Federal Office of Consumer Protection and Food Safety

BfR

Zoonoses Monitoring 2018

Summary of Findings and Conclusions

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***Salmonella* spp.**

The contamination rate of porcine carcasses with *Salmonella* spp. in the 2018 Zoonosis Monitoring was 5.1%. This meant in tendency that pig carcasses were more frequently contaminated with Salmonella than in the 2017 Zoonosis Monitoring programme, where 2.9% of the carcass samples were found Salmonella positive. The same holds for samples of porcine minced meat, 1.3% of which were found contaminated with Salmonella. In the previous year, the Salmonella detection rate found in porcine minced meat was 0.7%. The Salmonella serovars identified on carcasses and in minced meat were the same. Some slaughterhouses had particularly frequent Salmonella findings. This shows how important it is to keep good slaughter hygiene in order to prevent cross contamination of carcasses with germs.

Examinations into the food chains related to broilers and fattening turkeys show that a declining trend in the Salmonella detection rate in carcasses and fresh meat, which was observed over years until 2014, has not continued. In the 2018 Zoonosis Monitoring, 7.6% of neck skin samples of broiler carcasses and 5.6% of broiler fresh meat samples were contaminated with Salmonella, and thus slightly more than in the 2016 monitoring programme (6.7% and 4.7% positives, respectively, of corresponding samples,). Salmonella findings in turkey carcass neck skin samples even amounted to 22.7%, which is nearly double the rate detected in the 2016 Zoonosis Monitoring (then 11.9% positive samples). Turkey fresh meat from conventional production had 4.0% positive samples, and thus also a slightly higher contamination rate than found in the previous examinations of turkey fresh meat in 2016 (then, 2.6% positive samples). Fresh turkey meat from ecological production had a contamination rate of 2.9%.

In caecal content of fattening turkeys and broilers, in contrast, there were slightly fewer Salmonella findings than in the 2016 Zoonosis Monitoring, with 0.2% and 1.9% Salmonella-positive samples in 2018, compared to 1.0% and 2.3%, respectively, in 2016. The high rate of contamination of carcases – despite the low Salmonella detection rate the in caecal content of slaughtered animals, in particular in turkeys – indicates a considerable degree of cross-contamination with germs in the poultry slaughter process. The findings make clear that it definitely takes both measures at farm level and improvements in hygienic practices in the slaughter of broilers and fattening turkeys in order to prevent contamination of meat with Salmonella. The remarkable differences among slaughter establishments as regards the rates of Salmonella-contaminated carcasses, both broilers and turkeys, were again striking. Frequent detection of certain Salmonella serovars in turkey neck skin samples indicates cross-contamination of carcasses with slaughterhouse-specific Salmonella strains, all the

more as Salmonella was rarely found in caecal content of turkeys. The obvious variance in occurrence of positive samples should be reason to remind slaughter establishments of strict adherence to process hygiene criteria according to Regulation (EC) No. 2073/2005 for Salmonella in poultry carcasses. If the criteria are not met, appropriated measures should be taken.

With 0.2% positive samples, raw sausages from chicken and/or turkey meat are a potential source of human infection with *Salmonella* spp. Raw sausages from porcine meat examined in the 2017 Zoonoses Monitoring programme had no Salmonella findings, in contrast.

Untreated sesame seed sampled at retail level did not produce any Salmonella findings. It cannot be excluded, however, that identification of Salmonella-positive seed lots may have failed because of very low germ counts and/or uneven distribution of the bacteria in the matrix. Larger amounts of samples may be necessary in order to reliably detect Salmonella in sesame seeds. This is backed by the fact that sesame seeds were repeatedly identified as the cause of food-borne outbreaks of salmonellosis in humans.

