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**Special issue: DairyCare
husbandry for wellbeing**

DairyCare “Blueprint for Action”: husbandry for wellbeing

Christopher H Knight
UK

Abstract

“Keep calm and carry on” was a wartime message to the British public that has achieved renewed fame in the last few years. The strategy was simple: in times of extreme difficulty a cool head combined with stoicism is an appropriate response to ensure a successful outcome. The latest major challenge to society (COVID-19) met with a very different response, and only history will reveal whether “Stay home and worry” will be equally effective. In devising blueprints or strategies it is extremely important to have a clear idea of what you are trying to achieve, whether it be maintaining world freedom or stopping a pandemic. In the case of livestock agriculture, it is helping to feed a rapidly growing global population in harmony with the needs of current and future generations. I hope that I have stated this clearly, and calmly. If so, I ask you to picture a scene. We are on a Calm Farm. Dairy animals go about their daily lives contented, unhurried and focused on the simple feeding and socialising activities that are so important to them. Unstressed, their productive capacities and abilities to avoid and, when necessary, cope with physiological and pathological challenges are maximised. They are not alone: the exact same characteristics also apply to the farmer and husbandry staff that we meet. How is this calm farming approach relevant to the aspirations we had when we established the EU COST Action DairyCare? Our objective was to harness the power of *computing* technologies to *assist our management* of dairy livestock. A simple rearrangement leads us to *Computing Assisted Livestock Management*, CALM. In this short Research Reflection I shall assess how far we have come towards the achievement of sensible goals related to technological assessment of dairy animal wellbeing, and speculate on what more things both can and need to be done to finish the job. It is a personal account. DairyCare was a major collaboration involving several hundred active researchers. To involve them all would be impossible, and I do not pretend to speak for them all. As will become evident, the wide skills base that was assembled was so successful in its primary objectives that different skills, chiefly in economics, are now needed to exploit all of the technological advance that has been achieved. DairyCare succeeded in a second direction. Whilst the focus was technology development, by assembling a large cohort of biologists with animal welfare interests, it soon became apparent that technology should run alongside and help to enable improved management practices. This Special Issue is, therefore, in two sections. The first is dedicated to technology development and the second to a novel management practice that has the potential to significantly improve the wellbeing of cows and calves: cow-calf contact rearing. That section is introduced by my DairyCare colleague, Sigrid Agenäs (Agenäs, 2020).

Refining consumer attitudes to milk and dairy product purchase and use to reduce food waste and improve animal welfare on-farm

Marta Brscic
Italy

Abstract

This Research Reflection raises awareness of the need to broaden perspectives and levels of multidisciplinary and interdisciplinary approaches when considering on-farm dairy cattle welfare. It starts with a brief overview of current animal welfare issues on dairy farms and how they are perceived by different stakeholders. Some divergences in points of view are discussed in more detail and the first steps in networking are mentioned. Particular emphasis is given to both milk and dairy product waste in industrialized countries and the potential effects of its reduction on changes in the production system. The needs for a quantification of such quota and retailer involvement are also analyzed from the perspective that on-farm animal welfare is directly linked to the amount of milk that might be removed from the food chain by adoption of welfare-friendly management, such as cow-calf systems.

Systems for evaluation of welfare on dairy farms

Angela Krueger, Jenifer Cruickshank, Erminio Trevisi and Massimo Bionaz

USA and Italy

Abstract

Animal welfare is an essential component of dairy production and several systems exist to evaluate the welfare of dairy cows. Here, we review and compare three well-known systems that operate at farm level from around the world (FARM, Welfare Quality[®], and The Code of Welfare) and discuss their advantages and limitations. Despite having some commonalities, the programs evaluate different elements. We also briefly review an emerging system (Integrated Diagnostic Welfare System) that might address some of the shortcomings of the existing systems, especially the possibility of automating the evaluation of animal well-being and identifying any cause of poor welfare. None of the aforementioned systems has been fully validated for their ability to assess animal welfare using independent measurements. The future holds increased attention around the well-being of dairy cows and increased use of sensing technologies. There is an urgent need for dairy welfare evaluation systems that are scientifically validated, holistic, and that can take advantage of the use of sensing technologies to continuously monitor animal welfare.

