Biosecurity for Housed Broilers

Cleaner farms Better flocks

Keeping out disease and harmful bacteria

FOOD STANDARDS AGENCY

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Introduction

Human food poisoning associated with *Campylobacter* continues to be a problem in the United Kingdom, and poultry meat is recognised as a significant route by which the organism can enter kitchens and the human food chain. The FSA has, as part of its wider strategy to reduce the prevalence of food poisoning due to *Campylobacter*, initiated a campaign to improve biosecurity on the broiler farm as research indicated that many farms are not following best practice. The campaign promotes good biosecurity as a foundation for *Campylobacter* control.

Biosecurity – active measures that can be taken to reduce the likelihood that poultry flocks become infected with *Campylobacter* – plays an important role in minimising the risks to human health from contaminated poultry meat. Biosecurity is about far more than just controlling food poisoning organisms though, good biosecurity will also improve the performance of the flock. This booklet explains the benefits of biosecurity in general and the specific benefits for *Campylobacter*. This booklet covers intensive broiler flock production. Biosecurity of catching crews will be covered in a separate document.

Please note, this booklet is not intended to be a substitute for detailed operating procedures, which should be tailored to individual circumstances but rather is designed to highlight important areas and provide examples of best practice. For biosecurity to be properly implemented and adhered to, all employees must be trained so that they understand what is required and why.

Q: What is biosecurity and why is it more important now than ever before?

A: Biosecurity can be defined as the actions taken to both reduce the risk of infection entering the farm and to remove infection from the farm. It is important to recognise that biosecurity is about bird health and ultimately profits – it is not an end in itself – and *Campylobacter* is just one of many different organisms that biosecurity programmes are designed to exclude from poultry flocks.

Poor biosecurity can:

- allow notifiable diseases like Avian Influenza or Newcastle Disease to establish themselves, some of which can decimate your flock;
- result in disease outbreaks that require the flock to be slaughtered;
- allow disease outbreaks to pose a significant threat to your neighbours and the wider industry.

And this can lead to:

- increased disease risk,
- higher mortality,
- loss of uniformity,
- poor feed conversion ratios (FCRs) and
- an increase in condemnations at the processing plant.

Apart from diseases that affect the performance of the flock there are other pathogens such as some strains of *Salmonella* and *Campylobacter* that, while not having a significant effect on the birds, traced back to contaminated chicken products can cause severe food poisoning and sometimes death in humans.

Q: Does biosecurity work?

A: Yes, that is why companies spend large sums of money on biosecurity-related measures. High levels of biosecurity have helped to reduce dramatically the incidence of Gumboro disease and *Salmonella* in the UK flock to an all-time low.

Q: What does biosecurity cost?

A: Perhaps it is better to ask "what does disease cost?" One company estimated disease cost was 5% of total production costs – the cost of disease is almost always greater than the cost of prevention.

Q: *Campylobacter* does not affect the bird so why is it an important pathogen?

A: *Campylobacter* is less well known by the general public than *Salmonella*, but is responsible for more cases of food poisoning in the UK than any other organism. It is considered to be so important that the Food Standards Agency, which is committed to reducing the incidence of food poisoning in the UK, has targeted *Campylobacter* as the priority organism.

Campylobacter can be picked up from the family dog, contaminated water supplies and many other similar sources, but most cases of *Campylobacter*-associated food poisoning have been traced back to chicken products. This is reflected in the findings of a 2001 retail survey of UK-produced fresh chicken products that showed over 50% of products to be contaminated with *Campylobacter*.

Food poisoning caused by *Campylobacter* can be extremely unpleasant but most healthy people will recover. Less fortunate however may be the very young and elderly, or those already suffering from ill health, for which the consequences may be more serious.

Q: If cooking chicken products correctly kills *Campylobacter* why should we be concerned about levels of *Campylobacter* in chicken products?

A: Yes, cooking chicken thoroughly will kill *Campylobacter* but equally important is the risk of *Campylobacter* being picked up from the meat when it is being prepared for cooking. This so-called cross-contamination in the kitchen leads to *Campylobacter* being transferred to the person preparing the food, on to foods that may not be cooked and on to work surfaces and kitchen utensils – all potential sources of food poisoning. It does not stop here though: *Campylobacter* has been shown to survive for days in the kitchen, and long after the chicken has been eaten, *Campylobacter* may still present a threat to those that consume food prepared in it.