Depending on the origin of isolates, the resistance situation in Salmonella was extremely heterogenic – a phenomenon also noted in the years before. In total, only 35.0% of the Salmonella isolates were sensitive to all antimicrobials tested, with isolates from the fattening pigs food chain being more sensitive (52.0%) than isolates from the broilers food chain (28.6%) and fattening turkeys food chain (35.9%). While all tested Salmonella isolates from broiler meat were found resistant to at least one of the antimicrobial substances tested, only 50% of the Salmonella isolates from broiler carcasses displayed a resistance. This is related with the fact that *S*. Agona, which is characterised by very low resistance rates, made up a large portion of isolates from broiler carcasses in 2018, while serovars from broiler meat samples were often S. Infantis, which is characterised by high resistance rates and is also often detected in diseased humans. A finding rated as very positive is that none of the Salmonella isolates tested were resistant against the tried 3rd-generation cephalosporines or against carbapenemens. On the other hand, they were frequently resistant (47.7%) against the fluorchinolone ciprofloxacin, which has outstanding importance in the antibiotic treatment of humans. Here, too, isolates obtained from the broiler chickens and fattening turkey food chains were notably more often resistant than those obtained from the fattening pigs food chain (the respective percentages being 62.3% resistant isolates in the broilers food chain, 47.9% in the turkey food chain, versus 4.0% in the fattening pigs food chain).

***Campylobacter* spp.**

Detection rates of Campylobacter spp. in the food chains related to broilers and fattening turkeys have remained unchanged, at a high level. With 41.6% positive samples of caecal content, broiler chickens turned out to carry *Campylobycter* spp. about as often as in the 2016 Zoonoses Monitoring (then, 43.5% positive samples). Using the quantitative method, Campylobacter was detected in 46.3% of the neck skin samples. The portion of neck skin samples with a high Campylobacter count of more than 1000 cfu/g was, in 2018, still about as high as in the years before (2013: 19.4%; 2016: 24.1%; 2017: 22.7%), in spite of the introduction of a process hygiene criterion for Campylobacter on broiler carcasses in 2018. Continual testing in the framework of the Zoonoses Monitoring will show in how far the limit value introduced as a process hygiene criterion will contribute to improving this situation. The detection rate of *Campylobacter* spp. in samples of fresh broiler meat was 47.8%, and thus in the same range as in the years before (2014: 54.0 % positive samples, 2016: 47.2 % positive samples, 2017: 51.8 %).

Fattening turkeys were again still more frequently colonised with Campylobacter than broilers, with 64.3% positive caecal content samples. Still, compared to the last investigation into Campylobacter in caecal content, the detection rate has significantly decreased (75.5% positive samples in 2016). Fresh turkey meat from conventional farming had, with 19.4% positive samples, a lower contamination rate than broiler meat. This, too, was in line with earlier programme findings. It was striking that turkey meat from ecological farming had a significantly higher percentage of positive samples (32.7%) than conventionally produced turkey meat. At the time being, there is no explanation of that higher prevalence of Campylobacter in ecologically produced turkey meat compared to conventionally produced turkey meat. This needs more examinations along the food chains related to turkey meat of both kinds of production.

The portion of Campylobacter-positive samples in spreadable raw sausages of chicken or turkey meat was 0.5%. This makes raw sausages of poultry meat a potential vehicle of transmission of Campylobacter to humans.

Findings make clear that it is necessary to further intensify efforts to reduce the prevalence of Campylobacter in the poultry meat chain. To contribute to this end is the intention of the process hygiene criterion of 1000 cfu/g, which was introduced for Campylobacter on broiler carcasses in January 2018. If this limit is not complied with, the slaughter establishment must take appropriate measures to safeguard process hygiene. Continual examinations in the framework of the Zoonoses Monitoring will allow evaluating the effect of this limit value. As slaughter establishments obviously succeed to different degrees in limiting cross-contamination with Campylobacter, minimisation strategies should in future place a focus on

comparing the slaughter establishments, in order to identify the successful strategies suitable to reduce bacterial counts on carcasses.

At the same time, findings underline the need for consistent information of consumers regarding the risks associated to fresh poultry meat, because Campylobacter will remain a relatively frequent finding in raw chicken and turkey meat, even if the situation improves considerably.

