There are traumatizing areas and or slippery areas in the houses
8. The exercise areas are muddy and or full of gravel
9. The lack of hygiene and the humidity provoke claw lesions
10. The traumas on a hard wearing floor, and gravel are prone to cause phlegmonas.

Primary criteria for cattle welfare

1. The body posture of the cows.
2. The straightness of the spine of the cow, both while standing and while walking (locomotion score).
3. Treatments for lameness are either too late or non-existent
4. Treatments for lameness are either too late or non-existent

To ensure cow welfare better, a herd claw trimming routine must be implemented. Trimming frequency should be every four months. An alternative option is claw trimming twice yearly. Older cows and repeat cases must be trimmed more frequently.(Note that the current Dutch method of claw trimming is to trim the claws twice per year (routine functional trimming) and to trim each cow just before drying off, as well as after peak milk yield (after 100 days lactation). If necessary, older cows and chronic cases must be claw trimmed more often.

Table 6.1 14 key animal needs for cattle welfare*

Feed*	Health*
Drinking water*	Reproduction
Respiration	Grooming*
Excretion	Locomotion*
Resting*	Orientation/ exploration
Safety*	Pain experiences
Thermoregulation	Social interactions*

*= 8 primary issues for assurance & control
Note: these Animal Needs include both positive and negative [risk] indicators.*Metz, 2003, after Dantzer 2002 & Bracke *et al.* 2002)

Disease

> “Cattle health can be further optimised by knowledge of diseases that affect cattle. Preventing disease has become more important than curing disease and one key element in prevention is disease risk identification and management. Examples are given in this chapter and, although some diseases are addressed through checklists, this publication is not designed to be textbook on diseases.”

Level of resistance

Adapted from
GD Deventer NL, 2008

Table 7.1 Rapid screening test for the level of resistance in cows during the transition period

FARM: **Veterinarian:** **DATE:**

		YES	NO
Feed and feeding	The average BCS of the dry cows is above 3.5		
	Feed intake in dry cows dropped dramatically in late dry period		
Early lactation	Loss of BCS at six weeks after calving is > 1 unit		
	Rumen Fill score after calving is < 3		
Minerals & Vitamins	Dry cows and pregnant heifers receive a standard premix		
		Points scored	
Potential stress factors	Calvings occur in isolation outside the herd (yes = 4 points)		
	At the end of the dry period or on the day of calving, forage quantity differs by more than 50% from that offered in lactation (yes = 2 points)		
	At the end of dry period, the cows are still not adapted to at least two kg of concentrates (yes = 2 points)		
	The calf is not separated from its dam in the first six hrs after birth (yes = 2 points)		
	There are too few cubicles for all cows in the herd (yes = 6 points)		
	There are too few places at the feed rack for all cows to eat (yes = 4 points)		
	There is a lack of cow comfort in the herd (yes = 4 points)		
	Total number of points scored* =		
Herd health	High prevalence of infectious diseases		
	High prevalence of endemic diseases (mastitis, lameness, etc)		

➔ *a total score of points ≥ 6 indicates a lowered disease resistance in the cows.

The general health status of the herd (e.g. IBR, BVD, salmonellosis) may indicate whether such diseases specifically contribute to this lowered disease resistance.

If the answer to several of the above points has been 'YES' then this is indicative of a situation at relatively high risk for poor disease resistance.

In this situation, a more in-depth analysis is warranted to determine the cause(s).

Risk factors for abomasal displacement

Table 7.2 Risk factors for abomasal displacement	
General information	Number of cows present in the herd
	Number of cows per parity
	Mal-adaptation of cows and heifers in the herd after calving (acifodid; low feed intake)
	Level of milk production (in L, fat, protein)
	Animals of parity 1
Housing	Type of barn
	Type of cubicle and bedding
	Type of exercise area
Nutrition	Quantity of maize silage/cow/day at calving
	Quantity of grains/cow/day around calving
	Quantity of hay (long particles) at calving
	Quantity of fibre in the ration around calving
	Ratio concentrates-to-forages too high
	Proportion of grains in concentrates too high
	Low level of feed intake around calving
Feeding management	Feeding system (conventional or TMR)
	Changes in forages around calving
	Changes in concentrates around calving
	Grazing cows or zero-grazing without or with exercise area
Animal health	Retained afterbirth > 10% of the cows calved
	Milk fever > 4% of cows calved
	Ketosis > 5% of cows calved
	Mastitis, or endometritis > 15% of cows calved

After: Hultren & Pehrson, 1996 ; Grymer *et al.*, 1982 ; Willeberg *et al.*, 1982 ; van Winden,2002 ; AABP #32; Noordhuizen, 2008.

Economics

> “Dairy farming is an economic process where resource factors are turned into income (production) factors. Diseases cause substantial economic loss in dairy herds and some key indicators are provided in the text. Several examples have been given to exemplify how one can deal with certain issues in practice.”

Economic indicators for losses due to disease

Noordhuizen, Cannas da Silva, Boersema, 2007

Table 8.1. Estimation of economic losses due to intra-mammary infections in an average situation (in Euro)

	Losses per cow with clinical mastitis	Losses per cow without udder infection	Total losses per 100 cows (€)	Loss as a percentage of total loss
Streptococci spp.	240	20	2860	40
Coliforms	200	-	1375	19
Staphylococci spp.	275	35	1115	16
Aerogpyogenes	285	-	455	7
Bacteriology	235	-	1300	18
IN TOTAL & ON AVERAGE	235	25	7110	100%

(adapted after Berentsen, Saatkamp, Stelwagen & van Vliet, 1999)

Table 8.2 Losses due to claw disorders

	Per case	Per cow present
-a-Milk losses	55 Euro	15 Euro
-b- Losses in BCS or body weight	5 Euro	1.5 Euro
-c- Costs of treatment & additional labour	20 Euro	5 Euro
-d- Loss of reproductive performance	?	?
-e- Premature culling	225 Euro	5 Euro
Total (per cow present/year)		25 Euro

based on differences in the economic models applied, in regional husbandry methods and in milk price rating, etc. (Østergaard, 2005; Huijps *et al.*, 2008).

Reproductive performance

The ideal calving interval is still around the 365 day period, given the actual milk production level. But under certain conditions, (eg. high production persistency with high level of production) this mean interval could feasibly be extended as losses are largely compensated for by milk income (Berentsen *et al.*, 1999).

Beyond 395 days, every additional day yields economic losses in the region of around 0.5 to 1 Euro per cow per day between 395 and 425 days and 1 to 1.50 Euro per cow per day after the 425 day interval.

If a cow with reproductive problems finally becomes pregnant, the associated economic losses are less than if the same cow was culled. For the latter, losses would be doubled!

In herds with **seasonal calving** only, losses would be around 2 Euro per cow for each day of delay in calving interval (Buckley & Mee, 2006).

Economics - robotic vs. conventional

Source: ABAB, 2008

Table 8.10 The economics of robotic versus conventional farms

Costs (€)	Conventional	Robot farms
Net revenue per 100 kg milk	28,82	27,90
Fertiliser	0,46	0,35
Energy	1,22	1,31
Personnel	0,33	0,24
Depreciation	7,90	9,19
Lease costs / quota	0,51	0,59
Other	7,10	7,75
Financing	4,52	5,11
Totals (including machine costs)	6,78	3,36
Depreciation - machines/installations	1,92	3,45
Maintenance, small materials	1,19	1,52
Other machinery	0,23	0,32
Fuel	0,59	0,58
Calculated interest (machinery)	0,59	1,20
Costs of machines/installations	4,52	7,07

Feed & Feeding Management

“Cattle nutrition is one of the pillars of cattle production. Evaluation sheets and checklists are presented designed to help fine-tune feed and feeding management on the farm. Lists highlighting areas for risk assessment have also been included. Maize silage has received particular attention, not only because it is a good ration component, but also because it has sustainability features. Finally, this chapter contains a simple monitoring tool that includes scoring rumen fill, faecal consistency and undigested faecal fibre, which can be used as part of routine monitoring of rumen function, rumen health and productivity..”