Q: Good biosecurity including vaccination programmes have resulted in a dramatic drop in the incidence of *Salmonella* on poultry meat so why do we need to do more?

A: Not all pathogens (disease-causing organisms) respond to biosecurity measures in the same way. For example some organisms are relatively tolerant to disinfectants, while others can survive for long periods of time in empty, apparently clean, poultry housing. Also not all pathogens can be combated by vaccination. *Campylobacter* is a particularly difficult organism to combat because it occurs naturally in the environment, albeit often in low numbers. It is tolerant to a relatively wide range of climatic conditions and, once in a suitable host, like poultry, it can multiply very rapidly. Compared with *Salmonella*, *Campylobacter* is a far more difficult an organism to combat but the evidence is that the rigorous application of biosecurity measures can and does prevent *Campylobacter* getting into the flock, although the epidemiology is poorly understood.

Management practices

Consider pathogens as intruders – you can prevent entry of these intruders at three different levels:

- the perimeter of the site,
- each building,
- and the area where the birds are housed.

The nearer the pathogens get to the birds the greater the risk of the flock being contaminated. This is why biosecurity measures are most effective when they are integrated across the site and are adhered to by everyone that comes on to the site – keep the problems at the farm entrance. Remember it only takes one careless action to jeopardise the health status of your flock.

Once Campylobacter *gets into a flock it multiplies very rapidly (in a few days the numbers can increase to* 10^{13} *– 10,000,000,000,000 –* Campylobacter *per flock of 20,000 birds) and these organisms are shed continuously for the remainder of the flock's life. Following the flock becoming positive,* Campylobacter *can be recovered from across the farm site, including fan vents, farm office and ante-room doors, the grass and gravel around the house etc.*

Farm workers

Employees can bring harmful organisms on to the unit on their body (hands, hair etc) and clothing.

- **Good personal hygiene is critically important in preventing employees (who may carry human pathogens, such as *Salmonella* and *Campylobacter*) from spreading disease to other workers and livestock – this aspect of biosecurity cannot be overemphasised.**
- **It is important that all employees are not only aware of biosecurity procedures but put them into practice.**

You should ensure that:

- No employee is allowed to keep, or have contact with, other poultry or any other avian species, in case they bring a poultry disease on to the site.
- Employees who are ill and suffering from diarrhoea or vomiting, for example, should stay away from the farm until medical advice has been sought and appropriate action agreed with the line manager.

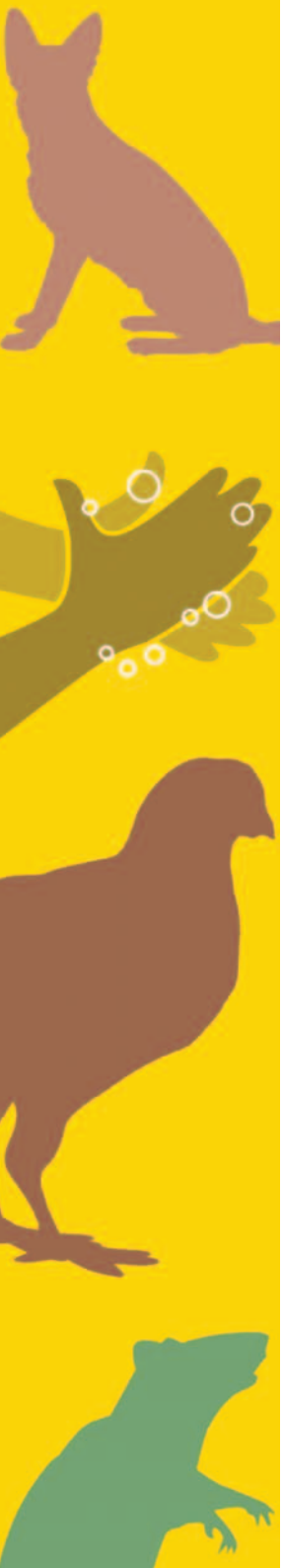
Visitors

The risk of Campylobacter *colonisation has been shown to increase as the number of persons visiting the flock increases.*

Every time a person comes on to the unit there is a chance that they will unknowingly bring harmful organisms with them. That chance is increased if they have come from another poultry unit.