As in the years before, *Campylobacter coli* isolates all displayed higher rates of resistance than *Campylobacter jejuni* isolates. Both Campylobacter species in the food chains related to broilers and turkeys displayed the highest resistance rates towards the (fluoro)chinolones ciprofloxacin and nalidixic acid. These rates were 87.1% in *C. coli* and 74.1% in *C. jejuni*, and largely corresponded to those found in the 2016 monitoring programme. It was noted that Campylobacter isolates from ecologically produced meat had overall lower resistance rates than isolates from conventionally produced meat.

Campylobacter isolates' resistance towards the substance erythromycin is low overall, which is good. It is at the same low level as in 2016, and thus also noticeably lower than in 2014. This is important because erythromycin is an antibiotic which is vital in the treatment of campylobacteriosis in humans. Possibly, the decline in resistance towards erythromycin may be connected with a declining use of macrolides in broiler chickens and fattening turkeys, compared to 2014.

Listeria monocytogenes

Fresh chicken meat was frequently contaminated with *Listeria monocytogenes*, with a portion of 15.4% positive samples. Here one has to consider that fresh chicken meat is not a ready-to-eat food, but is usually treated with heat before it is consumed.

Testing in slaughter establishments in the framework of the 2013 Zoonoses Monitoring showed that broiler chickens do not actually seem to be a significant reservoir of *L. monocytogenes*, as it was not found in any sample of caecal content. This indicates that meat is contaminated in the course of the production process. Deficient process hygiene in an establishment might be a cause of the problem. This problem requires more investigations along the broiler-related food chain. Investigations should also be extended to turkey meat.

Using a qualitative method, *L. monocytogenes* was detected in 3.4% of samples of spreadable or sliceable raw sausages from chicken or turkey meat. Actual bacterial counts were low, however, as there were no Listeria findings with the quantitative method, which

has a detection limit of 10 cfu/g. In contrast to this, the Zoonoses Monitoring of the year before produced single findings of *L. monocytogenes* in spreadable raw sausages of pork at bacterial levels posing a potential health risk to humans (220 cfu/g and 550 cfu/g).

There were no findings of *Listeria monocytogenes* in samples of vegetarian sliced sausage. Based on this, vegetarian sausage is not judged a potential source of human infection with *L. monocytogenes*.

Shigatoxin-/Verotoxin-forming *Escherichia coli* (STEC)

STEC was not detected in any of the samples of untreated sesame seeds tested. So that does not provide a basis for concluding that untreated sesame seeds would play a role as a potential source of human infection with STEC. Like with the detection of Salmonella, however, it may be possible that a larger sampling volume are required in order to safely detect this pathogen.

Methicillin-resistant *Staphylococcus aureus* (MRSA)

With 16.4% positive samples in 2018, fresh broiler meat was found contaminated with MRSA to a bit higher degree than in 2016 Zoonoses Monitoring (13% positive samples). Still, the level is clearly lower than found in earlier programmes (2009: 23.7%, 2011: 27.7%, and 2013: 24.2% positive samples). We do not know the cause of this decline in MRSA detection rates in fresh broiler meat. Future investigations in the framework of the Zoonoses Monitoring will show whether this will develop into a trend.

The results of examination of samples taken from conventional turkey fattening farms and conventionally produced turkey meat for presence of MRSA correspond to findings of previous years' programmes and confirm a high prevalence of MRSA both in turkey flocks (17.2% positive dust samples) and in fresh turkey meat (42.7% positive samples). It was conspicuous that there were clearly fewer MRSA findings in ecological turkey farms (2.7% positive dust samples) and ecologically produced turkey meat (11% positive samples), than in in the conventional farms and meat.

Transmission of MRSA to humans through consumption of food seems to play a rather minor role. Consumers should still handle foodstuffs with the necessary care, also with regard to other zoonotic agents.