Reduced feed intake risk factors checklist

Adapted from Interact Agrimanagement BV, 2004

Table 9.6 Checklist for risk factors associated with reduced feed intake

	Risk factor -Note Score* 1= poor; 5= good	Target value	Score*
Dry period management	Preparation		
	Conditions at close-up		
Feed	Palatability of grass silage		
	Palatability of maize silage		
	Fibres in grass silage		
	Fibres in maize silage		
	Other feed (by)products		
Feeding management	Feeding according to targets		
	Fresh, quality rations fed		
	Conserved forage analysis		
	Mixing & mixing time	< 10 min	
	Supply	24 hr/day	
	Increase in concentrates after calving	300 g/d	
	Competition among cows for cubicles (100% availability needed)		
	Competition of cows for feed places (100% availability needed)		
	Competition of cows for escape routes (3 routes for every 60 m)		
	Feed refusals and quality (< 5%; homogenous)		
Claw/leg health			
Cow comfort	Ventilation		
	Light (at level of cows shoulders)	150 lux	
	Space available behind feed rack	350 cm	
	Size of cubicles (depends on type)		
	Softness of bedding (knee-test)		
Water provision	Availability (additional troughs in heat stress periods)	6 cm width per cow (summer: 9 cm)	
	Trough positioning in barn		
	Cleanness (fresh; no sediment; no odour)		
	Water distribution system		
	Water distribution for calves separate from dry and lactating cows		
Production persistency			

Palatability of forage risk factors checklist

Table 9.7 Checklist for risk factors associated with palatability of forage

	Risk factors	Score for primary forage source 1 (poor) to 5 (good)	Score for secondary forage source 1 (poor) to 5 (good)
Feed harvesting & stock	Particle length		
	% DM in silage		
	Additives		
	Silage density		
	Height of silage hump		
	Feeding speed of the silage hump per week		
	Silage made in layers		
	Silage made in vertical portions		
	Heating found in silage hump		
	Covering of silage correct		
	Temperature in the silage hump is > or < ambient temperature		
Silage-face cutting method	Remainders		
	Time interval between cutting and feeding		
	Quality losses		
	Feeding speed of the silage hump per week		
	Time taken to mix TMR (norm < 10 min)		

Housing

> Cattle barns are a basic component of the cattle environment. The current principle is that the barn design should follow the cows' needs rather than human needs or human welfare. Many errors exist in today's cattle barns. Practical elements are provided in this chapter together with checklists for evaluation.

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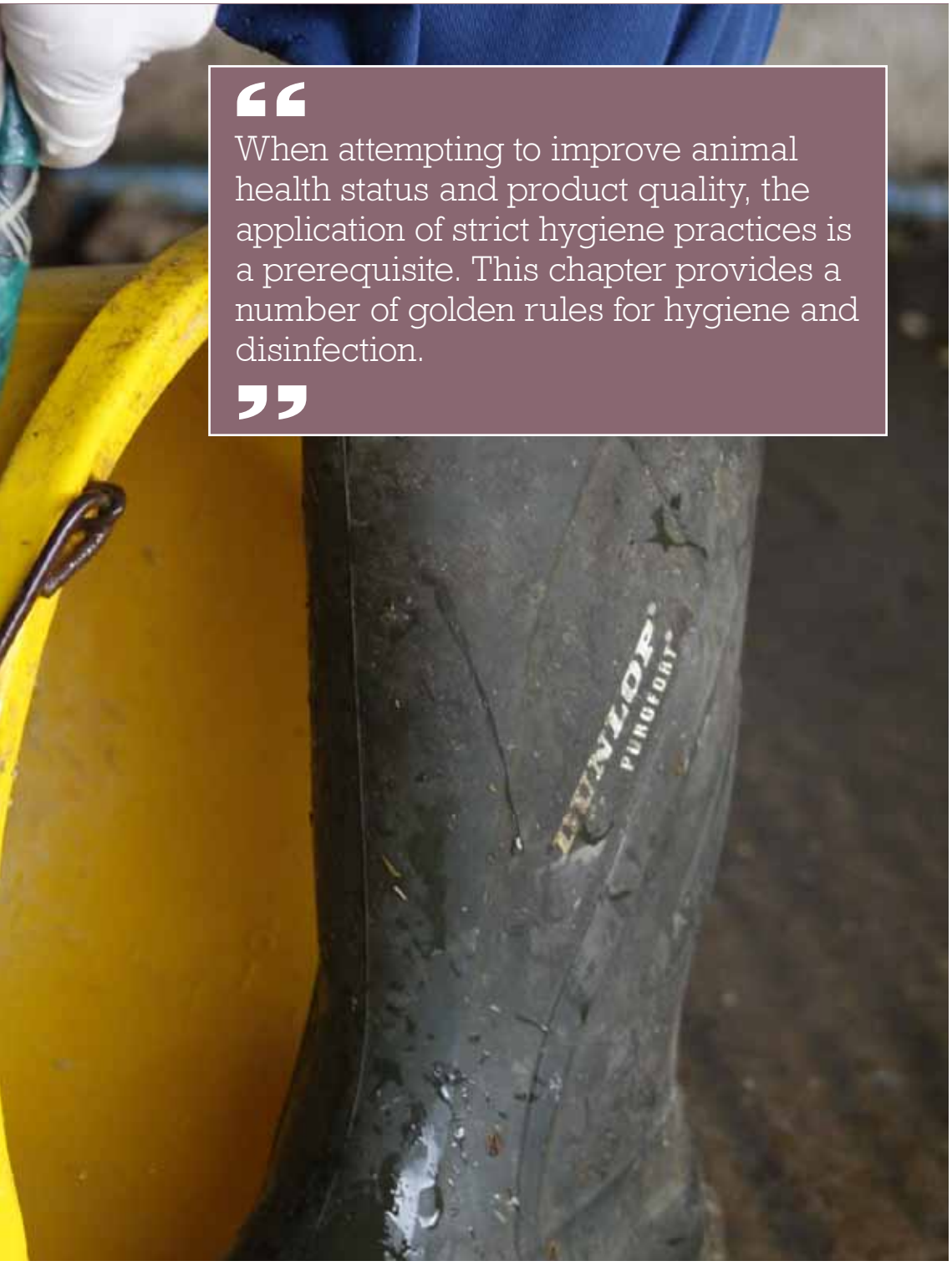
Hygiene



> When attempting to improve animal health status and product quality, the application of strict hygiene practices is a prerequisite. This chapter provides a number of golden rules for hygiene and disinfection.

