Transform
Dairy
Net

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Report on regulatory requirements

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Lead Partner	Thuenen Institute
Authors	Anna Rademann, Susanne Waiblinger (VMU)
Contributing Partners	Kerstin Barth, Anina Vogt (THU); Julie Føske Johnsen (NVI); Siobhan Mullan, Rachel Annan (UCD); Ada Braghieri (UB); Evangelia Sossidou (ELGO); Sabine Hartmann, Daniela Haager, Thainá Landim de Barros (VPI); Margret Vonholdt-Wenker (FLI); Yael Dotan, Mathilde Deville (FVE); National Network Facilitators: Iben Alber Christiansen (ICOEL); Airi Vetemaa (EOFF); Chloé Le Gall-Ladevèze (PHYLUM); Saro Ratter (SFS); Chrysa Adamakopoulou (ELGO); Alessia Pea (ANAFIBJ); Sabine Ferneborg (NMBU); Stine Grønmo Kischel (TINE); Dinu Gavojdian (RDIB); Jakob Gadermaier (BIOA)
Reviewers	Kerstin Barth (THU); Siobhan Mullan (UCD)
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Revisions

List of Acronyms

CCC	Cow-calf contact
EEA	European Economic Area
EU	European Union
ICAR	International Committee for Animal Recording
MAP	*Mycobacterium avium* subsp. *paratuberculosis*
NIP	National Innovation Practice Hub
NNF	National Network Facilitator
TDN	Transform Dairy Net
WP	Work Package

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Keywords list

- Cow-calf contact
- Regulation
- Legislation
- Welfare
- Health
- Housing
- Animal breeding
- Milk hygiene
- Food hygiene
- Food safety
- Cattle
- Cow
- Calf
- Dairy

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1. Executive summary

This report provides a comprehensive overview of European and TDN partner countries' regulations in the areas of animal welfare and housing, animal health, breeding, and food hygiene and safety that potentially affect the implementation and up-scaling of cow-calf contact (CCC) systems in dairy production. Relevant key legislative aspects were identified on EU level and on national level. They were analysed for differences between countries, offering insights into potential barriers and facilitations for CCC adoption.

Animal Welfare and Housing

Four EU regulations from the area of animal welfare and housing have been identified as being potentially relevant for CCC:

- *Directive 2008/119/EC: Minimum standards for the protection of calves*
- *Directive 98/58/EC: Protection of animals kept for farming purposes*
- *Regulation (EC) 1/2005: Animal Welfare during Transport*
- *Regulation (EU) 2018/848 on Organic production*

Directive 2008/119/EC sets minimum standards for calf protection, including requirements for feeding, space, and group housing. While these need to be followed for every calf raised within the EU, standards do not specify details when calves are housed with cows. Thus, in CCC systems with calves housed in the cow barn, special attention must be paid on, e.g., adequate (micro-)climate, lying area, floor conditions, and calves' access to resources such as feed and water. On the other hand, CCC systems generally fulfil the legislative requirements of a minimum of twice a day feeding, group housing, and space allowance, especially in whole-day CCC systems. In addition, physiological and ethological needs are better fulfilled in CCC systems due to the better fulfilled need for suckling and, often, absence of prolonged hunger, leading to less abnormal oral behaviours, although the effects are more pronounced in whole-day compared to part-time CCC systems.

In some TDN partner countries, national legislations exceed EU requirements. For example, some countries specify air quality parameters and thermal isolation for calf accommodations, several countries set maximum slot widths and/or minimum slat widths for calves, and Norwegian and Swedish legislation mandates the provision of a calf creep, as well as access to pasture. While stricter regulations are beneficial from an animal welfare point of view, some may be perceived by farmers as barrier to adopt a CCC system. Regulations in France, Greece, Ireland, Italy, and Romania did not exceed EU regulations.

EU Regulation 2018/848 on Organic production prescribes to feed whole milk, preferably maternal milk, to calves during the first 90 days of life, which may support adopting CCC systems on organic farms. In general, CCC systems align with organic farming values such as committing oneself to the promotion of animals' species-specific behavioural needs what may potentially reduce barriers to adoption.

Animal Health

The relevant legislation for animal health is Regulation (EU) 2016/429 on transmissible animal diseases („Animal Health Law"). Europe is free from several notifiable diseases, e.g. Vesicular Stomatitis and Contagious Bovine Pleuropneumonia, and there are only rare outbreaks of Bovine Tuberculosis (eradicated in most European countries), Bovine brucellosis, Anthrax and Listeriosis. No scientific evidence suggests increased risks of infection and / or spreading of these diseases in CCC systems compared to those when cow and calf are separated early for most diseases. Only for Paratuberculosis, immediate separation of cow and calf is frequently mentioned in calf keeping guidelines to help prevent infections, although the relevance of CCC as a risk factor for Paratuberculosis is still unclear. In terms of non-notifiable diseases, research indicates that CCC can have both positive and negative influences on cryptosporidiosis, pneumonia, immunity, and mortality in calves, while it seems beneficial or has no effect on calf diarrhoea.

Breeding

The relevant legislation for breeding on a European level is Regulation (EU) 2016/1012, which names the International Committee for Animal Recording (ICAR) as the reference centre for cattle breeding of the EU. Guidelines for milk performance testing applicable in CCC systems in accordance with ICAR guidelines are available in some languages and can be followed by CCC farmers and milk control organisations but need translation and further distribution.

Food hygiene and safety

Regulation (EC) 178/2002: General principles and requirements of food law and Regulation (EC) 853/2004: Specific hygiene rules for food of animal origin may be of relevance for CCC stakeholders. If calves join the cows in the milking parlour, a contamination of milk with calf saliva must be avoided. Scientific evidence and practical experience showed no increased risk of CCC milk for human food safety, provided that milk hygiene rules are properly followed.

Conclusion

In terms of Animal Welfare and Housing, most CCC farms naturally fulfil regulations on group housing, space allowance, and ethological and physiological needs related to feeding. Regulations on material, air quality and temperature, inspection, cleaning, floor, lying area, and construction may need a special focus, and, in some cases, barn (re-)constructions might be necessary. Guidelines on milk performance testing in accordance with ICAR are available. There is no evidence that CCC is an increased risk for transmissible diseases and for human food safety, given that milking is managed hygienically.

2. Introduction

2.1. General Introduction

Adopting cow-calf-contact (CCC) systems affects farming practices in a variety of ways. One aspect that farmers and other stakeholders, including dairies, veterinarians, or advisors, must consider when dealing with CCC systems are regulatory requirements that may impact the adoption and / or maintenance of CCC rearing.

The aim of WP3 is to identify knowledge gaps and factors that may impact the implementation and up-scaling of CCC systems. The purpose of this report is therefore to provide an overview of European and National regulations of the TDN partner countries, to compare them and to detect possible barriers for CCC. The report firstly outlines the process of collection of regulations, then gives an overview of regulations on EU level, before specifying regulations in the TDN partner countries. Thereafter, analysis of the regulations for their possibility of hindering or strengthening implementation of CCC systems and comparison between partner countries is presented. In the end, suggestions for future legislative changes are outlined.

This report covers official legislation in the EU and the TDN partner states. In several partner countries, private institutions of CCC farmers have formed that may present extensive guidelines on CCC systems. As these guidelines or regulations do not apply to everyone but just specifically to the members of the organisations, they are not covered in this report. However, information on private organisations can be found on the *TDN website* and people interested in CCC are encouraged to reach out and connect to institutions in their, or, if not applicable, in other countries.