The isolates sent in for examination were all resistant to beta-lactam antibiotics, as it was expected. Apart from that, nearly all isolates were resistant towards tetracycline, which is

typical for MRSA strains associated with farm animals. MRSA isolated from ecologically produced turkey meat displayed lower rates of resistance towards the majority of tested substances than MRSA isolated from conventionally produced turkey meat. The difference was particular wide with regard to ciprofloxacin, which is important in human medicine, with 28.4% versus 65.2%. A good thing was that only few of the MRSA isolates from turkey meat were resistant towards the antibiotics linezolide, rifampin, and mupirocin, which are particularly important in the treatment of MRSA in humans.

Yersinia enterocolitica

Yersinia enterocolitica was detected in 2.4% of minced pork samples. It is to be assumed that the findings include a few apathogenic strains. The results of examination confirm older findings and underline that minced pork is a potential source of human infection with pathogenic *Y. enterocolitica*. Susceptible consumer groups such as small children, elderly and immune-deficient people or pregnant women should therefore refrain from consuming raw minced pork.

Clostridioides difficile

Minced pork is also a potential vehicle of transmission of *C. difficile* to humans, with 0.7% samples found positive with the bacterium. This was already demonstrated in the 2017 Zoonoses Monitoring, when C. difficile was detected in 1.4% of the minced pork samples.

The two *C. difficile* isolates originating from minced pork were ribotypes 078 and 126, and toxinogenic. Ribotype 078 was also detected in the 2017 programme and occurs frequently in porcines, so that fattening pigs can be conceived as the actual source of contamination. The importance of *C. difficile* strains stemming from pigs as causal agent of disease in humans is currently subject of diverse research activities.

Commensal *Escherichia coli*

Resistance rates found in *E. coli* isolates from conventional broiler and fattening turkey farming in the 2018 Zoonoses Monitoring were largely at the same level as in previous monitoring programmes, with rates even increasing as regards resistance to certain single substances. It was striking that *E. coli* isolates originating from ecological turkey farms and ecologically produced turkey meat displayed overall lower resistance (48.2%) than isolates from conventional productions (77.3%). The isolates from ecological production also had lower rates of multiple resistance against three or more substance classes than isolates from conventional production-type turkey farms and turkey meat (17.7% vs. 42.9%). *E. coli*

isolates from the boiler-related food chain were more often resistant to ciprofloxacin (51.6% resistant isolates) and nalidixic acid (46.3% resistant isolates) than *E. coli* isolates stemming from conventional turkey production (36.4% and 23.2% resistant isolates, respectively).

ESBL/AmpC-forming *Escherichia coli*

ESBL/AmpC-forming *Escherichia coli* were detected by selective methods in about half of the faecal samples from conventional turkey fattening farms (51.8% positive samples) and about half of the samples of caecal content taken from fattened turkeys in the slaughterhouse (48.6% positives). Conventionally produced turkey meat was contaminated with ESBL/AmpC-forming *Escherichia coli* at a percentage of 36.8%. Compared with the 2016 Zoonoses Monitoring, when 36.5% of the samples of caecal content were positive with ESBL/AmpC-forming *E. coli*, the detection rate in the animals was notably higher last year. The findings in conventionally produced turkey meat, on the other hand, correspond with the findings of 2016 (38.8% positive samples). It was conspicuous that faecal samples drawn at ecological turkey fattening farms, and in particular samples from ecologically produced turkey fresh meat, with detection rates of 36.8% and 12.2%, respectively, were obviously less often positive with ESBL/AmpC-forming *E. coli* than corresponding samples from conventional farms. These differences could be connected with the lower frequency of antimicrobial treatments in ecological farms, compared to conventional farms. More targeted investigations are necessary in order to find out more about possible differences in the contamination of animals and foodstuffs with antimicrobial-resistant germs in ecological and conventional production. In this context, we need to raise reliable data on the use of antimicrobials in conventional and ecological livestock farming.

Fresh chicken meat was found positive with ESBL/AmpC-forming *E. coli* in 35.4% of the samples, which is noticeably less frequent than in the 2016 Zoonoses Monitoring (when 49.8% samples were positive). The rate of detection of ESBL/AmpC-forming *E. coli* in caecal content of broiler chickens at the slaughter house was 46.8%, which is also below the rate found in the 2016 programme (52.6%). These findings continue the declining trend which has been observed over the recent years in the prevalence of ESBL/AmpC-forming *E. coli* in the broiler food chain.