The risk of contaminants being brought on to the site can be minimised by:

- only allowing essential visitors on to the site;
- requiring all visitors to record their visit in a site log-book that should include date, time of arrival, name and organisation. This allows you to track the movement of people in the event of a problem occurring.



- making sure that all visitors certify that they are not suffering with any enteric illness;
- asking all visitors to declare recent visits to poultry sites;
- not allowing visitors on the site if the health and welfare of the birds could be compromised.

Note: people who come onto the site as a result of an emergency (such as maintenance engineers) pose a particularly high risk as they may have come directly from another unit and often carry tools (which can be contaminated with pathogen carrying dust, litter etc) from site to site.

The biosecurity of the bird accommodation can only be maintained by setting and adhering to clear and effective procedures. It is likely to be the non-routine events, such as fan or power failure, relief personnel etc, that result in procedures being ignored. Toolboxes used by maintenance personnel for example are likely to travel from farm to farm and are very difficult to clean effectively. Providing a large sheet on which the toolbox should be placed and, if required, tools laid out, may limit the opportunity for cross-contamination from the toolbox and its contents to the environment in the control room or bird accommodation.

Clothing

Protective clothing helps to reduce the risk of pathogens being passed from the workers to the birds and from the birds to the workers and their home environment.

- All visitors should be provided with dedicated clothing (e.g. overalls, boots and masks) at the entrance to the farm (this is preferable to them using their own which may have been used previously or have become contaminated while in the visitor's vehicle).
- Protective clothing should be left on the farm for cleaning or disposal following the visit.

Campylobacter has been recovered from the boots of farm personnel and the shoes of catchers and some of these boot-contaminating strains have been shown to be the same type as those later colonising the birds and therefore may have been the source of flock infection.

Pets and livestock

It is not just other birds that present a threat to your poultry.

- On mixed farms the risk of disease being transmitted to poultry from other farmed livestock is high and particular attention needs to be given to this when considering on-farm biosecurity measures;
- No pets or livestock should be allowed beyond the poultry unit's perimeter fence.

Campylobacter *can be found in the intestines of most mammals and birds and in the majority of cases this does not cause any symptoms. The presence of other animals on the farm, such as dogs, cats, pigs, cattle and sheep, has been associated with an increased risk of flock infection and identical types have been found colonising the flocks that were first isolated from cattle in fields adjacent to the chicken houses.*

Footwear

The biosecurity measures associated with footwear are among the most important that you will use. Why is this? This is because the risk of harmful contaminants such as bacteria being brought into a poultry house on the soles of boots or other footwear is very high if no preventative measures are taken. For example, all it takes to move *Campylobacter* from the outside of the house to the bird area is for someone to walk through a contaminated puddle (of which there are likely to be many) outside of the house and not to dip or change their footwear before walking in among the birds – it is that easy.

There are a range of biosecurity measures primarily to do with footwear and while the measures differ, the aim that they all have in common is the prevention of harmful organisms being walked in among the birds. There are two potential strategies to cope with this:

- Not wearing footwear that has been worn outside the

bird area in with the birds i.e. dedicated footwear
- Disinfect footwear i.e. boot-dips

Covering up the footwear with a clean layer i.e. boot/shoe covers) has also been suggested, but in practice boot or shoe covers are prone to coming off or tearing and this may be more difficult to manage than the other measures.

There are therefore two recommended control measures - dedicated footwear and disinfection.

Dedicated footwear: Hygiene barriers

The most effective method available for controlling the transmission of pathogens on footwear is considered to be the use of dedicated footwear combined with a 'hygiene barrier'. This so-called barrier is a tangible reminder that dedicated footwear are not used anywhere except in the bird area. Footwear is changed to dedicated footwear when the barrier is crossed.

The hygiene barrier:

- can be a low physical barrier or an area marked out on the floor – the latter is preferable as it does not present a trip hazard.
- should be located immediately by the pedestrian door into the bird accommodation area (ie you must pass through it to go into the bird area).
- Dedicated footwear remain inside the hygiene barrier.
- needs to be kept clean and should be sanitised regularly.