2.1.1. Description of CCC systems

This report adheres to the definitions of different CCC systems proposed by Sirovnik et al., 2020:

Cow-calf contact system: Any housing or management where calves have contact to either the dam or a foster cow; cow-calf pairs either bond with or tolerate each other; they may or may not be able to suckle/nurse

Cow-calf contact: Any physical contact and behavioural interaction between a dam and her own calf or a foster cow and her foster calf

Dam-calf contact: CCC system allowing contact between the dam and her calf

Foster cow system: CCC system where cows suckle more than one calf, sometimes including their own calf

Whole-day CCC: Cow and calf are managed together with CCC for almost 24 h daily with a possible exception of being temporarily separated during milking and feeding and with a possibility to retreat

Part-time CCC: Cow and calf are managed with CCC during specific periods of the day only, that is when temporary cow-calf separation exceeds milking and feeding times

- *Several short times a day: CCC allowed during two (or more) short periods daily*
- *Daytime/night time CCC: CCC allowed only during daytime or only during night time*

Artificial rearing: Rearing calves without contact to a cow. Feeding can occur e.g. from a milk feeder, teat buckets, or buckets. Times of feeding and amount of milk per feeding can be *ad libitum* or restricted.

A minimum contact time between cow and calf before weaning/separation in order to call it a CCC system has not yet been specified. In the EFSA-report on the welfare of calves, a prolonged cow-calf contact is recommended for the future comprising the whole pre-weaning period (EFSA Panel on Animal Health and Animal Welfare et al., 2023). This is already practiced in most farms with CCC systems, with variations between countries (Eriksson et al. 2022).

2.2. Collection of regulations

EU Regulations were compiled by the first author. Regulations specific for each partner country were collected by the NNFs, the authors and the contributors. The main topics that were indicated comprised animal welfare/housing, management including feeding and weaning, animal hygiene including health care, milking, food/milk hygiene, sale and marketing of milk and milk products, sale of calves and breeding, although NNFs and contributors were encouraged to think of any additional regulations that may impact CCC farming.

3. Results

All the TDN partner countries, except for Norway and the United Kingdom, are part of the European Union and therefore must adhere to EU law. However, both Norway and the UK align closely with EU legislation due to Norway's membership in the European Economic Area and the UK's ongoing economic and regulatory ties with the EU. Therefore, legislation of both countries covers similar areas as EU legislation.

The following EU regulations have been identified as potentially relevant for the implementation of CCC:

Animal Welfare and housing

- *Directive 2008/119/EC: Minimum standards for the protection of calves (Council of the European Union, 2008)*
- *Directive 98/58/EC: Protection of animals kept for farming purposes (Council of the European Union, 1999)*
- *Regulation (EC) 1/2005: Animal Welfare during Transport (Council of the European Union, 2005)*
- *Regulation (EU) 2018/848 on Organic production (European Parliament, 2018)*

Animal Health

- *Regulation (EU) 2016/429 on transmissible animal diseases („Animal Health Law") (European Parliament, 2016a)*

Animal Breeding

- *Regulation (EU) 2016/1012: Animal Breeding (European Parliament, 2016b)*

Food hygiene and safety

- *Regulation (EC) 178/2002: General principles and requirements of food law (European Parliament, 2002)*
- *Regulation (EC) 853/2004: Specific hygiene rules for food of animal origin (European Parliament, 2004)*

3.1. Animal Welfare and Housing

3.1.1. Regulations on EU level

3.1.1.1. Directive 2008/119/EC: Minimum standards for the protection of calves

Table 1 gives an overview about the topics addressed in **Directive 2008/119/EC** on minimum standards for the protection of calves that may be relevant for CCC farmers or those interested in CCC.

Table 1. Aspects of Directive 2008/119/EC laying down minimum standards for the protection of calves relevant for CCC systems, grouped into thematic categories.

Topic	Content of regulation
Group housing	Obligatory for calves > 8 weeks[1,2]; single boxes must have perforated walls which allow direct visual and tactile contact
Space	*Individual pen*: width at least height of calf at withers, length at least body length[2] *Group pen*: 1.5 m^2 for calves < 150 kg, 1.7m^2 for calves < 220 kg, 1.8 m^2 for calves > 220 kg
Material	Materials of calf accommodation must not be harmful to the calves and must be capable of being thoroughly cleaned and disinfected
Air quality and temperature	Air circulation, dust level, temperature, relative air humidity and gas concentrations must be kept within limits which are not harmful to the calves
Light	Calves must not be kept permanently in darkness --> appropriate natural or artificial lighting (for a period at least equivalent to the period of natural light normally available)
Inspection and Treatment	- Inspection of calves housed indoors: 2x daily - Inspection of calves kept outside: at least 1x daily - Appropriate treatment without delay of ill or injured calves
Cleaning	- Housing, pens, equipment and utensils must be properly cleaned and disinfected to prevent cross-infection and the build-up of disease-carrying organisms - Faeces, urine and uneaten or spilt food must be removed as often as necessary to minimise smell and avoid attracting flies or rodents
Floor	- Floors must be smooth but not slippery, prevent injury or suffering to calves standing or lying on them - Suitable for size and weight, must form a rigid, even and stable surface
Lying area	- Comfortable, clean, adequately drained - Must not adversely affect calves - Appropriate bedding for calves < 2 weeks old
Feeding	- Appropriate diet adapted to age, weight and behavioural and physiological needs, to promote good health and welfare - Sufficient iron to ensure average blood haemoglobin level of at least 4.5 mmol / l - Minimum daily ration of fibrous food for each calf > 2 weeks (quantity raising with age) - All calves must be fed at least 2x / day
Construction feeding & water	Feeding and watering equipment must be designed, constructed, placed and maintained so that contaminations of the calves' feed and water is minimised
Colostrum	- Bovine colostrum as soon as possible, in any case within the first six hours of life

[1]Exceptions: Isolation ordered by veterinarian. [2]Does not apply for farms with < 6 calves **or calves kept with their mothers for suckling**.

3.1.1.2. Directive 98/58/EC: Protection of Animals kept for Farming purposes

Directive 98/58/EC concerning the protection of animals kept for farming purposes sets general aspects for the protection of farmed animals but no specific standards towards the keeping of cattle. However, the regulation states that animals must be fed a wholesome diet which is appropriate to their age and species, and which is fed to them in sufficient quantity to maintain them in good health and satisfy their nutritional needs. Moreover, all animals must have access to feed at intervals appropriate to their physiological needs.

3.1.1.3. Regulation (EC) 1/2005: Animal Welfare during Transport

The main aspect of the European Regulation on Animal Welfare during Transport that might affect the implementation and/or maintenance of CCC is the determination of a minimum age for the transportation of calves. The current version of the legislation states that animals cannot be considered fit for transport if “they are new-born mammals in which the navel has not yet completely healed” and if “they are […] calves of less than ten days of age, unless they are transported less than 100 km”. However, the European Commission has proposed changes to the current regulation that include a change of the minimum age for transportation of calves to 5 weeks and to set minimum weight of 50 kg for transportation > 100 km (European Commission, 2023) that might be adopted soon. Moreover, some partner countries set higher minimum ages for transportation, e.g. Austria (3 weeks, Bundesministerium für Soziales, Gesundheit, Pflege und Konsumentenschutz, 2007) or Germany (28 days, Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz, 2009), or a lower maximum distance (Germany: 50 km) for calves.

3.1.1.4. Regulation (EU) 2018/848 on Organic production

While CCC rearing is an option for every dairy farmer, most of the farms practising CCC so far are organic farmers (Barth et al., 2021; Rademann et. al., submitted). The following aspects may be relevant for CCC systems:

- *Calves shall preferably be fed on maternal milk for at least 90 days. Milk replacers containing chemically synthesised components or components of plant origin shall not be used during that period*
- *Calves must be housed in groups after 1 week of life*
- *Access to pasture must be provided whenever possible and allowed by environmental conditions*

The legislation does neither specify a minimum time that cows and calves need to stay together after birth, nor if animals must have the option for physical interactions like licking or suckling.

3.1.2. Regulations in the contributing countries

As almost all the national regulations from the partner countries that were reported by the NNFs to possibly impact CCC were on animal welfare and housing, specifically on calf welfare and housing, this will be the main focus of comparison. However, additional aspects that have been mentioned are listed in the section “Other aspects” and will also be discussed.