The Internet of Things enhancing animal welfare and farm operational efficiency

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UK

Abstract

The growth in wirelessly enabled sensor network technologies has enabled the low cost deployment of sensor platforms with applications in a range of sectors and communities. In the agricultural domain such sensors have been the foundation for the creation of decision support tools that enhance farm operational efficiency. This Research Reflection illustrates how these advances are assisting dairy farmers to optimise performance and illustrates where emerging sensor technology can offer additional benefits. One of the early applications for sensor technology at an individual animal level was the accurate identification of cattle entering into heat (oestrus) to increase the rate of successful pregnancies and thus optimise milk yield per animal. This was achieved through the use of activity monitoring collars and leg tags. Additional information relating to the behavior of the cattle, namely the time spent eating and ruminating, was subsequently derived from collars giving further insights of economic value into the wellbeing of the animal, thus an enhanced range of welfare related services have been provisioned. The integration of the information from neck-mounted collars with the compositional analysis data of milk measured at a robotic milking station facilitates the early diagnosis of specific illnesses such as mastitis. The combination of different data streams also serves to eliminate the generation of false alarms, improving the decision making capability. The principle of integrating more data streams from deployed on-farm systems, for example, with feed composition data measured at the point of delivery using instrumented feeding wagons, supports the optimisation of feeding strategies and identification of the most productive animals. Optimised feeding strategies reduce operational costs and minimise waste whilst ensuring high welfare standards. These IoT-inspired solutions, made possible through Internet-enabled cloud data exchange, have the potential to make a major impact within farming practices. This paper gives illustrative examples and considers where new sensor technology from the automotive industry may also have a role.

Welfare Quality® for dairy cows: towards a sensor-based assessment

Francisco Maroto Molina, Carlos C. Pérez Marín, Laura Molina Moreno, Estrella I. Agüera Buendía and Dolores C. Pérez Marín

Spain

Abstract

This Research Reflection addresses the possibilities for Welfare Quality® to evolve from an assessment method based on data gathered on punctual visits to the farm to an assessment method based on sensor data. This approach could provide continuous and objective data, while being less costly and time consuming. Precision Livestock Farming (PLF) technologies enabling the monitorisation of Welfare Quality® measures are reviewed and discussed. For those measures that cannot be assessed by current technologies, some options to be developed are proposed. Picturing future dairy farms, the need for multipurpose and non-invasive PLF technologies is stated, in order to avoid an excessive artificialization of the production system. Social concerns regarding digitalisation are also discussed.

The human-animal relationship in dairy animals

Fabio Napolitano, Andrea Bragaglio, Emilio Sabia, Francesco Serrapica, Ada Braghieri and Giuseppe De Rosa

Italy

Abstract

The present study aims to identify margins for the improvement of dairy animal welfare and production based on the quality of the human-animal relationship (HAR). The main tool proposed to improve the quality of HAR in dairy animals is training of stock-people by targeting their attitude and behaviour. Given that a good quality HAR may benefit the welfare of dairy animals and productivity, new technologies, by monitoring the handling routine on farm, may be more effective in promoting good practices. In particular, the implementation of new technologies may allow identification of specific inappropriate behaviours to be targeted at stockperson level, thus increasing the efficacy of training. However, an issue related to the introduction of new technologies in the farms, particularly in those that follow traditional farming practices, is the resistance to innovation which may be encountered.

Heat stress in dairy calves from birth to weaning

Mikolt Bakony and Viktor Jurkovich

Hungary

Abstract

This Research Reflection collects current knowledge on the effects of heat stress in dairy calves. Authors describe the indicators of heat stress in the prenatal and preweaning period, discuss the term thermoneutral zone and possible methods for measuring environmental heat load, and enumerate the existing techniques to decrease heat load in calves. Several conclusions for further research about economic efficiency, improved research methodology, and integrating the concept of foetal programming when evaluating calf performance in the preweaning period are also proposed.

Point-of-care tests for bovine clinical mastitis: What do we have and what do we need?