Note: if dedicated footwear are used a boot-dip is still required at the entrance to the building and it is beneficial to have a boot-dip at the door into the bird area also.

In a cross-sectional survey, 53% of 88 randomly selected farms investigated had no, or an inadequate, hygiene barrier present and Campylobacter-positive flocks were significantly more prevalent on those farms. The use of hygiene barriers has been shown, under commercial conditions, to delay or prevent spread between flocks.

Disinfected footwear: Boot-dips

Of all the biosecurity measures routinely employed this is the one that is most often abused, often without realising it. The general principles that should be followed are:

- Boot-dips should be placed at all points being used to access the house/bird area. It is very difficult to sanitise the control room, office and storage areas so it is best practice that before entering the bird area the boots are dipped even if they have been dipped when entering the building.
- Remember to place dips, when required, at access points that are used infrequently (eg during thinning, setting-up the house post-cleaning, emergency maintenance).
- The container holding the disinfectant needs to be stable so as not to tip over when in use.
- The container should hold sufficient disinfectant to enable the foot-part of the footwear to be immersed.
- **Boots with deep cleats tend to hold litter and unless this compacted litter is removed from the cleats before dipping it is unlikely that disinfectants will penetrate through the litter to kill all of the organisms present – this point is important. Use a boot brush to knock out soles before leaving the house.**
- The disinfectant used should be approved by Defra for English and Welsh flocks, SEERAD for Scottish flocks and DARD for Northern Ireland flocks and suitable for boot-dips. See Appendix II for general points about foot dips.
- The amounts of disinfectant and water to be added to the container should be calculated carefully and measured into the boot-dip. (Standardising the dips on the farm makes this task easier.)
- The disinfectant should be checked and replaced before it becomes ineffective. There is no standard time after which the boot-dip should be emptied and replenished, although typically a minimum of two changes per week might be expected. As heavy usage, exposure to the weather and the type of disinfectant used are only three of the factors that can affect the effective life of a boot-dip the use of 'check-sticks' or similar procedures will give an objective assessment of when the dip needs changing.




• A simple cover and hinge mechanism could be used to prevent the dilution of boot-dips by rainwater.

Note: irrespective of whether hygiene barriers, boot-dips or a combination of the two are chosen as the biosecurity measure to be used at the entrance to the bird accommodation area, these measures will only be effective if:

- **They are used correctly (e.g. a hygiene barrier will only work if boots are changed every time);**
- **They are actively managed (e.g. boot-dips are regularly replenished; if dedicated footwear is to be used in the bird area then it could be of a different colour)**

Campylobacter *is susceptible to disinfectants at the recommended levels and the use of boot-dips is associated with a lower risk of a flock becoming* Campylobacter-*positive*.

- *The training of farm staff in boot-dip use is critical.*
- *The use of double dips, one at the entrance to the house and a second at the entrance to the live bird area, has been shown to be more effective than single dips.*

Hand-washing/sanitising

Hands can become heavily contaminated with bacteria during visits to poultry houses and bacteria, including *Campylobacter*, can be transmitted around a farm via hands.

To minimise the risk of transmission from hands:

- Hand-washing facilities (warm water, soap, and disposable towels/hot-air hand drier) must be available on site.
- Hand sanitisers should be available for personnel entering and leaving the bird area.
- Hands must be washed after handling dead birds and visiting the toilet.

Note: the use of a sanitiser on hands that are obviously dirty is likely to be only partially effective and facilities should be available so hands can be washed before applying sanitiser if required. Forearms, if exposed, should be sanitised at the same time as the hands. As well as being an element of sound biosecurity hand-washing/sanitising is an important measure in the prevention of transmission of disease to personnel from the environment or birds.

Campylobacter *has been recovered from the farm office and ante-room door handles as well as from hand-washing equipment. Use of a hand sanitiser after visiting houses will reduce the bacterial load while failure to hand-wash routinely increases the risk of* Campylobacter *colonisation in a flock*.

Vehicles

Non-essential vehicles should not be allowed on the site and should be parked at the edge of the site. Vehicles that must go on the site, such as feed lorries, should have their wheels and wheel arches disinfected before entering, and if feasible, on leaving the site.