Hygiene & management in the milking parlour

After S. Klimpel & B. Maassen-Francken, GEA Group, Internatl Dairy Topics vol.10, nr.3

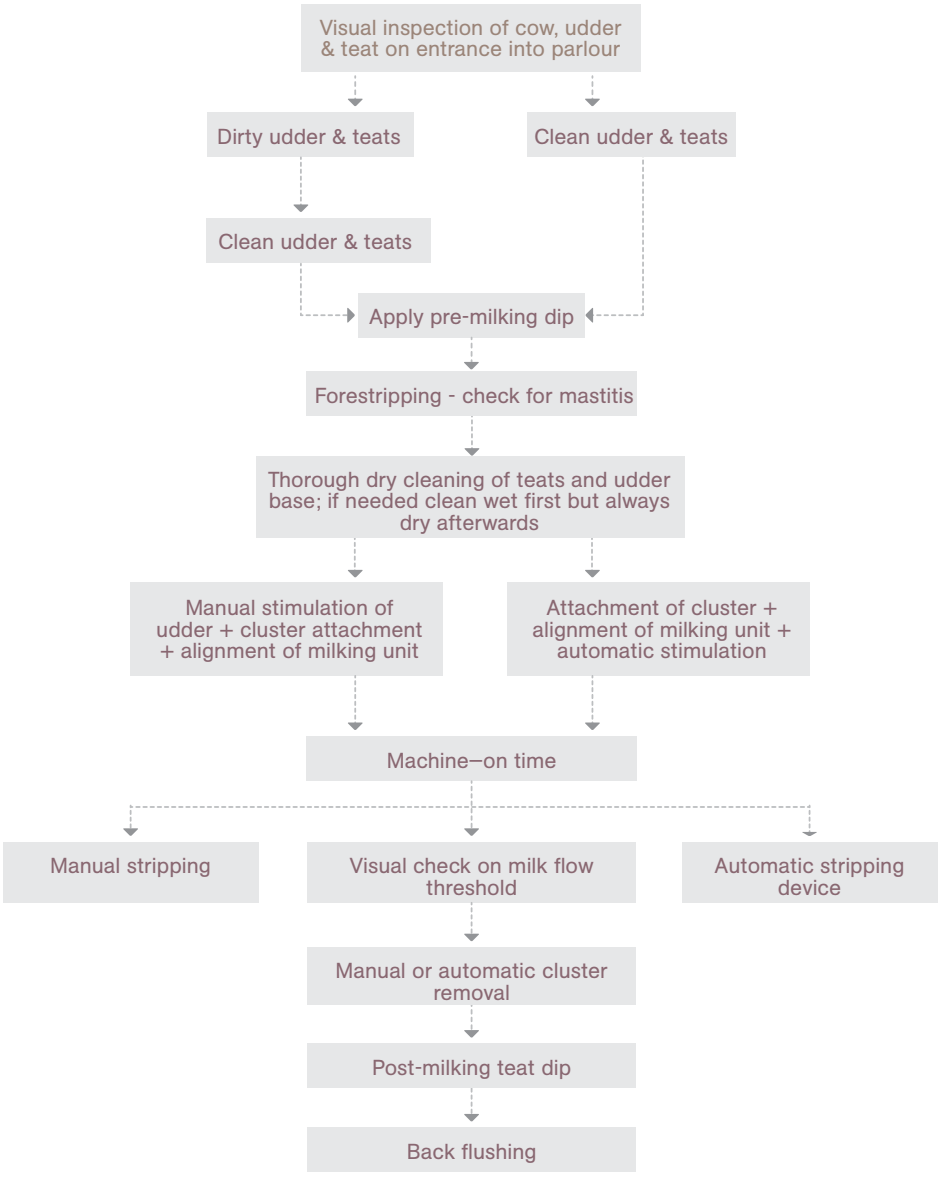
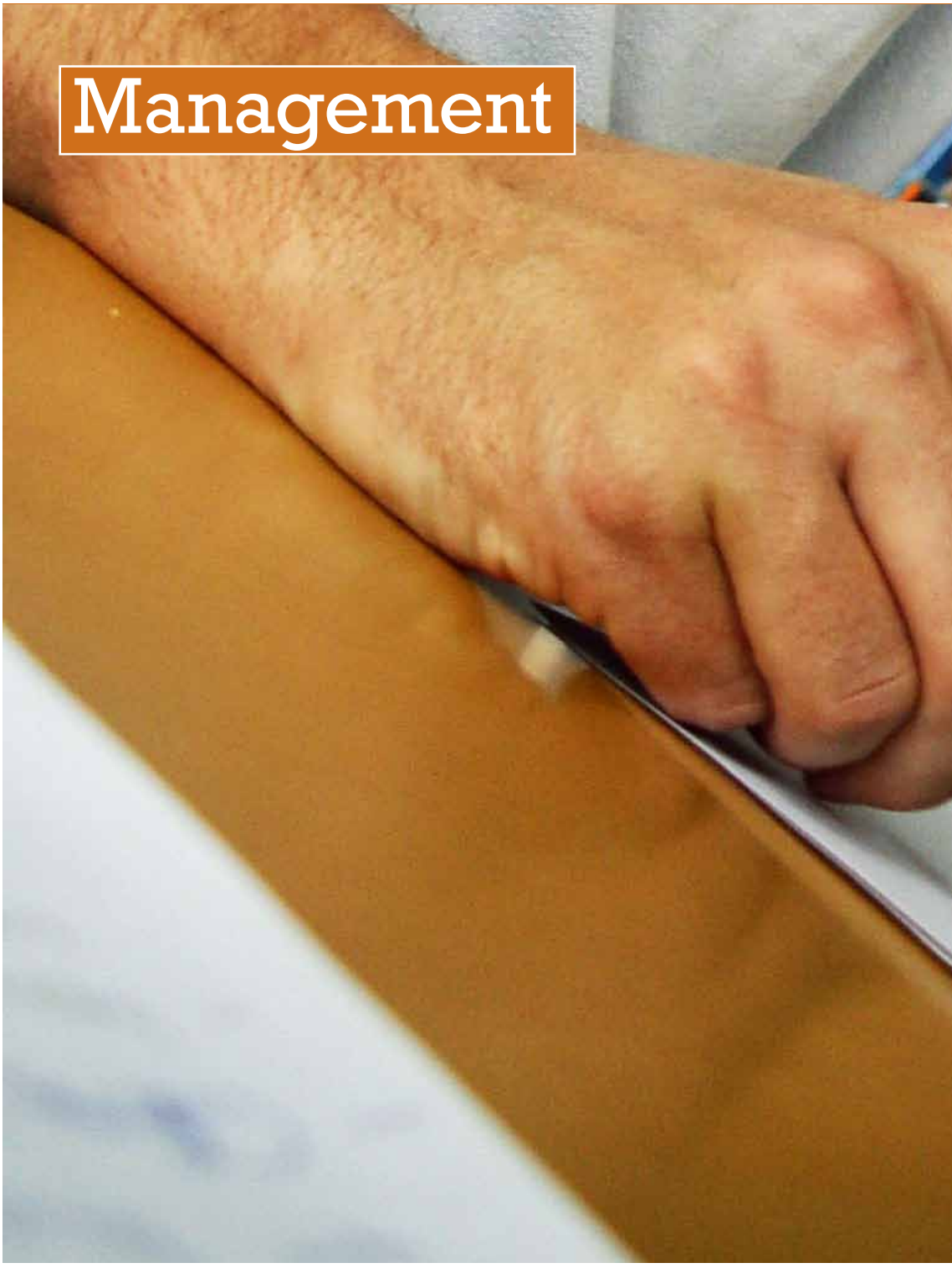
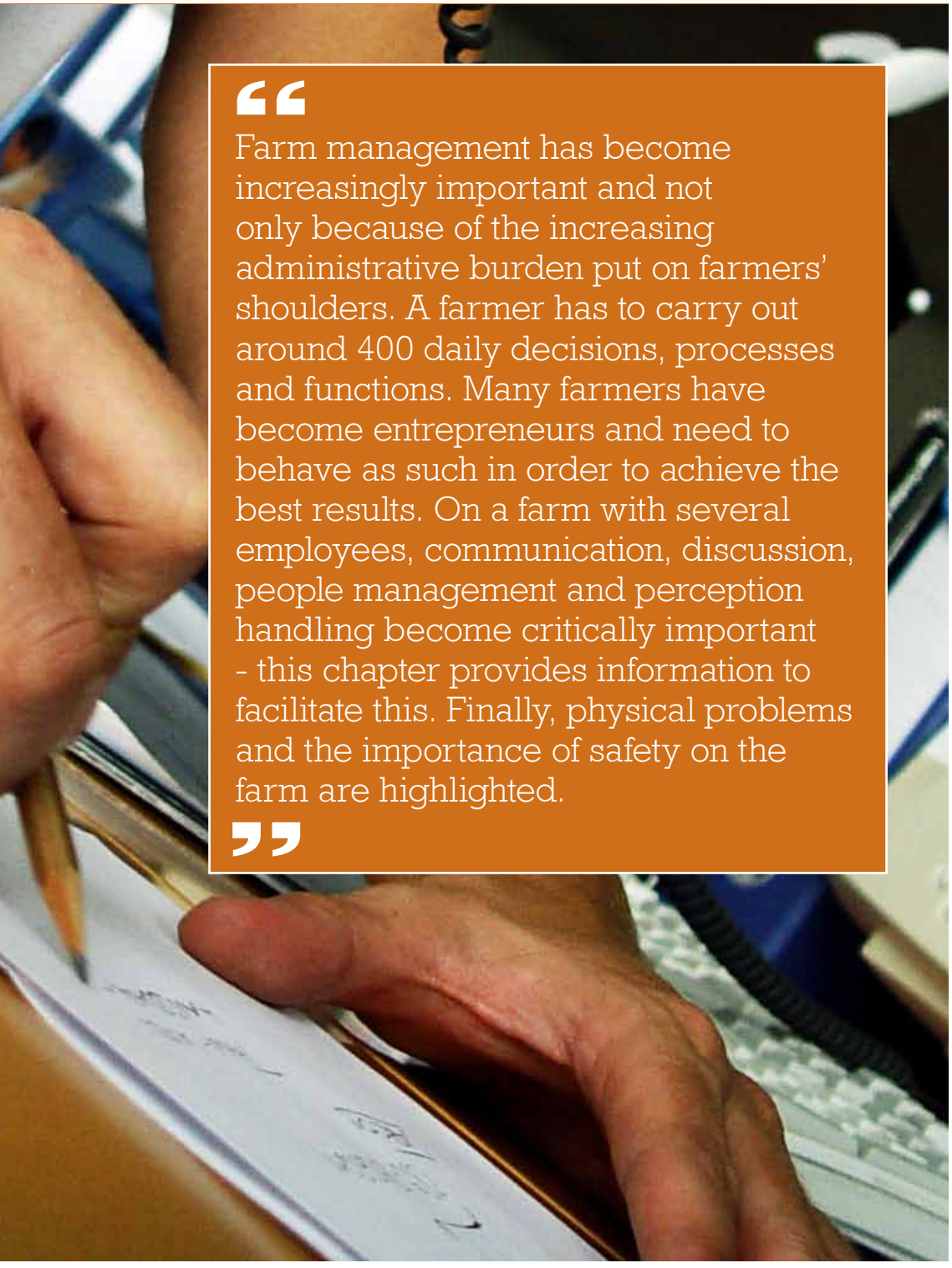


