Rapid immunodetection of campylobacter at farms and processing plants

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It is estimated that one in three people in industrialised countries may be affected by foodborne illnesses per year. According to the European Food Safety Authority (EFSA), campylobacteriosis, caused by the pathogen campylobacter, is the most frequently reported cause of food-related illness in the European Union with an estimated nine million cases each year.

To protect consumers from this public health threat, regulations and policies are being implemented to shift the focus from contamination response to prevention.

The EU has adopted an integrated approach to food safety from the 'farm to the fork'. The approach consists of both risk assessment and risk management measures.

Similarly, the US has seen a sweeping reform of its food safety laws with the Food Safety Modernisation Act of 2011. The act represents a paradigm shift to prevention by establishing a modern system of food safety protection based not on reacting to problems but rather on preventing them from happening in the first place.

Campylobacter can be introduced to poultry flocks in a number of ways. Contaminated feed, insects or bacteria from human interaction can introduce the pathogen, causing the campylobacter status of an entire flock to change from negative to positive within a few days.

To identify risk of contamination, it is critical to screen live chickens for campylobacter; this enables segregation of contaminated flocks at the farm, ahead of slaughter. While testing methods do exist, standard microbiological testing and real-time PCR require samples to be analysed in a laboratory setting by trained personnel, not directly on the farm, and can take up to four days to obtain results.

Since the campylobacter status of an entire flock can change so quickly, such results may be of limited predictive value. For the most up-to-date information, testing for campylobacter in chicken should be done as close as possible to slaughter.

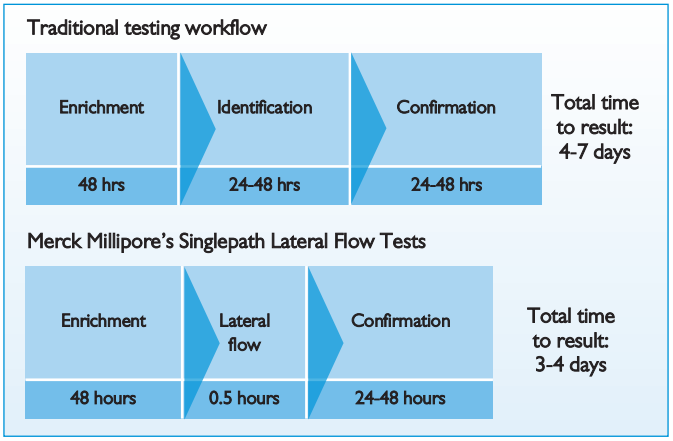

Fig. 1. Comparison of traditional and Singlepath workflows.

During the slaughter, plucking and evisceration can lead to contamination of carcases; if a campylobacter-positive flock is slaughtered, it is likely that a large number of carcases will become contaminated.

A number of measures can be taken to protect consumers from campylobacteriosis and include scheduled slaughter, logistic slaughter or after-slaughter treatment such as disinfection with chlorinated water, which is used in the US, or steam treatment.

Rapid identification

Since campylobacter can spread to an entire flock in a matter of days, testing with a rapid turnaround time is essential. Unfortunately, current campylobacter detection methods have significant shortcomings that contribute to longer testing timeframes.

Currently, the most commonly used techniques to test food products for campylobacter are traditional methods based on culture media. The standard detection method involves enrichment for 48 hours, followed by isolation on selective agars, so that final identification results are available only after four to five days. Both culture steps have to be carried out in a microaerophilic environment. These methods are time consuming as well as labour intensive.

While real-time PCR is more rapid (about one hour) it requires capital-intensive instrumentation (for example a thermocycler) and trained personnel. The transport of samples to the laboratory can increase the risk of false negatives if transportation conditions are inadequate for campylobacter survival.

Singlepath lateral flow tests (Merck Millipore, Darmstadt, Germany) for the detection of campylobacter allow the poultry industry to identify the presence of contamination much faster, enabling a more effective and timely response.

Tests are optimised for use both on the farm and at the processing facility, from on-site pre-screening to release testing. The tests deliver reliable results without the need for expensive instrumentation or trained staff. Results are clearly displayed in a yes/no format within 20 minutes after sample application.

On-site pre-screening

The Singlepath Direct Campy Poultry Kit for rapid point-of-use immunological screening of campylobacter requires no prior enrichment step and delivers results within two hours.

By elimination of the extended enrichment step, the speed of the test enables screening immediately prior to slaughter. This allows financially relevant logistical decisions, such as the separation of campylobacter high-risk and low-risk flocks for slaughter, to be made on the basis of up-to-date information.

The easy-to-use 'mini-laboratory' contains the test device, tubes, a pipette, sample buffer and sample diluent and includes a built-in control reaction for increased result reliability.

Release testing

The Singlepath campylobacter kit is AOAC Research Institute approved and delivers clear yes/no results in just 20 minutes after sample application.

The majority of Campylobacter spp. have low biochemical activity, therefore identification is difficult on phenotypic characteristics.

The standard detection method is enrichment for 48 hours in a microaerophilic environment, followed by isolation on selective agars for 48 hours in a microaerophilic environment. Results are therefore only available after four days.

The Singlepath campylobacter kit, however, greatly reduces the time-to-result. Following 48-hour enrichment, a result is obtained on the heat-killed sample within 20 minutes (Fig. 1).

Simple-to-use Singlepath lateral flow tests for campylobacter detection deliver results in just a few hours and can be used on the farm or at processing plants to help protect product integrity and reduce risk to consumers.

These rapid methods are enabling the poultry industry to shift from contamination response to earlier detection and deliver on the promise of 'farm to fork' protection as envisioned by regulatory authorities. ■

References are available from the author on request
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