Table 2. CCC-relevant calf welfare and housing regulations in TDN partner countries in comparison to 2008/119/EC and further aspects. National regulations specifically for organic production are not included here. Cells with x mark areas where the respective national regulations exceed requirements of European legislation. The respective contents are listed below.

Topic	Country													
	AUT	BEL	DEN	EST	FRA	GER	GRE	IRE	ITA	NED	NOR	ROM	SWE	UK
Group housing						x					x		x	
Space	x		x			x					x		x	x
Material						x								
Air quality & temperature						x					x		x	
Light						x				x				
Inspection and Treatment														
Cleaning														
Floor	x					x					x		x	
Lying area	x					x				x	x		x	
Feeding						x								x
Construction feeding & water	x													
Colostrum						x								
Other aspects			x	x	x					x	x		x	

3.1.2.1. Austria

Space: Austria's "*1. Tierhaltungsverordnung*" defines minimum space for single boxes for calf housing:

- *< 2 weeks of age: 120 x 80 cm*
- *2 – 8 weeks of age: 140 x 90 cm*
- *> 8 weeks of age: 160 x 100 cm*

Floor: Austria's "*1. Tierhaltungsverordnung*" defines a maximum slot width of 30 mm for beef suckler cows with calves. If cattle of ≤ 200 kg are kept without cows, the maximum slat width is defined as 25 mm.

Lying area: Calves < 150 kg must be provided with a dry, soft and deformable lying area

Construction: Austria's Animal Welfare law (*Tierschutzgesetz*) prescribes that the housing as well as devices used to tie up or physically enclose animals must be designed and maintained in such a way that the animals cannot suffer injuries, particularly from sharp edges or uneven surfaces.

3.1.2.2. Belgium

No further standards than according to the EU legislation were identified.

3.1.2.3. Denmark

Space: The *Dyrevelfærdsmæssige mindstekrav for hold af kvæg* defines slightly higher space requirements for Danish calves > 150 kg compared to EU legislation:

- *1.5 m^2 / calf if < 150 kg*
- *1.7 m^2 / calf if < 200 kg*
- *1.9 m^2 / calf > 200 kg*

Other aspects: It is prescribed by Danish law that cow and calf spent a minimum of 12 h together in an individual maternity pen.

3.1.2.4. Estonia

Other aspects: The *Nõuded veise pidamise ja selleks ettenähtud ruumi või ehitise kohta* prescribes that:

- *A cow must be allowed to lick her calf after calving unless advised otherwise by a veterinarian*
- *A cow kept for milking purposes, except one at the end of her lactation period, must be milked at least twice a day*

3.1.2.5. France

Other aspects: According to the *Cahier des charges d'appellations protégées de fromages* for protected types of cheese such as Comté and Gruyère, milk must be collected twice a day and the cheese made from a single milking.

3.1.2.6. Germany

Germany's *Tierschutznutztierhaltungsverordnung* states in Part 2 special requirements for calf housing. Regulations differ from on EU level for:

Group housing: Exception to group-housing of calves after 8 weeks only if less than **three** calves suitable regarding age or weight (EU: six calves without limitation).

Space requirements: If single housed, the calf's box must have a size of at least 120 x 80 x 80 cm for the first two weeks and 180 (if trough is inside the box) or 160 (if trough is outside the box), respectively, x 100 (90) cm from week 2-8.

Material: Outer walls that calves could touch regularly must be sufficiently thermally isolated. This does not apply for calf hutches and non-insulated buildings ("Kaltställe").

Air quality and temperature: Specific limit (maximum) values for the calf area are set per m³ air for NH_3: 20 cm^3, CO_2: 3000 cm^3, H_2S: 5 cm^3. The temperature of the calves' lying area should be between 10-25°C in the first 10 days of life and between 5-25°C after 10 days. The relative humidity should be between 60-80%, except for calves housed in calf huts. These regulations do not apply for calf hutches and non-insulated buildings ("Kaltställe").

Light: Barns for calf accommodation must have light openings and light intensity must be at least 80 Lux.

Floor: A maximum slot space of 2.5 cm and a minimum tread width of 8 cm are defined.

Lying area: Must avoid adverse effects of calves through heat loss.

Feeding: The legislation states, in addition to the requirement of feeding calves at least twice a day, that care must be taken that the calves' need for suckling is adequately met. Moreover, if calves < 70 kg are fed with milk replacer, it needs to contain at least 30 mg iron / kg (related to 88% dry matter) and calves > 70 kg need to have a blood iron content of at least 6 mmol/l on group average.

Colostrum: Colostrum must be administered maximum 4 h after birth.

3.1.2.7. Greece

Greece currently has no special law on the protection of farmed animals, including cows or calves, so adheres to the European regulations mentioned above.

3.1.2.8. Ireland

No further standards than according to the EU legislation were identified.

3.1.2.9. Italy

The legislation regarding animal welfare and housing applies to both dairy cattle and buffaloes. Requirements do not differ from those on EU level.

3.1.2.10. The Netherlands

Light: The Dutch Animal husbandry act prescribes that calves must have access to appropriate daylight or artificial light. This is the case if the area of light-transmitting material in the wall or roof of a barn is at least 5 % (veal calves: 2 %). The material must be arranged in such a way that the light is evenly distributed in the barn.

Lying area: Calves, except for beef bull calves > 2 months, must have access to a lying area that is either bedded with straw or equipped with a plastic mat, wooden slatted floor, or rubber top layer.

Other aspects: A law requiring "animal-centred" husbandry by 2040 has been adopted in the Netherlands that mandates, among other aspects, the possibility to express maternal behaviour for farmed animals.

3.1.2.11. Norway

Space: The *Veileder til forskrift om hold av storfe* defines slightly higher space requirements for single- and group-housed Norwegian calves compared to EU legislation:

Single-housing:

- *Min. length of individual pen: 1.1 x calf's body length*
- *Min. 120 x 100 cm if < 60 kg*
- *Min. 140 x 110 cm if > 60 kg and max. 8 weeks old*

Group-housing:

- *Min. 1.5 m^2 / calf if < 150 kg*
- *Min. 1.8 m^2 / calf if < 220 kg*
- *Min. 2.0 m^2 / calf > 220 kg*

Group housing: Exception to group-housing of calves after 8 weeks only if less than two (EU: six) calves of the same age

Floor: For calves, the slot opening must be 25-30 mm. Moreover, the legislation prescribes that if there is a large variation in the size of the animals housed together, a slot opening of maximum 35 mm could be used when calves are housed with the cows.

Lying area: In addition, it is prescribed that a calf's lying area must be dry, draft-free, and soft with a dense and heat-insulating floor.

Air quality: No cattle should be more than temporarily exposed to air pollution above the following levels: NH_3: 10 ppm, CO_2: 3 000 ppm, H_2S: 0.5 ppm

Other aspects:

1) *Calf creeps:* In *Forskrift om hold av storfe*, it is prescribed that systems that involve housing cows and calves together indoors must include a separate calf creep with a dense floor of at least 0.7 m² per calf,

ensuring that all calves can lie down simultaneously. If cows and calves are housed together outdoors, a separate calf creep in the warmest part of the resting area to which older animals do not have access must be provided.

2) *Pasture:* The same regulation prescribes that access to pasture of 12- or 16-weeks during summer (depending on geographical region and type of barn) is mandatory, except for uncastrated male calves < 6 months
3) *Tameness:* Also, it is prescribed that cattle must be "sufficiently tame" and be accustomed to human contact from an early age.
4) *Teat feeding (organic)*: The Norwegian Organic legislation mandates that if organic calves cannot suckle, they shall be fed using an artificial teat during the first 4 weeks of life.
5) *Suckling (organic)*: Moreover, it is prescribed that Norwegian organic calves must be allowed to suckle for the first 3 days of life.

3.1.2.12. Romania

No further standards than according to the EU legislation were identified.

3.1.2.13. Sweden

Space: The regulation *Föreskrifter och allmänna råd om nötkreatursh*å*llning inom lantbruket m.m* prescribes slightly higher minimum space requirements for single- and group-housed calves compared to EU regulations.