Francisco B Malcata, P Theo Pepler, Emily L. O'Reilly, Nicola Brady, P David Eckersall, Ruth N Zadoks and Lorenzo Viora

UK and Australia

Abstract

Mastitis, inflammation of the bovine mammary gland, is generally caused by intramammary infection with bacteria, and antimicrobials have long been a corner stone of mastitis control. As societal concern about antimicrobial use in animal agriculture grows, there is pressure to reduce antimicrobial use in dairy farming. Point-of-care tests for on-farm use are increasingly available as tools to support this. In this Research Reflection, we consider available culture-dependent and culture-independent tests in the context of ASSURED criteria for low-resource settings, including convenience criteria, scientific criteria and societal criteria that can be used to evaluate test performance. As tests become more sophisticated and sensitive, we may be generating more data than we need. Special attention is given to the relationship between test outcomes and treatment decisions, including issues of diagnostic refinement, antimicrobial susceptibility testing, and detection of viable organisms. In addition, we explore the role of technology, big data and people in improved performance and uptake of point-of-care tests, recognising that societal barriers may limit uptake of available or future tests. Finally, we propose that the 3Rs of reduction, refinement and replacement, which have been used in an animal welfare context for many years, could be applied to antimicrobial use for mastitis control on dairy farms.

Lameness in dairy cows: farmer perceptions and automated detection technology

Kate J. Dutton-Regester, Tamsin S. Barnes, John D. Wright and Ahmad R. Rabiee

Australia

Abstract

This Research Reflection provides an overview of three interrelated topics: i) lameness in dairy cows, demonstrating the underpinning importance of the condition, ii) dairy farmer detection, diagnosis and treatment of lameness and associated foot lesions as well as dairy farmer perceptions towards the condition and iii) lameness detection technologies, and their potential application on farm to automate the detection of lameness in commercial dairy herds. The presented literature clearly demonstrates that lameness is a major health issue in dairy herds, compromising dairy cow welfare and productivity, and resulting in significant economic implications for dairy farmers. Despite this, dairy farmers fail to perceive lameness as a serious threat to their dairy business. This restricted perception of the importance of lameness may be a product of limited ability to detect lame cows. Many automated lameness detection technologies have been proposed to assist dairy farmers in managing their herds. However, limitations such as cost, performance and dairy farmer perception of the usefulness of these technologies, has lead to poor uptake. It can, therefore, be concluded that there is a need to more thoroughly evaluate the effectiveness of these technologies under on-farm conditions, potentially in the form of a demonstration farm network. This will allow generation of the necessary data required to show dairy farmers that these technologies are reliable and are economically rational for their dairy business.

Welfare assessment in dairy cows using hair cortisol as a part of monitoring protocols

Urška Vesel, Tea Pavič, Jožica Ježek, Tomaž Snoj and Jože Starič

Slovenia

Abstract

Welfare of dairy cows can be assessed using welfare assessment protocols consisting of resource, management and animal-based measures. Welfare Quality® Assessment Protocol is one of the best-known protocols, which depends almost entirely on animal-based measures. To gain more objective and rapid welfare assessment, new techniques have been developed to measure welfare of animals, such as hair cortisol concentration. As cortisol is released in response to stress, it has long been used as a biomarker of stress in animals. While the precise mechanism of cortisol incorporation into hair is unknown, hair cortisol concentration seems to be a marker of long-term systemic cortisol concentration. Hair cortisol is, therefore, a potential marker of chronic stress and is not likely to be affected by acute stress. Studies on cattle show connections between hair cortisol concentration and factors such as pregnancy, parity, diseases, ectoparasites, body condition score, environmental changes, stocking density and milk yield. Hair cortisol concentration appears to be affected by time of sampling, cow age and breed, UV radiation, season, body region of sampled hair and hair colour. Its concentration also depends on sampling and analytical methods. Hair cortisol is a promising non-invasive tool to evaluate welfare of dairy cows, however, more research is needed to determine the extent of effects on its concentration and the appropriate method of sampling and analysis. Correlations between Welfare Quality® Assessment Protocol scores and pooled hair cortisol concentrations have not yet been found, and more research is needed with larger sample size, a standardized protocol of hair sampling, processing and analysis. With proper attention to detail, hair cortisol levels in pooled hair samples might come to be used as a reliable indicator of dairy animal welfare.

Exosome cargo in milk as a potential marker of cow health

Monica Colitti, Sandy Sgorlon and Bruno Stefanon

Italy

Abstract

Recent advances on milk exosomes (EXO), cargoes in cell-cell communication, explored their role within and between individuals, including in dairy species. The potential use of EXO as biomarkers of disease and metabolic conditions adds significant interest to the study of EXO in milk. Although several researches have been carried out on circulating miRNA in the milk, less information is available about milk-derived exosomal miRNAs, which are stable over time and resistant to digestion and milk processing. EXO are taken up by recipient cells through specific mechanisms, which enable the selective delivery of cargoes. This suggests that EXO cargoes can be used as biomarkers of health. Nevertheless, methodological limitations and potential applications of milk EXO in dairy ruminants must be considered. The paucity of studies that associate the EXO cargo to specific challenges deserves further investigations to unravel the variation of miRNA and proteins cargo in relation to metabolic imbalance and infectious disease of the mammary gland.