Campylobacter *has been isolated from a variety of vehicles on the farm, including chick lorry steps and wheels, forklift trucks, live-bird transport lorry cabs and steps and van wheels. In some cases these types have subsequently been isolated from the flocks on the farm. Clearly cleaning and disinfection of such vehicles is inherently important, especially when lorries are coming from heavily contaminated locations such as poultry abattoirs.*

Pests/vermin/wild birds

Pests and vermin (including rodents, flies, and wild birds) have been shown to carry a range of organisms including *Salmonella*, *Campylobacter* and avian influenza. Pests and vermin should be controlled using an approved pest-control company or trained personnel. Pesticides must be inaccessible to wild birds and bait boxes should be secure. Buildings should be made secure against wild birds. Feed spillages should be removed immediately or they will attract vermin and wild birds. Carcasses should be covered during storage to avoid attracting flies and scavengers as these can disseminate contaminated material and thus increase the risk of *Campylobacter* infection.




Campylobacter *has been recovered from the faeces of wild rodents, including rats, mice and bank voles, wild birds and insects. In the case of wild bird faeces, identical types of* Campylobacter*, isolated from around the chicken house, have been subsequently isolated from the flock.* Campylobacter *has been cultured from over 70% of flies and there is evidence that flies may contaminate the flock. Most pests (eg rats, some litter beetles) can spread* Campylobacter *from one flock to another, if they move between houses.*

Area around the poultry building

Hard surfaces around and between poultry buildings such as asphalt and concrete are easier than compacted soil or grass to keep clean and clear of the rubbish and detritus that can encourage vermin and micro-organisms. All vegetation should be cut back and maintained in a well-trimmed condition; while trees and shrubs shield poultry farms they also encourage wild birds that can be carrying pathogens.

Good run-offs and drainage for surface water is important as standing water, such as puddles, can provide a refuge and reservoir for organisms such as *Campylobacter*.

Campylobacter *are routinely recovered from puddles on poultry farms and these types have subsequently colonised the flock in the house.*

Dead and cull birds

Dead birds, whether they have died from disease or have been culled, are a disease risk.

Minimise the risk by:

- removing dead birds from the site or incinerating them at the earliest opportunity
- storing birds awaiting disposal in sealed containers away from the bird housing and transport to the farm gate for collection
- if birds are to be incinerated on site, ensuring complete incineration.

Containers used to store dead birds must be constructed in such a way that:

- they prevent the entry of vermin and fluids;
- do not leak or drain into the environment and
- are capable of being cleaned and disinfected on a regular basis (the greater the usage the more frequent the cleaning) and between flocks irrespective of the level of use.

Clean-out

Clean-out provides an opportunity, if done well, to eradicate or reduce the number of bacteria in the bird accommodation and consequently to break the cycle of infection. Key points include:

- The bird accommodation should first be dry-cleaned to remove organic material, washed and then disinfected.
- When removing used litter from the building be careful to avoid material being blown around the site – potentially harmful bacteria and viruses can be readily spread by careless removal of the litter. Remember some organisms may survive for long periods (> 6 months) in the environment.
- Spent litter should not be stored on the farm as it can harbour and encourage pathogens.
- Equipment should not be stored without first being cleaned.
- A hygiene specialist should be asked to check the efficacy of the clean-out process.

Providing a defined break between disinfection and restocking allows thorough cleaning to be undertaken, enables disinfectant contact times to be observed thus maximising their efficacy, and increases the likelihood of organisms being killed or inactivated. See Appendix I for checking the efficacy of the clean-out process.

Note: it should be the intention to provide a period of at least 5 days between the completion of disinfection and restocking. (A period of ~14 days between last birds off and first birds back on the farm is generally recommended for farm clean-out although it is recognised that this if often not feasible on a commercial farm.) While the time allocated is very important, what is done during the time is critical. It is also essential that this time is utilised

properly to remove pathogens from the farm as quickly as possible.

Areas occupied by Campylobacter*-colonised chickens become heavily contaminated with* Campylobacter *in the litter, water lines and drinkers/cups, on the walls, uprights and vents, in the dust and the atmosphere. Although cleaning regimes and schedules vary between companies the available evidence indicates that current regimes usually eliminate* Campylobacter *or reduce it to levels that cannot be detected.*

The down time between flocks also appears to be important, with a down period of less than 14 days being identified as a significant risk factor for Campylobacter *infection of chickens.* Campylobacter *can survive for long periods of time in cool, damp conditions so cleaning regimes should ensure that houses are dry before placement of the next flock.*

Remember, for biosecurity to be properly implemented and adhered to, all employees must be trained so that they understand what is required and why.