Single-housing:
- *Min. 1.2 x 1.0 m if < 60 kg*
- *Min. 1.4 x 1.1 m if 60 – 90 kg*

Group-housing:
- *Min. 1.5 m^2 per calf if < 60 kg*
- *Min. 1.7 m^2 per calf if > 60 and < 90 kg, of which 1.2 m^2 per calf should be lying area (1.5 m^2 if floors are slatted or moving)*
- *Min. 2.2 m^2 per calf if > 90 and < 150 kg, of which 1.5 m^2 per calf should be lying area*
- *Min. 2.9 m^2 per calf if < 250 kg, of which 2.0 m^2 should be lying area (1.8 m^2 per calf if floors are slatted or moving)*

Lying area: The regulation *Föreskrifter och allmänna råd om nötkreatursh*å*llning inom lantbruket m.m* prescribes that also calves > 1 month of age should have a bedded lying area. Fully slatted floor is only allowed if covered with rubber mats or similar material. Lying areas should provide thermal comfort and the bedding must be appropriate for the animal category and of good hygienic quality.

Floor: The same legislation states that slat opening must be maximum 25 mm for calves < 90 kg and maximum 30 mm for calves < 400 kg. The proportion of slats in relation to solid floor must not exceed 28 % for calves and youngstock < 400 kg.

Air quality: No cattle should be more than temporarily exposed to air pollution above the following levels: NH_3: 10 ppm, CO_2: 3 000 ppm, H_2S: 0.5 ppm, Organic dust: 10 mg/m^3

Other aspects: In the same legislation it is prescribed that:

1) *Calf creeps:* In loose housing systems with foster or nurse cows, calves < 3 months of age should have access to a calf creep with a minimum lying area of 0.9 m^2 per calf
2) *Cow-calf interactions:* Cows should always be allowed to lick their newborn calves

Moreover, *Djurskyddsförordningen* prescribes that:

3) *Pasture:* Cattle kept for milk production and older than 6 months shall be kept on pasture during summer.

3.1.2.14. UK

Space: For group-housed calves, UKs *Regulations on the Welfare of Farmed Animals* state unobstructed minimum space requirements of 1.5 m² per calf for animals < 150 kg, 2 m² per calf for animals between 150 and 200 kg and 3 m² per calf for animals > 200 kg.

Feeding: According to UK law, it is required to feed a minimum daily ration of fibrous food to calves older than 2 weeks, starting with a minimum of 100 g per day at an age of two weeks.

3.2. Breeding

The relevant legislation for breeding on the European level is **Regulation (EU) 2016/1012**. In the legislation, the International Committee for Animal Recording (ICAR) was named as the reference centre for cattle breeding of the EU and sets the guidelines for performance testing of breeding cattle. Performance testings must be conducted by external, third parties that carry out the testing procedures according to the ICAR guidelines. Guidelines for milk performance testing in dairy cows with suckling calves in accordance with ICAR standards are available, however currently only in German and French (Spengler Neff et al., 2022).

3.3. Animal Health

Regulation (EU) 2016/429 („Animal Health Law") regulates special prevention and combatting of major transmissible animal diseases. The following diseases that are covered by the regulation (listed in Annex II) were identified by the authors as being potentially relevant for CCC systems because they can be transmitted via milk and, therefore, suckling and/or direct contact to a cow:

- *Vesicular stomatitis*
- *Paratuberculosis*
- *Contagious bovine pleuropneumonia*
- *Bovine Tuberculosis*

- *Bovine brucellosis (Brucella abortus)*
- *Anthrax*
- *Listeriosis*
- *Salmonellosis*

Paratuberculosis (disease caused by *Mycobacterium avium* subsp. *paratuberculosis*; MAP) is the only of these diseases for which immediate separation of cow and calf after birth is regularly mentioned in calf keeping guidelines as a recommendation to reduce infections (FAWC, 2015; Friedrich Löffler Institut, 2012, 2016). However, the role of CCC as a risk factor for Paratuberculosis is still unclear (Martins et al., 2025). Nevertheless, testing of pregnant cows and of youngstock and individual management strategies may be of even higher importance in CCC systems (Martins et al., 2025). No scientific evidence or reports of public authorities indicate a higher risk of CCC rearing on infection and / or spreading of the other diseases. No transmission via direct contact and/or milk is known for Blue tongue virus, Rift Valley Fever, Lumpy Skin Disease and Bovine Spongiform Encephalopathy, therefore there is no increased risk of infection and / or spreading of these diseases due to CCC.

3.4. Food hygiene / safety

3.4.1. Regulation (EC) 178/2002: General principles and requirements of food law

Regulation (EC) 178/2002 describes that risk assessment of food safety must be based on the available scientific evidence. This could be of relevance for CCC as some farmers reported difficulties with dairies that considered CCC milk as being unhygienic (Rademann, personal communication).

3.4.2. Regulation (EC) 853/2004: Specific hygiene rules for food of animal origin

Regulation (EC) 853/2004 states that milk must come from animals that do not have any udder wound likely to affect the milk. Moreover, teats, udder and adjacent parts must be cleaned before milking. The regulation also states a maximum plate count of 100 000 / mL, and a maximum somatic cell count of 400 000 / mL for raw milk of 30°C.

Some countries limit the amount of milk that can be directly marketed, *e.g.* 70 l / week in Denmark.

4. Discussion

4.1. Animal Welfare and Housing

4.1.1. Directive 2008/119/EC: Protection of Calves

Group housing

According to the Directive, calves must be housed in groups after at least 8 weeks of age and numerous studies have proven beneficial effects of group-housing on calves' behavioural, social and cognitive development compared to single-housed calves (reviewed in Costa et al., 2016). In a CCC system with whole-day contact (for terminology of CCC systems see 2.1.1. and Sirovnik et al., 2020), calves are naturally kept in a group-housed setting starting from birth (given that keeping with the dam is taken as group housing), therefore automatically fulfilling the Directive's requirements. If calves are kept with part-time contact to cows, group-housing still is usual on most farms to make reunion and separation of cows and calves easier. In a recent study comparing 25 farms with CCC rearing and 25 farms with early separation in Austria, calves were single housed on only one CCC farm for some time after weaning, but on 60 % of early separation farms (Rademann et al., submitted). Apart from compliance with legal standards, several studies have shown benefits of CCC rearing on calves' social behaviour and reduced stress responses to isolation, even if compared to calves reared in same-aged groups (Buchli et al., 2017; Magierski et al., 2025; Wagner et al., 2012, 2013, 2015; Waiblinger et al., 2020a). This indicates beneficial effects of calf-rearing with cow-contact beyond housing them in same-aged groups. To summarise, whole-day CCC systems automatically fulfil the legal requirement of group-housing, and also part-time CCC systems usually do so.

Space

The Directive outlines specific minimum space requirements for both individual and group pens. If calves are housed in a cow barn, it is important to take the calves' presence into account appropriately to assure sufficient space for both calves and cows. It is important to notice that, regardless of rearing system, the values given in the Directive are minimum requirements that still limit behaviours eliciting positive emotional states such as locomotor play (reviewed in EFSA Panel on Animal Health and Animal Welfare et al., 2023) - so when considering animal welfare beyond CCC, more space per animal should be provided. Having access to the cow barn, including times where cows have left for milking, offers calves a quite high space allowance at least part of the day which stimulates locomotor play (Jensen and Kyhn, 2000; Mintline et al., 2012), and locomotor play is higher in calves in such a whole-day dam-calf-contact system compared to early separated calves (Waiblinger et al., 2020a).

Material

Concerning material for calf accommodation, Regulation 2008/119/EC states that it "must not be harmful" and that it "must be capable of being thoroughly cleaned and disinfected". Both aspects must be considered in the planning of a CCC system.