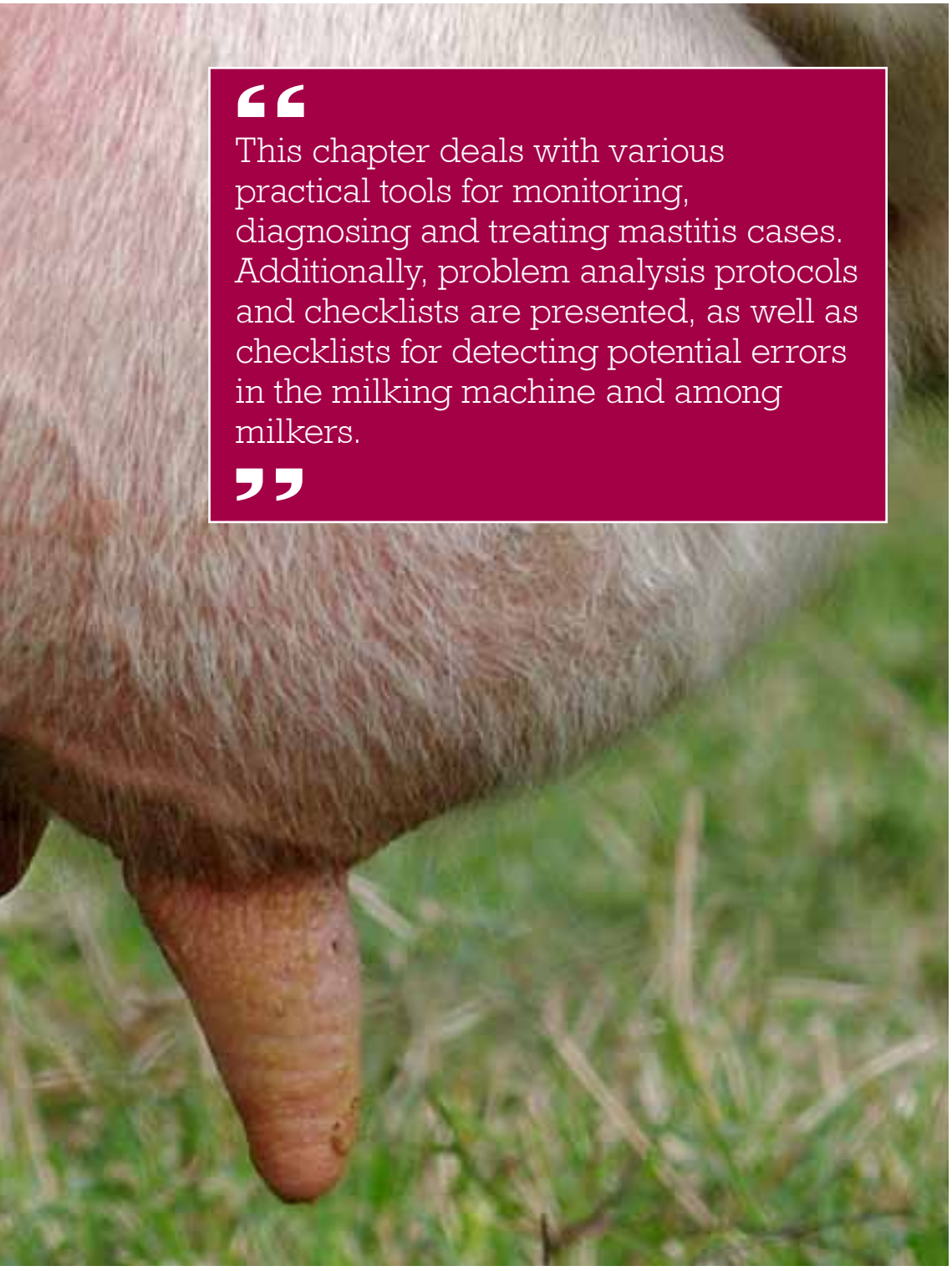
Figure 11.2 Hygiene and management in the milking parlour


Management



Farm management has become increasingly important and not only because of the increasing administrative burden put on farmers' shoulders. A farmer has to carry out around 400 daily decisions, processes and functions. Many farmers have become entrepreneurs and need to behave as such in order to achieve the best results. On a farm with several employees, communication, discussion, people management and perception handling become critically important - this chapter provides information to facilitate this. Finally, physical problems and the importance of safety on the farm are highlighted.


