

Fast serotyping supports *Salmonella* reduction

Food safety is the prime concern throughout the food supply chain. Despite the fact that food safety has undoubtedly improved considerably over the last decade, consumer confidence lags behind. Meanwhile, governmental regulations are being tightened in order to provide a greater degree of safety assurance. A new fast serotyping test may support control programmes better.

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Salmonella in products of animal origin has been a focus of food safety for many years. This contamination can cause intestinal discomfort, fever and in extreme cases it may cause death (e.g. in the weak and elderly people). Each year millions of people contract Salmonellosis, with an estimated economic impact in billions of dollars.

Many *Salmonella* reduction programmes exist, but a workable solution is elusive, mostly because of insufficient analytical accuracy, be it the sampling procedures, the choice of the selective media and/or inadequate follow-up in cleaning and disinfection and other management measurements.

On the analytical side, a noticeable flaw in many programmes is the inability to trace the contamination to its origin. To accurately trace *Salmonella* contamination back to its origins, serotyping of the isolates is essential. This part of the analytical work requires specialised skills to perform and is often given to specialised laboratories where the feedback of the results is very slow or serotyping is altogether left out of the programme.

Now, finally, for these *Salmonella* reduction programmes and, indeed, for a rapid decrease of the *Salmonella* contamination in the food chain, there is a light at the end of the tunnel.

Salmonella breakthrough

DSM recently introduced a new test for *Salmonella* serotyping, the Premi@Test *Salmonella*. This test is particularly important in reducing *Salmonella*-contamination, because it enables an exact tab (its serotype) to be put on the bacteria. Through this serotyping, the source of the problem can be traced back to the vulnerable shackle of the chain, be it the hatchery, the breeder flock, the feed mill, the grow-out farm or the processing

plant, or where ever the problem arose.

The test identifies the DNA-differences between the *Salmonella* serotypes, with a set of specific markers on a bio-chip and routine PCR technology that matches the results of classical serotyping extremely well.

Tracing the problem

To illustrate the importance of the serotyping, it is important to understand the contamination processes in the total production chain. Taking poultry production as an example there are, in addition to processing, two basic transmission routes for *Salmonella*: vertical and horizontal. For poultry, which worldwide has traditionally been considered as the biggest source of *Salmonella* poisoning, vertical transmission is from the grandparent stock through the parent hatchery, rearing breeders, breeders and broiler hatchery, to the processors, retailers and kitchens. Horizontal transmission, which is more complex and sometimes more difficult to trace, can take place via the feed, equipment or environment at any of the stages mentioned for vertical transmission.

Monitoring and prevention involves; sampling at all stages of the production chain, like chicken houses, hatcheries, feed and feed mills, tracing the source of contamination and cleaning and disinfecting chicken houses, slaughterhouses and equipment, environment and staff. Measures to trace the source of contamination along the vertical route involve sampling procedures such as protective overshoes, feed dust, pallet coolers, hatchery down, chicken-box liners, transportation boxes, box washers, chicken faeces, caeca and skin, as well as (breast) meat.

Successful reduction programmes

While monitoring programmes are in place in several countries throughout



Bio-chip of Premi@Test *Salmonella*.

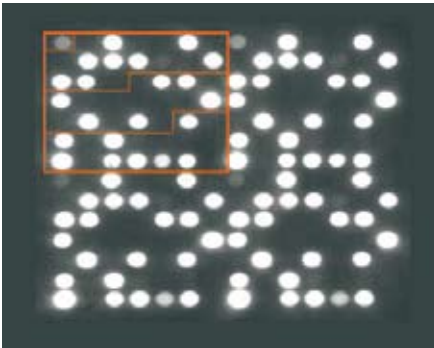
Europe and around the world, they alone are not enough. To be successful a *Salmonella* reduction programme needs to trace the contaminating source through serotyping to its origin and implement reduction measures at the source of the contamination.

For example, in addition to strict monitoring, preventative measures to eliminate or reduce problems in the flock can take place: cleaning and disinfection regimes, vaccination (up to now only possible for two serotypes, *S. enteritidis* and *S. typhimurium*), probiotic- and antibiotic treatments, and acidified or palletised feeds. Another important aspect in parent and breeder flocks is to avoid contamination of separate lots from other breeder houses on the same farm. A special regime involving meticulous segregation (separation or canalisation) has been introduced targeting avoidance of cross-contamination. Similar strict monitoring measures were introduced in grow-out houses and on farms, while processing plants were subjected to strict canalisation and cleaning regimes.

A similar monitoring regime can be carried out at breeders and hatcheries through the sampling of each new hatch. In grow-out houses, protective overshoes are sampled 10 days before stock is slaughtered. Finally, in the processing phase, 30 caecal, feather, skin and meat samples are taken at every house. In the Netherlands, over a sustained period of several years (1997–2006) this intensive monitoring programme, and the subsequent management of anti-*Salmonella* actions, in which serotyping has played a key role, has resulted in less than 1% occurrence of both the *Salmonella* enteritidis and typhimurium bacteria, and a fall in overall contamination from 35% to 6%.

Serotyping, key of success

To meet the challenges presented by *Salmonella* contamination and to meet the tighter governmental regulations,



Typical pattern of DNA-markers.

DSM Nutritional Products and its partner Check-Points developed a *Salmonella* serotyping method that enables the source of contamination in the supply chain to be indicated faster and with greater precision. This routine test is extremely fast and can be carried out in the lab of food processors, enabling appropriate action to be taken to prevent further contamination. Called Premi@Test *Salmonella*, it goes beyond the primary-screening stage and identifies a large number of serotypes in a single test.

As mentioned earlier, monitoring for *Salmonella* and serotyping the positive samples must be an integral part to manage this aspect of food safety of products of animal origin. There are over 2,000 *Salmonella* subtypes or serotypes. Different *Salmonella* contaminations are often caused by different serotypes. Classical serological methods require well trained and experienced staff and full serotype-identification can take 2-3 weeks or more. However, routine serotype-identification is important for two main reasons: first, recent EU and national requirements demand more detailed serotype-identification when positive *Salmonella* contamination is found. Second, routine serotype-identification enables each specific cause of *Salmonella* contamination in the food chain to be pinpointed, thus reducing *Salmonella* contamination by taking specific appropriate sanitary measures in the specific part of the production chain, like broiler house, feed mill or hatchery. As has been demonstrated in the Netherlands, excellent results have been achieved with this approach. ■

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