A review of vitamin D and its importance to the health of dairy cattle

Jaka Jakob Hodnik, Jožica Ježek and Jože Starič

Slovenia

Abstract

This Research Reflection short review will discuss vitamin D metabolism, its role in nutrition, disease prevention, and welfare of dairy cattle, as well as its toxicity. Vitamin D is an important fat-soluble vitamin. However, some researchers regard it as a hormone due to its function in the organism. Its role is not limited just to Ca homeostasis and bone metabolism but is also associated with immunity. In dairy cattle it is known for preventing milk fever. Cows can acquire vitamin D in many ways for example through feed, parenteral injections or through UVB irradiation from the sun or artificial lighting. The vitamin D in feed can either be plant-/ fungi- based ergocalciferol or animal-based cholecalciferol. There is currently only one registered feed vitamin D supplement for cattle in the European Union and it is cholecalciferol. Animals can also synthesize their own vitamin D when 7-dihydrocholesterol in the skin is irradiated with UVB light resulting in cholecalciferol production. Despite its importance, many cattle are deficient in vitamin D due to inadequate supplementation or insufficient sun exposure. In a study performed at the Veterinary Faculty in Slovenia 12 high producing Holstein Friesian cows at a commercial dairy farm were blood tested for vitamin D status for three succeeding months and all but one were vitamin D insufficient in all testings. The cows were not exposed to direct sunlight and the content of vitamin D₃ in feed was < 400 IU/kg dry matter, which is only around half of the NRC (2001) recommendation. Deficiency can also occur due to diseases affecting the gastrointestinal tract, such as paratuberculosis, which lower the absorptive capacity of the gut. Vitamin D can be toxic if cows are over-supplemented or consume large quantities of plants like *Trisetum flavescens*, which contain an active form of vitamin D-calcitriol or its glycosides, that are activated by digestion in the rumen.

Early weaning: new insights on an ever-persistent problem in the dairy industry

Tomislav Mikuš, Rok Marzel and Ornella Mikuš

Croatia

Abstract

It is common practice in the dairy industry to separate the calf from the cow immediately after parturition, and in most parts of the world calves are housed individually during the milk-feeding period. Early and abrupt separation has major implications for the calf's physical and psychological development. In this Research Reflection short review we present and discuss the main housing systems and management practices regarding early weaning in today's dairy industry. Main benefits and disadvantages are critically addressed, and possible future research suggested. Furthermore, major policy issues related to consumers, scientific recommendations and economic performance of farms have been identified, as well as future drivers for more viable housing solutions for neonatal calves. This review serves as an introduction and preamble to the second section of this Special Issue, which is dedicated to cow-calf contact management systems.

Management practices that influence the welfare of calves on small family farms

Renata Relić, Jože Starič and Jožica Ježek

Serbia and Slovenia

Abstract

In this Research Reflection we review management practices in small family farms with less than 100 cows. Small farms represent the majority of farms in the EU and the world, and they are of great importance for the economy of a country. On cattle farms, the welfare of calves is of primary importance for the profitability of the herd, and poor management is one of the main factors influencing calves' health and survival. Data on the risk factors for calf welfare issues in small-scale farms are limited. For this purpose, the literature data from six world countries were presented and compared, including Serbia and Slovenia where a survey related to the issue was carried out within the COST Action FA1308, DairyCare. Some practices within the following areas in calf management were considered: calving management, care for new-born calves, use of painful procedures, colostrum management, cow-calf separation, calf feeding, weaning, calf housing, and general monitoring. In each of the countries, the health and welfare of calves are threatened by some omissions in rearing practices and the major are related to the new-born calf management, the feeding and watering management, and the application of hygienic measures. Many farmers are well aware of the importance of proper calf rearing; others would need more incentive to improve calf management. Each country should pay attention to the education of farmers about the most common deficiencies in calf management.