Mastitis



> This chapter deals with various practical tools for monitoring, diagnosing and treating mastitis cases. Additionally, problem analysis protocols and checklists are presented, as well as checklists for detecting potential errors in the milking machine and among milkers.

Teat end callosity scoring

Teat-end callosity can be scored in a very detailed manner (Neijenhuijs *et al.*, 2001 & 2005), a less detailed practical manner (with a 1-5 scale) and a simple practical manner (with a 1-3 scale).

The latter is sufficient for a Diagnostic Herd Evaluation. It is always possible to go into more detail once a problem has been detected.

Teat-end callosity is associated with an **increased risk of mastitis**, in particular *Staph. aureus* mastitis.

There are two criteria for determining teat-end callosity: a ring and thickening of tissue:

- The ring can be smooth or frayed
- The thickening can be present or absent

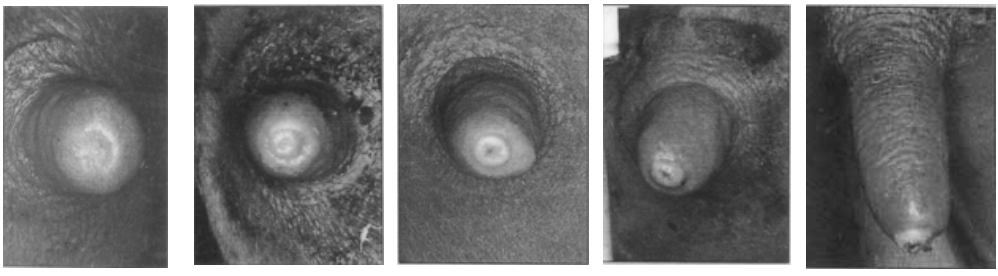
The scoring method has been described above, with lowest scores (1-2) being preferred and highest scores (3-4) being undesirable.

See also the paper by F. Neijenhuijs *et al.* (2005) in the proceedings of the 4th IDF congress in Maastricht, Holland, 11-16 June 2005, pp 376-382 ; or their paper in the Journal of dairy Science 84 : 2664-2672 (2001)

Some remarks

After milking the teat must leave the teat liner and cluster in a nearly dry condition.

If the teat is wet, there is a problem with the speed at which the milk is transported to the milk container. The teats end up being “washed” in their own milk. In this situation, bacteria can easily travel from one quarter to another.



Score 1	Score 2	Score 3	Score 4	Score 5
This is the perfect score. No edema after milking; a round smooth ring. An indication for the least lesions caused by the milking machine.	The first signs of callosity are the round but thick rings around the teat base. The teat end is a little swollen.	The teat end is swollen ; the ring is round but irregular and thick.	At the teat end one can observe the round thick ring, very edematous and eversed. There are not yet looking like warts.	This score is given to cases which look and feel like warts. The teat end is eversed and frayed.

Figure 13.1 Teat end callosity scoring

Teat end callosity

Solution:

- Install milk reception containers in the milking parlour at each post
- Install claws with a milk volume that is much larger (eg 100 or 200 ml)
- Use other installation measures for rapid milk transportation in the system.

A (sometimes blue) ring is visible at the teat base after milking.

During milking, the teat liner can crawl up the teat towards the base, for example when wet udder prepration has been carreid out and teats are wet when the cluster is attached. Another causal factor may be teat liners, which are too wide, long or short, or poor functioning of pulsators, too long a duration of milking, or a too high a vacuum. Cows with blue rings are often poorly milked. First lactation heifers and cows in early lactation are most frequently affected.

Flat teats.

This teat has been blocked in the teat liner, which can be painful for the cow. The cause is a too long D phase (empty phase) of the pulsator, worn out teat liners, or teat liners, which are too hard or wide.

Petechia on the teat skin.

These little haemorrhages are caused by too high a vacuum under the teats or teat liners that are too large.

and finally...

The skin of the teat must feel flexible, without cracks or lesions. This can be achieved by applying good cosmetic teat-care products and good housing (cow comfort).