Special precautions might be necessary, especially when calves are kept in a cow barn (whole-day or part-time system) but also in the contact area of cow and calf in the case of a part-time system with a special CCC-area, to avoid risks of injuries that could result from, e.g., sharp objects like screws or nails from broken feeding racks or drinkers, automated manure scrapers, or any other possible source of injury. Although a similar requirement is also stated in Directive 98/58/EC concerning the protection of animals kept for faming purposes ("Accommodation and fittings for securing animals shall be constructed and maintained so that there are no sharp edges or protrusions likely to cause injury to the animals"), special attention must be paid if calves are introduced to the cow barn due to differences in height, behaviour and robustness that bring different risks.

Although also material for cow barns without calves needs to be suitable for hygienic measures as mentioned in the Directive for the Protection of Farmed Animals 98/58/EC ("Materials to be used for the construction of accommodation […] must be capable of being thoroughly cleaned and disinfected"), special attention may be needed when allowing CCC. The infectious pressure is higher when keeping calves in contact with a cow and cow barns might be not as easy to clean and disinfect as single calf boxes. Therefore, an appropriate hygiene management is of even greater importance in a CCC system. Although the risk of disease transmission can be considered higher in whole-day contact systems, disease transmission is possible also in part-time contact systems. Even though an enhanced immune response from CCC calves may be possible due to beneficial effects of oxytocin on the immune system and its development shown in other species (Vargas-Martínez et al., 2014) and higher oxytocin release in calves suckling an udder compared to sucking milk from a bucket (Lupoli et al., 2001; Uvnäs-Moberg et al., 2001), there is so far no consistent evidence on the effects of CCC on the calf's immune system and health (reviewed in Beaver et al., 2019) likely due to the complex interactions of housing, management, care and animal factors.

Air quality, temperature and light

Attention must be paid to air quality, especially in whole-day systems where calves are kept in a cow barn. Calf lungs are even more vulnerable to environmental conditions than those of older cattle e.g. due to their immature immune system, their higher respiratory rate and smaller lung capacity, what leads to a high susceptibility to respiratory diseases (reviewed in Sáfár et al., 2023). Air quality is, among others, influenced by housing and ventilation system, stocking density, body size, floor and litter material and manure management (reviewed in Roland et al., 2016, Sáfár et al., 2023), all of which being factors that need to be considered in the transition towards a CCC system.

Ammonia (NH_3), Carbon Dioxide (CO_2), Carbon Monoxide (CO), Dihydrogen Sulphide (H_2S), and Methane (CH_4) can be considered the most harmful gases in barns (Roland et al., 2016). Ammonia can be detrimental for the respiratory tract already in low concentrations. Concentrations below 10 ppm are recommended for cattle and were associated with lower antimicrobial treatment in calves, and concentrations below 6 ppm were associated with lower risk of respiratory disease (reviewed in EFSA AHAW Panel et. al., 2023). Accordingly, EFSA Panel on Animal Health and Welfare (2006) recommends to keep ammonia below 6 ppm, although even lower concentrations can have detrimental effects, also depending on exposure time (reviewed in Sáfár et al., 2023). For cattle, a CO_2 concentration of < 2000 ppm and a H_2S concentration of < 0,5 ppm are recommended (e.g. Ofner-Schröck et al., 2023; Anonymous, 2024).

Moreover, it must be considered that calves are less tolerant towards heat and cold than cows (Roland et al., 2016). As the thermoneutral zone does not only depend on the temperature, also air speeds of > 0.2 m/s at low temperatures or > 0.6 m/s at high temperatures should be avoided (ÖKL, 2022; Roland et al., 2016) and the relative humidity should be between 60-80 % in mechanically ventilated and 40-70 % in heated barns (DIN, 1992; Roland et al., 2016). Some countries have defined threshold values in their national legislation (see 3.1.2).

To sufficiently protect calves from adverse environmental effects, calves kept in a cow barn can be provided with a space with their optimal microclimate zone, e.g. with a creep only accessible for calves (see also below: lying area, construction of feeding and water). Lying close to cows as is possible in whole-day contact systems likely generates a microclimate as well (heat production of cows, protection from draught), but special areas for calves (creep) should be offered, nevertheless.

An animal-friendly light management must be followed. Specific attention to calves' requirements may be necessary when kept with cows, however in practice, this area is not expected to generate problems for CCC.

Inspection and treatment

Animals should be provided with sufficient inspection and treatment regardless of rearing system. However, in CCC systems where calves are kept together with cows, animal observation and inspection can be more challenging and, partly, time consuming. For example, milk intake in artificially reared calves can be monitored easily, while it is more difficult to evaluate in CCC systems (Hansen et al., 2023; Johanssen et al., 2023; Vaarst et al., 2020; Waiblinger and Kirchweger, 2025). On the other hand, in CCC systems, less time needs to be invested for calf feeding and this time can be used for observation (Hansen et al., 2023; Johanssen et al., 2023; Vaarst et al., 2020; Waiblinger and Kirchweger, 2025).

Cleaning

Regardless of rearing system, animals must be kept in an adequately cleaned and hygienically managed environment. Special attention must be paid to sufficient cleaning and disinfection in CCC systems due to the higher possibility of diseases transmission between cow and calf (see also above: Material). Moreover, if calves are kept in a cow barn, an automatic manure scraper can be a risk of injury for calves and the discharge chute should be constructed in such a way that prevents access for calves to that they cannot accidentally fall in or be pushed in by the manure scraper.

Floor

As defined in the Directive on Calf Welfare, the floor should be "smooth but not slippery". Especially when keeping calves in the cow barn, the calves' smaller feet, softer hooves and lower weight in comparison to cows must be considered, so that the floor may have to be adapted accordingly. Some countries (e.g. Austria, Germany, Norway and Sweden) have recognised this by defining minimum slot widths for cattle with different weights in their regulations (see 3.1.2).

Lying area

To allow calves to lie down undisturbed from cows, a separate lying area for calves that is inaccessible for cows (creep) is recommended, where requirements of a comfortable, clean and adequately drained lying are fulfilled.

This area may also be used to provide resources such as feed and water (see also above: air quality and temperature, light and below: construction feeding & water) exclusively for calves. However, in whole-day systems especially younger calves prefer to lie down in the cow barn even if a calf area is provided (Barth et al., 2022) and thus additional lying space is recommended there as well.

Feeding

The Directive sets 2x daily feeding of calves as a minimum requirement. However, this does not correspond to the previously defined requirement that the calves' diet should be appropriate, adapted to their age, weight and behavioural and physiological needs to promote good health and welfare, as calves would naturally consume milk more often (6-8 x in the first 2 weeks of life, 4-5 x > 2 weeks of life; FiBL, 2018). While no minimum amount of milk that must be fed is described in the Directive, common practice is still to feed calves only around 10 % of their body weight (EFSA AHAW Panel et al., 2023). Restricted feeding practices contribute to the development of abnormal oral behaviours due to unsatisfied hunger (De Passillé, 2001; De Passillé and Rushen, 1997; Schuldt and Dinse, 2020). In addition, artificial rearing does not allow calves to fulfil their suckling motivation sufficiently. Thus, artificially reared calves show a higher amount of abnormal oral behaviours such as cross-sucking compared to CCC calves (Fröberg and Lidfors, 2009; Roth et al., 2009; Veissier et al., 2013, reviewed in EFSA AHAW Panel et al., 2023), even if fed ad libitum and with an artificial teat (EFSA AHAW Panel et al. 2023).

In whole-day CCC systems, the animals' behavioural and physiological needs and, therefore, regulatory requirements, are usually fulfilled best, as the system allows natural suckling frequencies, underlined by studies where no cross-sucking occurred in calves in such CCC systems (Fröberg and Lidfors, 2009, Roth et al. 2009). Short-time CCC systems and foster cow systems pose some risk that calves' needs are partly thwarted due to the restricted feeding regime with longer intervals between meals (short-time CCC systems) or a too high number of calves per foster cow and/or reduced suckling possibilities for single foster calves (foster cow systems; Fröberg and Lidfors, 2009; Wieczorreck and Hillmann, 2022; Rademann et. al., submitted). However, the risk for thwarted suckling motivation, e.g. reflected in cross-sucking, is still lower in such systems compared to artificial rearing (Roth et al. 2009, Fröberg and Lidfors 2009, EFSA AHAW Panel et al. 2023). Allowing access to the dam only once a day for a short period, as used in one recent scientific study (Nicolao et al. 2022), would not fulfil the legal requirements, as young, pre-ruminant calves should be fed with milk (replacer) several times a day (Lidfors and Hernandez, 2023).