Introduction: Special Issue themed section on milk production with cow and calf together

Sigrid Agenäs

Sweden

Three years ago I had the opportunity to write an editorial for JDR, asking for reports on work with cows and calves kept together in dairy production. It is with great satisfaction I now introduce the themed section on cows and calves together in this special issue of the Journal of Dairy Research. The papers in this section are a combination of literature based suggestions for important aspects on production systems with cows and calves together, proposals for a common terminology and methodology for describing and studying these systems, novel data from research projects and identification of knowledge gaps that are a priority for furthering the field. The publications in this section are linked in one way or another (sometimes simply by inspiration!) to the EU COST Action DairyCare that enabled an incubator for discussions on calf management in dairy production, including the possibility to keep calves together with their dams. The funding from EU COST made it possible to bring scientists, who may not have met otherwise, together for workshops. This has resulted in new collaborations that have been very fruitful and we now have a closely-knit network of scientists in Europe, North and South America working together to forward the knowledge about dairy production with cows and calves together. DairyCare is greatly acknowledged for this.

The cow-calf relationship: from maternal responsiveness to the maternal bond and the possibilities for fostering

John P Kent

Ireland

Abstract

The relationship between the cow and calf develops over time after birth. The behavioural mechanisms underlying its development are important and comparisons with other species may increase our understanding. In nature the cow will separate herself from the herd to give birth and then the cow-calf relationship will develop with the ability to recognise each other. While twinning levels are low in cows, they do rear their twin calves. If the calf is lost at or after birth the cow can be responsive towards other calves and in specific circumstances the cow can develop a maternal bond with an alien calf, ie foster. In this Research Reflection a distinction is made between the development of, on the one hand, maternal responsiveness (the tendency of the cow to care for a calf which occurs before birth) and, on the other hand, the development of the maternal-filial bond or relationship which is reciprocal, occurs after birth and is characterised by the ability to discriminate the mother's own calf from alien calves. These processes can overlap and the relationship between cow and calf in this 'hider' species is more plastic than in some other mammals. For example, a cow might form an attachment with an alien calf before she gives birth. After the cow has given birth the loss of her own calf may result in the state of maternal responsiveness being maintained, such that developing a maternal bond with one or several appropriate alien calves is possible. Viable fostering techniques are possible. If a maternal relationship to the mother's own calf has developed then fostering will be more difficult. If the cow's relationship with her own calf is not exclusive, and she is in a state of maternal responsiveness then fostering of calves of an appropriate age and status can be achieved.

Methodological terminology and definitions for research and discussion of cow-calf contact systems

Janja Sirovnik, Kerstin Barth, Daiana de Oliveira, Sabine Ferneborg, Marie J. Haskell, Edna Hillmann, Margit Bak Jensen, Cecilie M. Mejdell, Fabio Napolitano, Mette Vaarst, Cynthia M. Verwer, Susanne Waiblinger, Katharina A. Zipp and Julie Føske Johnsen

Germany, Austria, Sweden, Norway, UK, Denmark, Italy, The Netherlands

Abstract

Due to increasing public concern regarding separation of the dairy cow and calf within the first days after birth, alternative systems, where cows and calves stay in contact for an extended period, are receiving increasing interest from a broad array of researchers and other stakeholders. With more research in the area, there is a risk of inconsistencies emerging in the use of terminology. To create a better consensus in further discussions, the aim of this work is to provide definitions and propose a common terminology for cow-calf contact in dairy production. We also suggest definitions for various systems allowing cow-calf contact and describe the distinct phases of cow-calf contact systems.

Methodology for experimental and observational animal studies in cow-calf contact systems

Daiana de Oliveira, Kerstin Barth, Marie J. Haskell, Edna Hillmann, Margit Bak Jensen, Julie Føske Johnsen, Cecilie Mejdell, Susanne Waiblinger and Sabine Ferneborg
Sweden, Germany, UK, Denmark, Norway and Austria

Abstract

In this Research Reflection we describe a common standpoint on suitable methodology for controlled and observational studies in cow-calf contact systems in dairy production. Different methods to assess behaviour, health and production in cow-calf contact systems are outlined. Knowledge and experience from researchers working in this field supplement scientific literature whenever relevant. Specific methods including study design, early behaviour of cow and calf, social behaviour relevant to cow-calf contact systems, human-animal relationships and aspects related to management (milking, weaning and separation, health) are reviewed, and recommendations formed. We expect that this paper can contribute to a better understanding of the complexity of cow-calf contact systems and help to advance research in this area of dairy production.