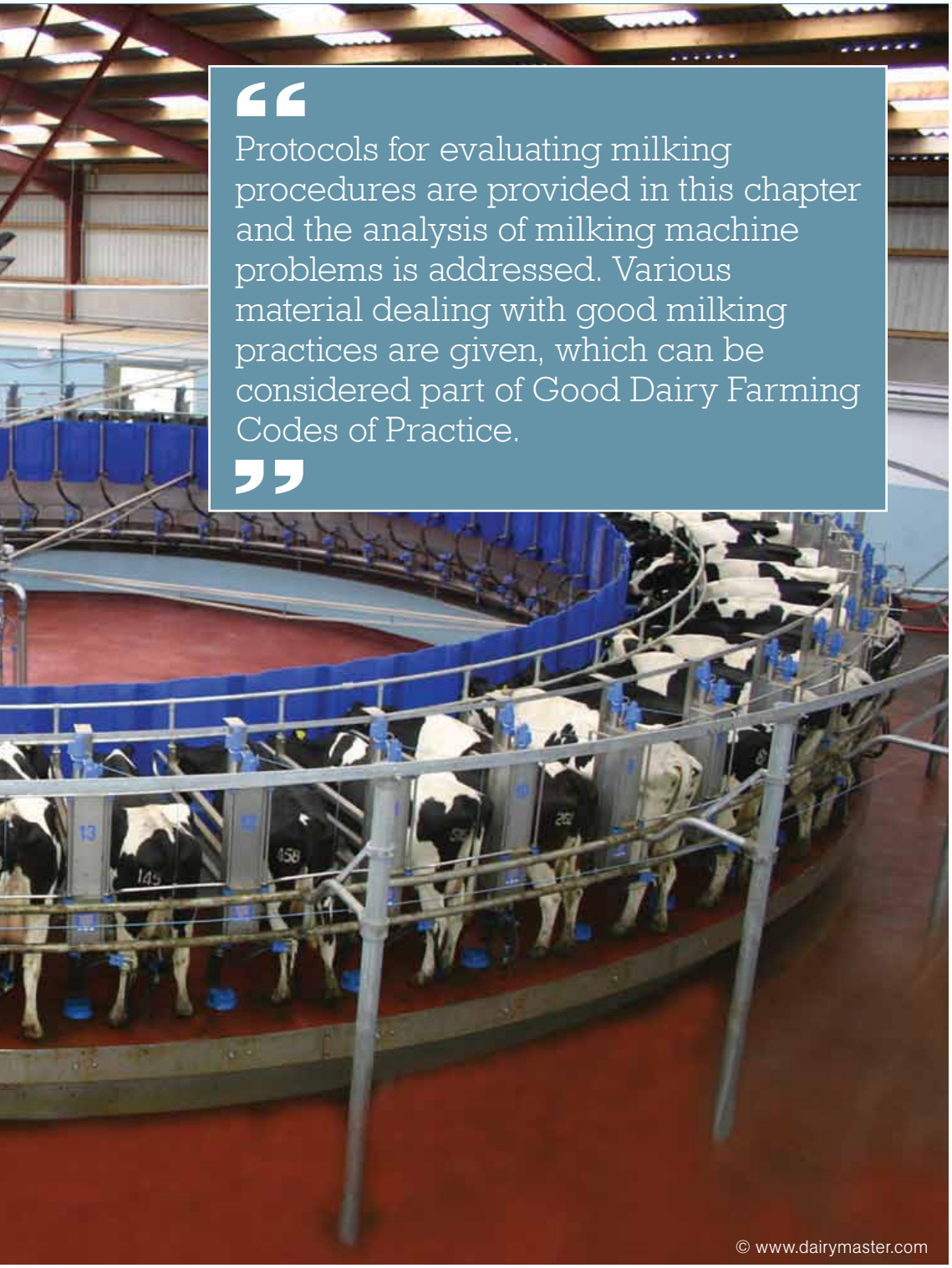
Taking milk samples

Only bacteriology, carried out on milk samples taken from cows with udder infections, can give information about causative pathogens causative of mastitis in dairy farms. A bacteriological profile at herd level is very useful for a more effective mastitis treatment and, therefore, more economical. This applies to both new and recurrent infections.

A milk sample must be taken before any antibiotic treatment.

1. Write the ID or name of the cow to be sampled, the quarter and the date on the label with a waterproof pencil
2. Take a clean towel and clean the teats and teat ends of one (1) cow
3. Eliminate the first milk streams
4. Disinfect the teat orifice (teat end) with 80% alcohol
5. Again, eliminate some milk streams; take the cap off the sampling container in using an aseptic technique
6. Milk a few milk streams into the sampling container but do not fill above ¾; tilt the sampling container while milking to avoid contamination with dirt
7. Put the cap of the sampling container back on using an aseptic technique and seal it
8. Write the ID or name of the cow, the quarter and the date on the label with a waterproof pencil
9. Put the sampling container in the freezer until the next farm visit from the vet. Or send it to the laboratory in the appropriate manner

Milking practise



> Protocols for evaluating milking procedures are provided in this chapter and the analysis of milking machine problems is addressed. Various material dealing with good milking practices are given, which can be considered part of Good Dairy Farming Codes of Practice.

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Milking machine and/or personnel problems

Problem	Checkpoints for milking machine	Checkpoints for personnel	Other potential causes
Somatic cell count is too high	See known risk factors	Adaptation of milking practice ?	Other known risk factors
Too many bacteria in the milk	Cleaning of the machine after milking is poor. The water temperature is too low at start (<80°C) and/or at end of cycle (<40 °C). Machine parts are worn.	A non-hygienic milking.	Temperature of bulk tank is too high (>4°C). Cleaning of tank is insufficient.
Loss of milk production	Insufficient milking: Vacuum; ratio; pulsation; teat liners.	Poor udder/teat preparation (variable; disturbed routines; too many different people).	Feeding Weather Genetics Housing Climate etc.


Production
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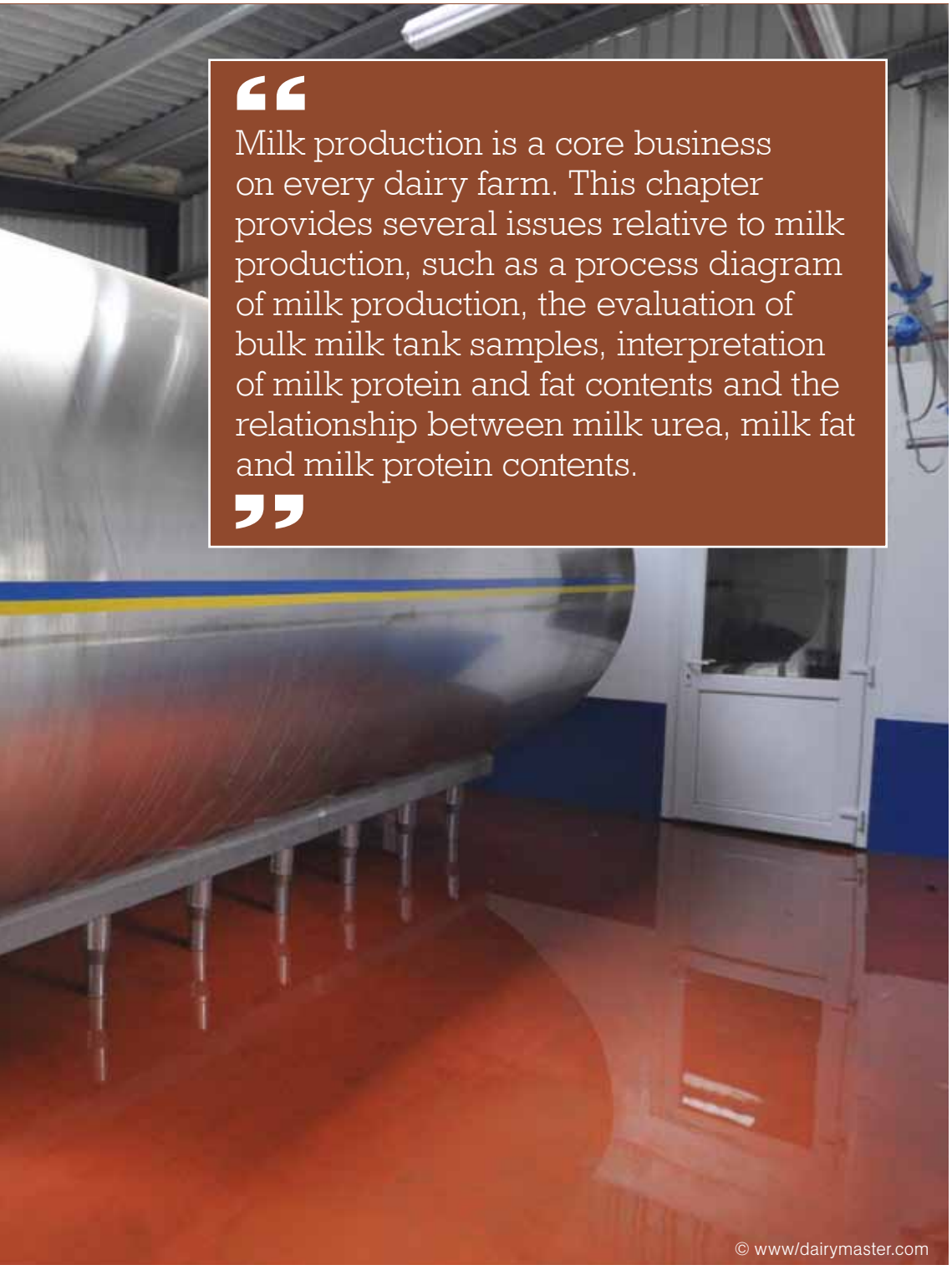

> Milk production is a core business on every dairy farm. This chapter provides several issues relative to milk production, such as a process diagram of milk production, the evaluation of bulk milk tank samples, interpretation of milk protein and fat contents and the relationship between milk urea, milk fat and milk protein contents.