Appendix I

Checking the efficacy of the clean-out process

To confirm the efficacy of the cleaning cycle samples/swabs should be taken for microbial assessment each time the building is cleaned. When taking swabs or samples for the purposes of assessing the efficacy of the cleaning process you or your manager should ensure that:

- appropriate samples are taken;
- the samples are handled correctly and
- the results of the tests are provided in such a way that they are useful and meaningful.

Points to consider include the following:

- Samples should be taken from areas of the house that are difficult to clean (eg ducting, corners, tops of exposed surfaces) – the aim of testing must be to find the organism if it is present.
- The correct number of (labelled) samples, sampled according to a predetermined sampling plan should be taken.
- The correct amount of material/surface area should be sampled. For example what surface area should you be swabbing with your swab – 1cm^2, 2cm^2 or 10cm^2?
- Appropriate swabs and tests should be conducted. The most critical areas are the surfaces that are likely to infect the bird like air inlets, drinkers, feeders and floor areas.
- Samples/swabs should be handled correctly and dispatched to an approved laboratory for analysis as quickly as is feasible. Exposing the sample to extremes or fluctuating temperatures can significantly affect the number of organisms that are recovered from the sample (chill temperatures would normally be used for holding samples etc). Similarly the more time that elapses between the sample being taken and analysed the greater the likelihood of the more sensitive organisms, such as *Campylobacter*, dying and therefore not being detected.
- A decision needs to be made as to how the results are used. For example total viable counts can be

used as a ready guide to cleaning and disinfection efficiency.

• The results need to be acted upon so each submission should result in an action report back to the farm. If the house is found to be positive after cleaning for say, *Campylobacter*, the cleaning process should be reviewed to ensure the protocol is effective and that it is being carried out properly as *Campylobacter* does not usually survive cleaning and disinfectant.

• While results for a single time period provide valuable information it is important to look for trends over time in the results.

To summarise – assessing the efficacy of the clean-out process requires taking samples for microbiological assessment. The reliability of the testing relies upon advice having been sought on issues ranging from the type of test, to the number of tests, to the timing of tests, to targets. Critical to the process is the taking of the samples – for this to be done reliably employees should be trained and 'involved in the process'.

Appendix II

General points about the use of disinfectants

Disinfectants do not kill all organisms all the time.
You need to be aware that:

• Disinfectants need to be in contact with the microbe for a minimum period of time before they have a permanent effect. As an indication of activation, surfaces should be in contact with disinfectants for ~30 minutes to be totally effective. More rapid acting disinfectants are more prone to inactivation by organic matter. The phenolic class of disinfectants are the most stable and least inactivated by organic matter and are therefore probably the most appropriate for use in boot-dips on broiler farms.

• In general the time required for death to occur is closely related to the concentration of the disinfectant, so the weaker the disinfectant the longer the contact time required.

• This is why it is important when cleaning buildings to allow the disinfectant to remain on the surface being treated for at least the minimum time recommended before washing it away.

• Boots should be cleaned with a brush before disinfection. Because disinfectants tend to work by binding fairly indiscriminately to organic material, some disinfectants can be quickly neutralised if, for example, litter is not knocked off the boots prior to dipping when leaving the bird area. Similarly bacteria will be protected from disinfectants when the building is cleaned unless the litter, dust etc are removed prior to disinfection taking place.

• Because not all disinfectants operate in the same way and because manufacturers can change the specification of their disinfectants it is important that the manufacturers' instructions and guidelines are checked and adhered to. It is recommended that any disinfectant product should be used at a dilution rate that covers both the diseases of the Poultry Order and the General Orders for disinfectants as a minimum.

• Inappropriate use may reduce the efficacy of the disinfectant and can be hazardous to the health of company employees and the livestock.

• Complete records, providing traceability, should be kept of disinfectant usage.

• Used disinfectants should be disposed of in accordance with manufacturers' instructions.

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