In terms of access to solid feed to ensure adequate iron intake, a sufficient provision of roughage for calves kept in a cow barn must be guaranteed, e.g. through ensuring access to the cows' feeding table for calves and/or providing a calf creep with additional feed (see also above: air quality and temperature, lying area and below: construction of feeding and water). Being kept with older conspecifics stimulates solid food intake (De Paula Vieira et al., 2012). Thus, CCC systems with contact beyond suckling times can also be considered beneficial in this respect compared to group housing of similar-aged calves or, even more so, compared to individual housing.

Construction feeding & water

When calves are kept in a cow barn, special attention must be paid that water and feed resources are at a reachable height for calves, not only for cows. This might include adaptation of drinkers and feeding places or the construction of new drinkers and/or feeding places preferably in a calf creep, providing them with resources like

feed and water but also a separate lying area (see above). Moreover, contamination of calves' resources by cows as well as vice versa (e.g. calves climbing through the feeding rack and urinating or defecating on the feeding table) must be prohibited. Further, feeding racks where calves can be injured by, e.g. by getting caught, need to be avoided. In general, dialogues with beef suckler farmers regarding barn construction but also in terms of other topics, *e.g.* health management, should be facilitated.

Colostrum

Intake of a sufficient amount (and, if measured, also quality) of colostrum can be monitored more easily when administering colostrum manually by bucket or bottle. However, when calves are allowed to suckle colostrum from their dam, they can suckle an ad libitum quantity and there is, in contrast to artificial rearing, no risk of contamination when milking colostrum in a bucket or bottle (Stewart et al., 2005). The need of proper colostrum management in CCC systems needs to be highlighted to assure sufficient intake of high quality colostrum as the basis of a healthy calf development (Robbers et al., 2021). That is, observation of successful and sufficient suckling and provision of (additional) colostrum to calves where needed due to insufficient or unknown suckling or insufficient colostrum quality of the dam, or to all calves, depending on the situation on the farm.

Summary

As outlined above, some requirements of the EU directive are naturally fulfilled in whole-day dam-calf contact systems and often in part-time dam-calf contact systems and foster cow systems. These include e.g. group housing, space allowance, and the fulfilment of ethological and physiological needs related to feeding. On the other hand, regulations on other aspects, including material, air quality and temperature, inspection, cleaning, floor, lying area, and construction may need a special focus in CCC systems. In some cases, barn constructions might be necessary to fulfil the regulations, mainly when reconstruction of the floor is required.

4.1.1.1. Comparison between partner countries

Group housing, Space

Some partner countries (e.g. Germany, Norway) set stricter requirements for group housing than the EU regulation. However, in CCC systems, at least in systems with whole-day contact, group-housing is always achieved, making it a system-inherent benefit for CCC farmers. Some countries have slightly higher space requirements compared to EU legislation, however they will most likely be fulfilled in CCC systems, at least in those with whole-day contact where calves are kept in the cow barn.

Material, air quality and temperature

Some partner countries set distinct values for air quality parameters for cattle (e.g. Sweden and Norway) or calf (Germany) housing, at least for NH_3, CO_2, and H_2S, as well as for temperature, relative humidity and light intensity. Moreover, some countries (e.g. Germany) require thermally insulated outer walls that calves are regularly in contact with, although these requirements apply only for insulated buildings ("Warmställe"). The maximum threshold values for air quality align with those in literature (Sáfár et al., 2023) but are higher compared to recommended values (Anonymous, 2022). Setting threshold values is to be welcomed, as it provides clear guidance for farmers, as well as assessors, advisors and veterinarians, especially when planning a CCC system to

identify possible animal welfare risks. The threshold values for calf accommodation are such that are also advised for older cattle, thus should also be met for cows and therefore not pose additional complication for CCC systems. Insulated buildings are rare in modern cow barns with loose housing systems but more common in tie stalls and may thus also be found in reconstructed barns. In this case, it can be argued that only the outer wall of the creep area is relevant and may need an additionally insulated outer wall. However, in most cases, no or little problems for CCC farmers can be expected from this legislation.

Floor and lying area

Some countries (e.g. Austria, Germany, Norway and Sweden) set specific values for maximum slot width and / or minimum slat width for calves, considering the smaller size of calf hooves. In Austria, a somewhat higher slot width is accepted in case of keeping calves together with cows in loose housing with slatted floors, which is, however, still lower than the slot width prescribed for cow barns. Thus, existing cow barns with slatted floors may only be suitable for some CCC systems or may need reconstruction. For new buildings, avoiding slatted floors for CCC is recommendable.

In addition to the requirement of the EU Directive that a calf's lying area must be comfortable, clean, adequately drained and must not adversely affect calves, according to Austria's national legislation, a dry, soft, and deformable lying area is required for calves < 150 kg what sets slightly better lying standards for calves reared in Austria and must be remembered when planning a CCC system. Moreover, Germany's national legislation specifies that the lying area must avoid adverse effects on calves through heat loss, Norway prescribes for the calf lying area to be draft-free and have a heat-insulating floor, and Sweden mandates a bedded lying area also for calves > 1 month. While this could be inferred from the EU Directive, the specific attention to the importance of thermal and lying comfort in calves is important and should be considered in CCC systems.

Feeding and construction

Germany's national legislation states that the calves' need for suckling must be adequately met, a more explicit formulation than in EU law. However, it is unclear if the inclusion of this formulation has led to any changes in practice, as the legislation still allows 2x daily feeding what is not sufficient to meet calves' suckling needs (Appleby et al., 2001; De Passillé and Rushen, 2006; Jasper and Weary, 2002). As discussed above, there is ample scientific evidence that CCC systems fulfil the calves' need for suckling and, therefore, the requirements of the legislation, more sufficiently than artificial rearing (see 4.1.1: Feeding).

UK law requires a slightly higher amount of fibrous food that needs to be fed to calves from two weeks of age. Although this most likely does not affect CCC systems more than others, the importance of providing CCC calves sufficient access to fibrous food needs to be highlighted (see 4.1.1: Construction feeding and water).

Austria's general Animal Welfare Law specifically forbids devices used to physically enclose animals to cause injuries. While this may be inferred from EU law, Austria's legislation more directly implies that precautions must be taken that CCC calves, *e.g.*, cannot be caught and hurt in feeding racks designed for cows.

Other aspects

Cow-calf contact: In Estonian, Swedish, Danish and Norwegian organic legislation, some (Estonia and Sweden: licking, Denmark: spending 12 h together in separate box, Norwegian organic: suckling for the first 3 days of life) contact between cow and calf is prescribed. It needs to be considered that separation of cow and calf after a few

days when the dam-calf bond has been formed enhances the stress of separation (Flower and Weary, 2001; Hudson and Mullord, 1977; Stěhulová et al., 2008; Weary and Chua, 2000). Therefore, contact for just a few days or few weeks must be viewed with caution. In the report on the welfare of calves, EFSA Panel on Animal Health and Animal Welfare et al. (2023) recommend to increasingly implement prolonged CCC aiming for a dam-calf contact for the whole pre-weaning period. Cow-calf contact for at least 10 weeks is already practiced in most farms with CCC systems, with variations between countries (Eriksson et al. 2022).

Dutch law mandates an animal-centred husbandry by 2040 that includes, among other species-specific requirements, the obligation to provide the animals with opportunities for maternal behaviour. Cattle are highly motivated to reunite with their calf even one week after early separation (Wenker et al., 2020), therefore dam-calf-contact systems can be considered to fulfil these requirements best.