Methodology for studying human attitudes and behaviour to cow-calf contact systems

Sabine Ferneborg, Fabio Napolitano, Mette Vaarst, Cecilie M. Mejdell, Susanne Waiblinger and Daiana de Oliveira
Norway, Italy, Denmark, Austria and Sweden

Abstract

This position paper describes a common stand on methodology of human attitudes and behaviour that is suitable to use in studies regarding cow-calf contact (CCC) in dairy production, in order to create a common knowledge base and foundation for future recommendations of CCC systems. We describe how different quantitative and qualitative methods can be used to study human attitudes to cow-calf contact as well as farmer or consumer behaviour. We aim to contribute to a better understanding of the available methods, and hope that this paper can be used as a guideline for future studies in this area.

A framework for the socio-economic evaluation of rearing systems of dairy calves with or without cow contact

Ute Knierim, Dagmar Wicklow, Silvia Ivemeyer and Detlev Möller
Germany

Abstract

Interest in dairy calf rearing systems with cow-calf contact during the milk feeding period is increasing among farmers, advisors and researchers, but socio-economic consequences have only scarcely been investigated yet. In this Research Reflection we develop a suggestion for a socio-economic methodical framework that is suitable for the wide variation of cow calf rearing systems, farm, market and societal conditions. Based on a literature based, system-theoretical structuring of involved elements, and on full cost accounting in an exemplary case study concerning two model farms, we itemize monetary factors, and additionally important non-monetary factors, that should be included in a socio-economic evaluation. This process also revealed further research needs. We propose as a next research step to gather a greater number of real farm data including different rearing systems and to perform individual full cost accountings, in order to identify input and output patterns on this basis. This might not only help to provide a robust basis for economic decision making, but also help to fill research gaps concerning long-term effects of calf rearing with cow contact. In addition, ways should be explored on how to take non-monetary effects into account.

Effects of suckling on milk yield and milk composition of dairy cows in cow-calf contact systems

Kerstin Barth

Germany

Abstract

In this research communication I show the effect of various cow-calf contact systems on milk yield and milk composition during the periods when calves were allowed to suckle their dams and after the calves were separated in comparison to cows that were only machine milked throughout their lactation. Analyses were based on four different experiments, but conducted at the same research station and under comparable housing and feeding conditions. Nursing dams had contact to their calves during the whole day, during night-time or only twice per day shortly before milking. A control group of cows that had no contact to their offspring was part of every experiment. Data of the regular monthly milk recordings were analysed with linear mixed models. Results showed a significant effect of the suckling system on the machine milk yield over the whole lactation. While cows with night-time contact reached the milk production level of the control cows, cows with whole day or short-time contact still produced less milk after the calves were separated. Fat content was always lower during the suckling period but not afterwards. The significantly higher milk protein content in dams with calf contact requires further investigation. Somatic cell count in milk of nursing dams was slightly increased, probably due to the exposure of the teats to frequent suckling in addition to machine milkings. In conclusion, cow-calf contact systems influence the performance of cows during and after the suckling period but to varying degrees depending on the system adopted.

The influence of maternal contact on activity, emotionality and social competence in young dairy calves

Noemi Kim Santo, Uta König von Borstel and Janja Sirovnik

Germany and Austria

Abstract

The study reported in this research communication aimed to assess the influence of maternal contact on calves' activity, fearfulness, and social competence. Calves were either dam-reared for their first 14 days of age (Maternal Contact, n = 12) or were separated from their dams within 12 hours after birth (Motherless, n = 12). Calves of both treatments and the dams of Maternal Contact calves were group-housed and suckling was prevented with udder nets. The general activity (lying, locomotion, swapping between lying and standing) was measured using pedometers in eight Maternal Contact and eight Motherless calves within a 24-day period. Since general activity might be affected by calves' age or the separation of Maternal Contact calves from the dams the 24-day period was additionally divided into two groups (period A: 3rd-13th day of age, period B: 14th-27th day of age). Emotionality and social competence were assessed in the open field, novel object, and confrontation test with an unknown cow at 14, 21, and 28 days of age, respectively. Mann-Whitney-U-Tests were performed for statistical analysis. Locomotion was greater in Motherless calves than Maternal Contact calves during the 24-day period (A+B combined, $P < 0.001$) and period B (14th to 27th day of age, $P < 0.001$). There was no treatment difference in duration of lying or in the amount of swapping in any of the periods. After a Bonferroni correction, which we used due to the exploratory character of the study, there were no treatment differences in behaviours indicating emotionality. Compared to Motherless calves, Maternal Contact calves showed increased vigilance ($P < 0.01$) during the confrontation test. The results of this study indicate that mother-reared calves likely searched less for social contact and developed greater social skills than calves that were separated from their mothers soon after birth.