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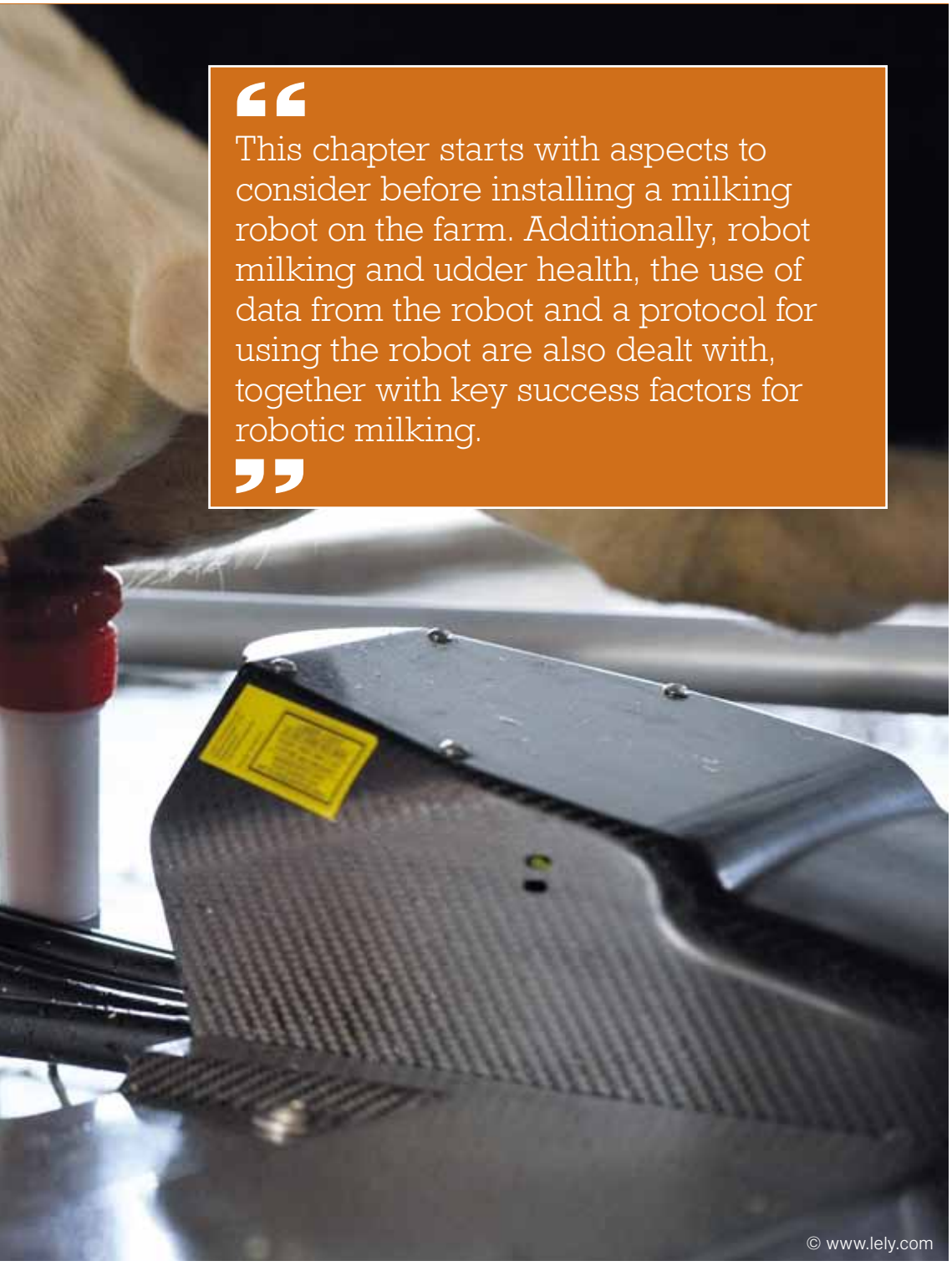
Reproduction

> Reproductive performance has always been a key component of herd fertility schemes and herd health & productivity management. In this chapter, we limit ourselves to the interpretation of herd reproductive data, monthly and yearly performance data. Moreover, a protocol is introduced for analysing reproductive problems in the herd. Finally, some more specific aspects are addressed, such as *Neospora* abortions and the relationship between milking and oestrus/ovulation in dairy cows.

Robotic milking



> This chapter starts with aspects to consider before installing a milking robot on the farm. Additionally, robot milking and udder health, the use of data from the robot and a protocol for using the robot are also dealt with, together with key success factors for robotic milking.

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Sustainability

> Sustainability on the dairy farm is a hot topic and is, therefore, included in this book. This chapter presents the four pillars of the sustainability concept and subsequently deals with contributions from the food chain to climatic change. Finally, several approaches to improve sustainability on the dairy farms are presented.

Values of reference

> Dairy farming is a process based on economics and performance parameters used to evaluate this process. To address performance over time, the (monthly or yearly) performance parameters are compared with target or reference values. Such target values are primarily farm-based. Performance parameters can also be compared with those of other, similar farms, or whole regions. In this chapter, various reference value. are presented, as an example, to facilitate comparisons. Farmers should always set target values for performance on their own farm.