Access to pasture: Norwegian and Swedish legislation prescribes access to pasture in the summer, at least for male animals > 6 months and all female animals (Norway) or for animals kept for milk production aged > 6 months (Sweden). Some farmers expressed unease about CCC on pasture, e.g. due to concerns about animal welfare and increased labour, which is why regulations like these may hamper the adoption of CCC systems, although only relevant for female calves in Norway as most farmers' unease concerned young calves (Johanssen et al., 2023; Neave et al., 2022). On the other hand, most farmers practising CCC experienced no or few challenges and/or perceived CCC on pasture as beneficial and most natural (Johanssen et al., 2023; Neave et al., 2022). This shows that CCC on pasture is possible or even beneficial and that, most likely, not the prescribed provision of pasture itself, but rather the perception of some farmers may hamper further adoption of CCC.

Calf creeps: Both Norwegian and Swedish legislation prescribes the presence of a calf creep if cows and calves are housed together. Although this may hinder the implementation of CCC rearing for some farmers due to possibly necessary changes in the cow barn, a calf creep is a reasonable resource to ensure several requirements in CCC systems, as outlined in the discussion about calf welfare and housing (4.1.1).

Tameness: Norwegian legislation prescribes that calves must be tame and accustomed to human contact. There is an increased risk of developing a weaker animal-human relationship in (whole-day) CCC systems where no regular human-animal interactions take place during feeding times (Waiblinger et al., 2020b). However, positive human-calf contact can be facilitated apart from feeding times, and results from both on-farm and experimental settings showed no differences in the avoidance distance between CCC and artificially reared calves, cows and heifers (Bieber et al., 2022; Schneider et al., 2024; Rademann et. al., submitted), therefore confirming that the requirements of the regulation can be fulfilled in CCC systems.

Milking of lactating cows: That Estonian law requires twice daily milking of a cow kept for milking purposes, except for when they are at the end of their lactation, should not hamper the adoption of CCC systems, because twice daily milking is usual on most CCC farms so far. However, some farmers, especially with lower-yielding cows, may choose to milk only once a day as a labour-saving strategy making CCC more economic. They may face a problem, if the removal of milk by suckling of calves is not considered an adequate replacement of milking. So far, no challenges with this legislation have been reported from the Estonian NIP, however this aspect should be addressed to avoid future complications.

Special cheese laws in France: Regulations for protected types of cheese, e.g. Comté or Gruyère, prescribe that the milk must be collected twice a day and that the cheese must be made from a single milking. The milk cannot be stored on farm, and animals cannot be milked by a robot or once a day. Therefore, CCC with once-a-day milking of cows is not possible for farmers who produce certain special types of cheese.

No differences compared to EU law in any of the partner countries were found for the topics *inspection and treatment, cleaning, and water supply*.

Summary

Austria, Germany, Norway and Sweden are the partner countries whose national regulations on calf welfare and housing exceed EU regulations most extensively. While this promotes slightly higher welfare standards, some stricter rules may complicate the adoption and/or maintenance of CCC.

Regarding threshold values for air quality and light in calf areas, no or little constraint is to be expected for the adoption of CCC if calves are kept together with cows, as the current threshold values are also advised for adult cattle. Temperature may need specific consideration to avoid draught in calf lying areas. Specifying values for maximum slot and minimum slat width for calves, as done in Austrian, German, Norwegian and Swedish legislation, is important from an animal welfare point of view but may mandate farmers to change floor type for adopting a CCC system in their cow barn. Attention should be paid to create sufficient space for lying areas for calves, both with and without cows. Practising CCC for only a few days poses a challenge for both cow and calf welfare due to the increased stress of separation after the dam-calf bond has formed while beneficial effects of CCC are limited due to the short time. Mandating access to pasture, as in Swedish and Norwegian legislation, is seen as an obstacle by some farmers, although most CCC practicing farmers did not experience extensive difficulties but rather benefits. Calf creeps are mandated in Swedish and Norwegian legislation. A good human-animal relationship and “tame” calves, as mandated in Norwegian legislation, can be achieved through regular gentle contact independent of rearing system. Due to regulations on special types of cheese, some French farmers are required to milk their cows twice a day, prohibiting a CCC system with once-a-day milking of cows.

4.1.2. Directive 98/58/EC: Protection of Animals kept for Farming purposes

As the Directive sets general principles for the protection of farmed animals, both CCC and non-CCC farms are equally affected. However, the Directive states that “All animals must have access to feed at intervals appropriate to their physiological needs” and that they must be fed a “wholesome diet which is appropriate to their age and species”. As discussed above (4.1.1: Feeding), twice daily feeding of calves with an often restricted amount of milk that is common practice and regulated in Directive 2008/119/EC neither fulfils the calves’ physiological nor ethological needs sufficiently. Therefore, whole-day CCC rearing, especially whole day dam-calf contact systems, can be considered to fulfil the requirements of the regulation more appropriately.

4.1.3. Regulation (EC) 1/2005: Animal Welfare during Transport

Some CCC farmers would like all their calves (male and female) to be reared with cow-contact on their own farm while others prefer to sell male calves as early as possible. The minimum age of transportation may affect CCC farmers that would like to sell their male calves to a foster cow or beef suckler farm to enable them cow-contact despite being sold from their farm of birth. If foster cow rearing is desired, foster cow and calf should get united as early as possible to improve the chances that the foster cow accepts the calf (Hudson, 1977). According to the legislation, this type of arranging cow-contact for male calves is possible based on personal farmers' arrangements, as calves younger than 10 days and a healed navel may be transported for up to 100 km by the farmer. In some partner countries, the minimum age for transportation by others than the farmer is higher (Germany: 28 days, Austria: three weeks) and the maximal distance of transportation of younger calves by the farmer is lower (Germany: 50 km). This means that in Germany, calves are not allowed to be transported before the age of 28 days, except for a distance of < 50 km if the navel is healed and transportation is done by their own farmer.

4.1.4. Regulation (EU) 2018/848 on Organic production

Organic farms are not allowed by EU law to feed their calves milk replacer but must feed them whole milk, preferably maternal milk, during the first 90 days of life. This brings organic farming closer to CCC rearing and may reduce the barrier to adopt a CCC system. Moreover, that calves must be housed in groups after the first week of life is also naturally fulfilled in whole-day CCC systems. However, also part-time contact systems generally work with group housing of calves as single housing would complicate the regular reunion and separation of cows and calves, making it more time-consuming and cumbersome. Access to pasture, which is mandated by the Organic regulation, however, may be perceived as a hindering factor by some farmers, although most CCC-practising farmers face no difficulties but rather report benefits from providing access to pasture in CCC systems (see 4.1.1.1: Other aspects).

Apart from more concrete requirements, one objective that is stated in the European legislation is that organic production shall pursue to contribute to high animal welfare standards and, in particular, to meeting the species-specific behavioural needs of animals. While this is realised in aspects like the obligation of access to pasture and the feeding of whole milk, cow-calf separation is, despite ample scientific advice showing the importance of the cow-calf bond for both parties (reviewed in Beaver et al., 2019; Meagher et al., 2019; Johnsen et al., 2016), still allowed. However, it has been argued that separation of cow and calf can be seen a violation of the principle of fairness, one of the principles of organic agriculture, therefore potentially easing the motivation to adopt a CCC system among organic farmers (Bertelsen and Vaarst, 2023; IFOAM, 2024).

4.2. Breeding

Regulation (EU) 2016/1012 names the International Committee for Animal Recording (ICAR) as the reference centre for cattle breeding of the EU. According to ICAR, milk performance recording so far is based on, among

other factors, the individual cow's milk yield. This creates difficulties in cows with CCC, as the amount of milk that is consumed by the calf and, therefore, the cow's exact milk yield, can only be estimated. Moreover, milkability is not possible to assess properly in cows with CCC. Accordingly, some farmers report about problems in this respect. However, guidelines for milk performance testing in dairy cows with suckling calves that are in accordance with ICAR standards are available (Spengler Neff et al., 2022) that should be translated and made more public, as they are currently only available in German and French, to overcome this potential obstacle. Nevertheless, difficulties to achieve a proper breeding value may still persist for farmers that practice particularly late weaning at calves' age of 4 months or older.