Play and social behaviour of calves with or without access to their dam and other cows

Susanne Waiblinger, Kathrin Wagner, Edna Hillmann and Kerstin Barth

Austria and Germany

Abstract

The aim of the study reported in this Research Communication was to compare play behaviour and social interactions of dairy calves either separated from their mother and reared in a calf group (*Artificial*) or with access to their mother and the cow herd (cow-calf contact - *Contact*). *Contact* calves had access to a calf area and also to the cow barn where they could suckle their dam. *Artificial* calves were fed whole milk up to 16 kg per day via an automatic milk feeder and were only kept in the calf area. We observed the animals on three days during the first three months of life. *Contact* calves showed solitary play, consisting predominantly locomotor play, for longer than *Artificial* calves and mainly in the cow barn. This indicates higher welfare in *Contact* calves. In addition, *Artificial* calves hardly experienced any agonistic interaction, while *Contact* calves both initiated and received agonistic interactions more often what might contribute to the development of higher social competence.

Short- and long-term effects of rearing dairy calves with contact to their mother on their reactions towards humans

Susanne Waiblinger, Kathrin Wagner, Edna Hillmann and Kerstin Barth

Austria and Germany

Abstract

In this Research Communication we address the hypotheses that reduced contact with humans during the first week of life would impair the relationship of dairy calves reared in dam-calf-contact systems to humans in comparison with artificially reared animals, but that this difference would vanish over time. Artificially reared calves (*Artificial*) that had been separated from their mother within 12 h after birth were bottle-fed with colostrum for 5 days and thereafter sucked milk from an automatic milk feeder. Animals reared with dam-calf contact (*Dam-contact*) were kept in the calving pen with their dam for 5 days, and then had permanent access to the cow barn and thus to their dam. Calves were weaned at an age of 12 weeks and kept in young stock groups mixed of both treatments until integration into the cow herd. We tested the animals' relationship with humans by assessing the animals' responses towards an unfamiliar person in (i) an avoidance distance (AD) test in the home environment at 4 weeks of age, at 15 months and at 33 months. In calves, we additionally measured AD in a novel arena after a stationary person test. *Artificial* animals had lower AD, i.e. showed lower level of fear, than *Dam-contact* calves. However, the AD in *Dam-contact* calves decreased with increasing number of days they experienced assistance for suckling. Further, there was no significant difference in later ages. In conclusion, gentle human contact in combination with feeding during the first five days of life improved calves' relationship to humans leading to differences between the two treatments as well as within the *Dam-contact* calves. Potential effects under different conditions regarding quantity and quality of human-animal interactions need further research.

Physical development, ease of integration into the dairy herd and performance of primiparous dairy cows reared with full whole-day, half-day or no mother-contact as calves

Katharina A Zipp and Ute Knierim

Germany

Abstract

We investigated whether different rearing conditions affected the physical development, ease of integration into the dairy herd and performance of primiparous dairy cows and the results are reported in this Research Communication. The three rearing conditions investigated were whole-day cow-calf contact for 9 weeks (WDC), half-day contact for nine weeks (HDC) and no mother-contact (NC) with nipple-bucket-feeding (max. 2x3 L/d) and group-housing from the 8th day onward. After permanent separation from the dams (WDC and HDC), all calves had been nipple-bucket-fed and gradually weaned from week 10 to 13 of life and kept together as calves and heifers. Measures of physical development were trunk girth, height at withers and body weight. Lying behavior during the first 48 h after introduction to the dairy herd after first calving was used as an indicator of ease of integration. Performance measures were age at calving, lactation duration, milk yield and culling rates during the first lactation. No differences between WDC and HDC could be detected. Moreover, no treatment-effects on physical development or performance could be found. All treatments showed reduced lying for the first 24 h after introduction to the dairy herd. Afterwards NC-heifers lay less than WDC, with HDC-heifers ranging in between. We conclude that under the conditions investigated higher weights two weeks after weaning in WDC- and HDC-calves did not carry through to the first lactation and did not lead to earlier maturity and higher performance, but that integration into the herd may be alleviated when calves have early experience of the herd and associated conditions.