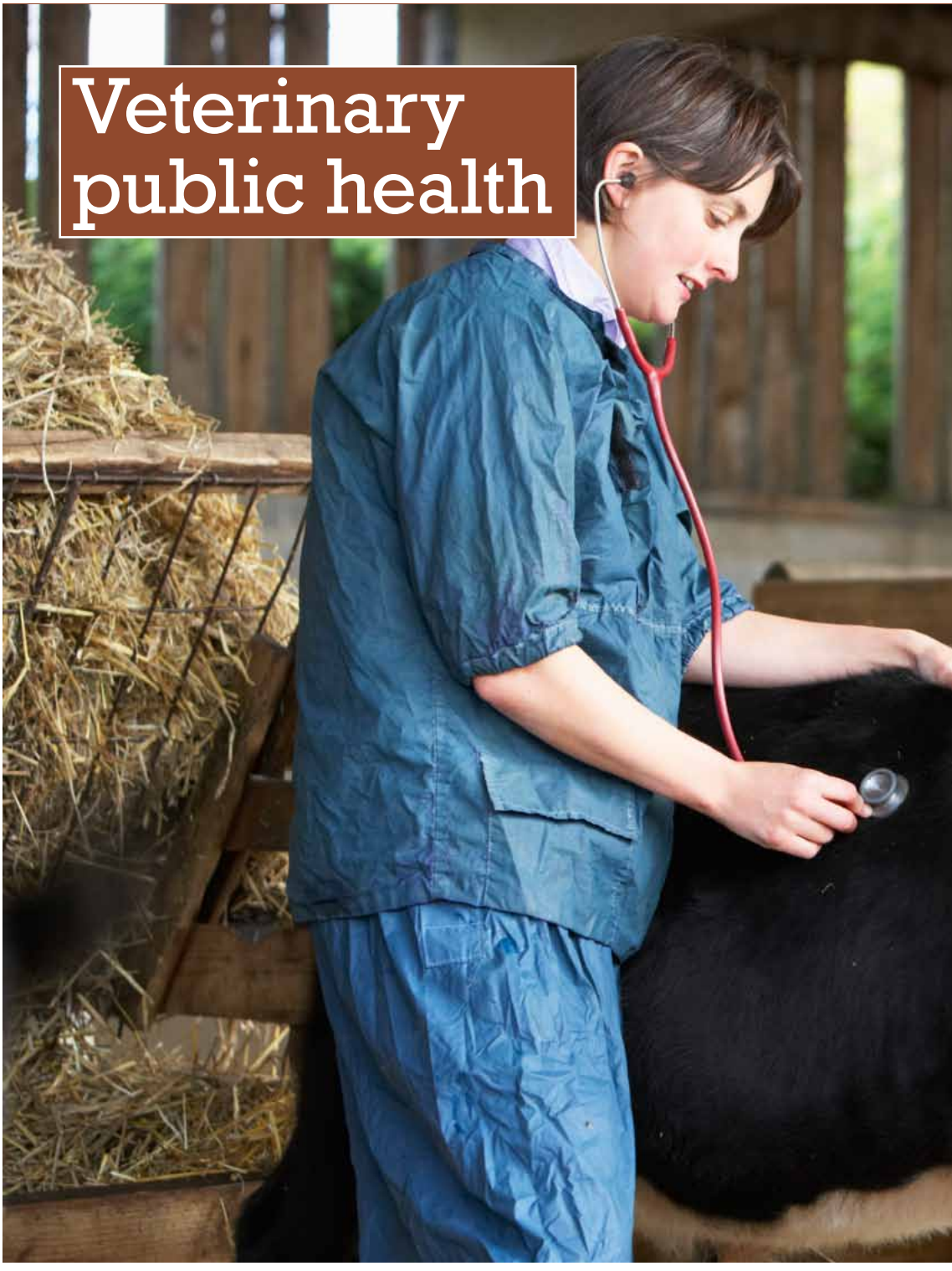
Dairy production parameters

Table 20.1 Reference value for cows for important dairy production parameters- diagnostic evaluation

	At calving	Early lactation	Mid lactation	End lactation	At dry off
Body condition score (1-5)	3 ½ → 3	2 ½ → 3	3	3 → 3 ½	3 ½ → 4
Rumen Fill score (1-5)	3	3	3 ½	4	4 – 4 ½
Faecal consistency score (1-5)	2 - 3	2 - 3	3	3 - 4	4
Fibres in faeces score	1 - 2	1 - 2	1 - 2	1 - 2	1 - 2
Locomotion score (1-5)	Herd distribution →	> 85% at score 1 or 2	< 10% at score 3	< 3% at score 4	< 2% at score 5
Hock lesions*	< 15%				
Poor leg posture* (% of cows in herd)	< 15%				
Hygiene & cleanliness	Herd distribution →	> 85% of the cows at score 1 or 2	< 15% dirty cows (score 3 or 4)		< 5% dirty dry cows (score 3 or 4)
Ketosis *	Herd level	< 5 %			
Acidosis *	Herd level	< 2 %			
Digestive problems *	Herd level	< 5 %			
Frequency of cows ruminating in the herd	Herd level	> 85%			

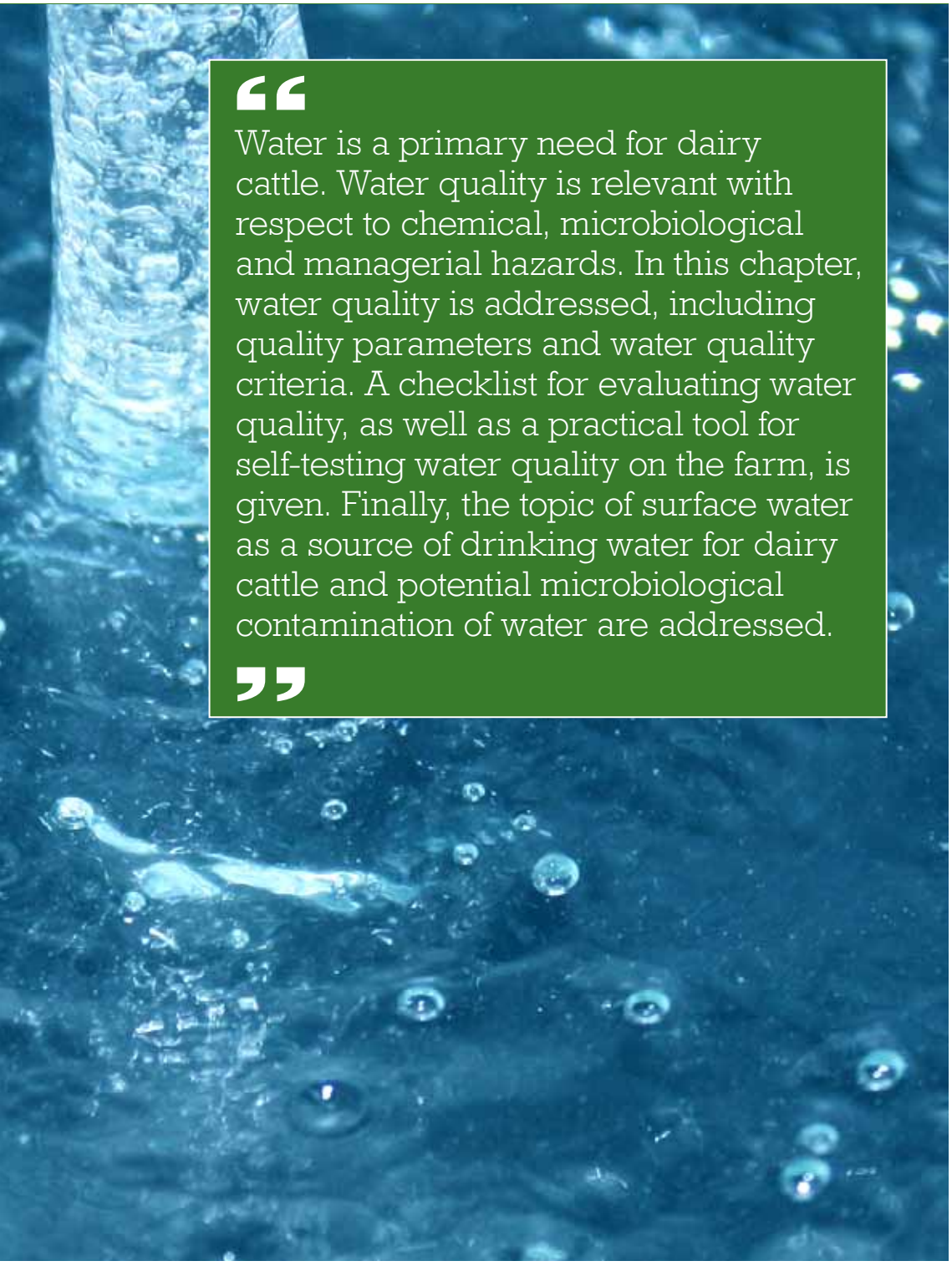
* Reference & target values are dynamic and can vary according to production, breed, husbandry method etc

Veterinary public health



Dairy farms producing milk, meat and dairy products have a great responsibility toward society. This responsibility concerns veterinary public health and food safety elements. Public health hazards as related to food safety are summarised in this chapter. Subsequently, an overview of zoonoses is given in a checklist format, as well as the main characteristics of zoonoses. Methods for the improvement of food safety are also included.


Water



“Water is a primary need for dairy cattle. Water quality is relevant with respect to chemical, microbiological and managerial hazards. In this chapter, water quality is addressed, including quality parameters and water quality criteria. A checklist for evaluating water quality, as well as a practical tool for self-testing water quality on the farm, is given. Finally, the topic of surface water as a source of drinking water for dairy cattle and potential microbiological contamination of water are addressed.”

Self-testing water quality

E.van Eenige, GHM Counotte, JPTM Noordhuizen

Self-testing water quality: Colour, transparency and sediment

Colour good
Transparency good

Colour poor
Transparency good

Colour poor
Transparency good

Colour bad
Transparency bad poor

Colour good
Transparency good
Sediment poor

Colour good
Transparency good
Sediment poor

Drinking water

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