4.3. Animal Health

All the diseases listed under 3.2 may be of relevance for CCC systems because they can be transmitted via milk and / or direct contact between animals. Extensive monitoring programmes for all these diseases are in place in Europe. The prevalence of most of these diseases in Europe is limited: Europe is free from Vesicular Stomatitis and Contagious Bovine Pleuropneumonia since at least 2005 (EFSA, 2025), most of the European countries are free from Bovine Tuberculosis while 11 countries participate in an eradication programme (Bovine Tuberculosis - European Union Reference Laboratory, 2024), and outbreaks of Bovine brucellosis and Anthrax are rare in Europe (WOAH, 2025). There are few, yet regular infections with Listeria spp. in cattle (EFSA and ECDC, 2024). Only Paratuberculosis is prevalent in most of the European countries (WOAH, 2025). Apart from Paratuberculosis (see below), no scientific evidence on increased problems with these diseases in CCC systems compared to early separation of cow and calf is known (Beaver et al., 2019).

Immediate separation of cow and calf is frequently, including by official disease control programs, stated to decrease the risk of infections with *Mycobacterium avium* subsp. *paratuberculosis* (MAP), the infectious agent of Paratuberculosis (Animal Health Australia, 2023; Fecteau, 2018; Friedrich Löffler Institut, 2012, 2016; USDA and APHIS, 2011). The main pathway of infection is the faecal-oral route, *i.e.* when calves ingest infectious agents that have been excreted by infected cows, *e.g.* when suckling a manure-contaminated teat (Fecteau, 2018; Sweeney, 2011). Moreover, MAP infections can also occur *in utero*, via colostrum and milk, and genetic disposition exists (Fecteau, 2018; Sweeney, 2011). Calves are highest susceptible for infection at an early age, while they become resistant after several months to one year (Fecteau, 2018; Sweeney, 2011). Despite the widespread view that immediate separation of cow and calf is an important factor for the prevention of MAP infections, scientific evidence could not consistently confirm CCC to be a risk for Paratuberculosis (reviewed in Beaver et al., 2019), so the role of CCC as a risk factor is still unclear (reviewed in Martins et al., 2025). Moreover, prevalences seem to be lower in beef suckler farms where calves are suckling their dam for months (Dargatz et al., 2001; Roussel, 2011). Therefore, it is likely that CCC poses no increased risk to MAP in general, and that proper hygiene, test regime and management, especially in the calving / maternity area are the key factors to prevent infection and / or spreading of MAP (Beaver et al., 2019; Martins et al., 2025). In general, infections with MAP should be prevented as best as possible, *e.g.* animals should only be purchased from MAP-free herds, and in case of infection, concrete action plans should be made together with the veterinarian.

Concerning other, non-notifiable diseases, research shows mixed evidence on the influence of CCC on calf health. Specifically, studies found positive, negative and no effects of CCC rearing on cryptosporidiosis, pneumonia, immunity, and calf mortality compared to early separation (Beaver et al., 2019), highlighting the considerable influence of other factors, especially management.

In general, hygienic management is the most important factor for animal health, regardless of rearing system. If cow and calf are kept in the calving pen for a prolonged time, the pen should be cleaned and enough fresh straw should be provided (Care4Dairy, 2022). Also, sufficient colostrum intake must be ensured (see also 4.1.1). Cow (and calf) feed and water should be kept clean and any other possible sources of infection must be removed immediately.

4.4. Food Hygiene / Safety

The relevant regulations for food hygiene and safety are regulation (EC) 178/2002: General principles and requirements of food law and regulation (EC) 853/2004: Specific hygiene rules for food of animal origin. However, there is no evidence, neither scientific nor from official authorities, that CCC might have a negative impact on food hygiene and / or safety.

One potential risk of CCC rearing, especially in foster cow rearing with more than one calf, is that it may increase teat wounds in cows (Zipp et al., 2024). This could potentially lead to udder infections or bleedings that could impurify the milk what would violate the prescription in Regulation (EC) 853/2004 (“milked animals should not have udder wounds likely to affect the milk”). However, foster cows are often not milked, in that case being of no risk for human food safety. To manage the risk of teat and/or udder wounds and for animal welfare reasons, the number of calves per foster cow should fit to the cow’s milk yield and close observation and regular inspection of foster cows’ teats should be performed (Zipp et al., 2024).

If calves join cows in the milking parlour, one potential risk for decreased milk quality might occur when calves try to suckle the cow after the teats have been cleaned before milking. It should be controlled for that the calves’ saliva does not contaminate the milk.

To conclude, scientific evidence and practical experience show that CCC milk is of no more risk than milk of cows without calf-contact, if milk hygiene rules are properly followed.

Nevertheless, food safety regulations may restrict CCC farms. Because labelling of CCC products is still limited across Europe, direct marketing is an opportunity for CCC farmers to place their “niche” products on the market, as the rearing system can be communicated to and valued by consumers and potential losses of saleable milk that are consumed by calves may be better compensated. Some countries limit the amount of raw milk that can be directly marketed, *e.g.* 70 l/week in Denmark and the impact of restrictions like these on CCC farms should be considered in policy-making processes.

5. Conclusion

Implementation and up-scaling of CCC systems are influenced by various legislative aspects across European and national regulations. This report highlights key regulations and differences among TDN partner countries that may impact CCC systems. Most relevant regulations are from the area of animal welfare and housing. Moreover, regulations on breeding, animal health and food hygiene and safety are included.

Group housing regulations differ, with the EU Directive mandating group housing after eight weeks of age. Whole-day CCC systems inherently fulfil the legal requirement of group-housing, but also part-time systems in general rely on group housing and offer contact between calves and adult cows besides their own mother, thus promoting a better social development that leads to higher social competences in CCC calves. Moreover, CCC systems generally fulfil or exceed the requirement of feeding calves at least twice a day and behavioural needs of calves are better satisfied when suckling a cow. These benefits account particularly strong for whole-day dam-cow contact systems.

In some TDN partner countries (*e.g.* Germany, Norway and Sweden), legislation specifies air quality parameters and thermal isolation for calf accommodations in specific cases, providing clear guidance for ensuring calf welfare also in CCC systems. Norwegian and Swedish legislation mandates summer pasture access for certain animals, although this only applies to (female) calves in Norway. While some farmers perceive this as beneficial, others express concerns about increased labour and animal welfare, making mandatory access to pasture a possible hindering factor for CCC. The presence of calf creeps, also mandated by Norwegian and Swedish legislation, supports calf welfare but may require barn (re-)constructions.

The Regulation on Organic production aligns organic farming practices more closely with CCC by prohibiting the use of milk replacer and weaning of calves before the age of 90 days, and requiring the preferential use of maternal milk for feeding calves, potentially reducing adoption barriers. Milk performance testing of CCC cows can be obtained in accordance with ICAR standards but corresponding guidelines need to be translated and made more public. There is mixed evidence on the impact of CCC on the animals' health, however CCC is neither a higher risk for spreading notifiable diseases nor for food hygiene and safety. Some food hygiene and safety regulations may restrict sale opportunities valuable for CCC farmers.

While some countries (Estonia, Denmark, Sweden; Norway) require very limited contact between cow and calf after calving, no requirement for prolonged CCC exists. Further, the minimum age of the calf before separation from the cow to define a CCC system has not yet been specified.

To conclude, certain legislative requirements are inherently met by CCC systems. To comply with other regulations, however, additional efforts, such as re-constructing barns, may be necessary. When formulating new or refining existing legislation on EU or national level in the areas covered by this report, CCC systems should be considered to avoid creating new barriers but instead promote implementation and upscaling of prolonged contact of cows and calves.

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