Carbapenemase-forming *Escherichia coli*

None of the isolates obtained from caecal content of broilers at the slaughterhouse and sent to the laboratory for suspected formation of ESBL/AmpC or resistance to carbapenem were confirmed phenotypically as carbapenem-resistant *E.coli*.

Enterococcus faecalis and *Enterococcus faecium*

Between 80% and 90% of the isolates of *Enterococcus faecalis* and *Enterococcus faecium* stemming from the broiler and fattening turkey food chains were found resistant to at least one of the anti-microbial substances tested. Under the 2016 programme, isolates stemming from broilers and fattening turkeys still showed somewhat lower resistance rates of 70% to 80%. Both species again displayed high rates of resistance to tetracycline and erythromycin

Roundup

The Zoonoses Monitoring programme raises representative and comparable data on the prevalence of zoonotic pathogens in major food-delivering animal species and major food products in order to evaluate consumers' risk of infection through consumption of foodstuffs. Investigations into resistance improve the data situation in this field and contribute to being able to more closely examine the relations between the use of antimicrobials in animal farming and the development of resistance to antimicrobials. Continual testing in the framework of the programme allows assessing trends and development in the spread of zoonotic agents and antimicrobial resistance. In addition, testing at diverse stages of production allows tracking the paths of contamination with zoonotic pathogens along the food chain.

In many respects, the findings of the 2018 Zoonoses Monitoring investigations into the food chains related to broilers, fattening turkeys, and fattening pigs ranged in the same orders as in the years before.

Yet, the declining trend observed over the past few years in the Salmonella detection rate in the fattening pig food chain did not continue in 2018. Salmonella was found somewhat more frequently on pig carcasses and in minced pork in 2018.

Minced pork is a potential source of human infection with pathogenic germs. Therefore, raw minced meat is not suitable as a foodstuff for vulnerable consumer groups such as small children, elderly and immune-deficient people or pregnant women.

Salmonella control measures in poultry stocks led to a decline in contamination levels in the food chains related to broilers and fattening turkeys in past years – a situation which was also accompanied by a decline in cases of salmonellosis in humans. Since 2014, however, the contamination level in poultry carcasses and poultry meat has not declined further. While Salmonella detection rates in the broilers food chain have remained largely steady over the past few years, rising contamination rates have been observed in turkey carcasses. This

gives rise to concern, because findings on turkey carcasses are often *S.* Typhimurium, which is among the serovars causing the majority of infections in humans.

The findings underline the need for further efforts, in order to improve slaughter hygiene in this sector.

As regards reduction of Campylobacter in the broilers food chain, progress remained absent. Nearly a quarter of broiler carcasses had bacterial counts higher than 1000 cfu/g, which means that the process hygiene criterion for campylobacter which was introduced last year has not had an effect on findings in the Zoonoses Monitoring.
As slaughterhouses obviously succeed to different degree in their management of cross-contamination of carcasses with Campylobacter, minimisation strategies should place the focus on comparing various slaughterhouses, in order to identify control measures suitable to reduce bacterial counts on carcasses.

A positive finding of the Zoonoses Monitoring was that detection rates of both MRSA and ESBL/AmpC-forming *E. coli* were declining at all levels of the broilers food chain.

This does not hold for the fattening turkey food chain. Here it was striking that MRSA and ESBL/AmpC-forming *E. coli* were detected clearly less frequently in ecological turkey farms and in ecologically manufactured turkey meat than in conventional farms and conventional meat.

The frequent findings of ESBL/AmpC-forming *E. coli* in food-delivering animals give rise to concern because of the extra-ordinary importance of 3rd and 4th generation cephalosporins for therapy in humans, all the more as it must be assumed, at the present state of knowledge, that foodstuffs may convey these resistant bacteria to humans.

Test findings in untreated sesame seeds and vegetarian sliced sausage do not indicate a recognisable risk of human infection with *Salmonella* spp., STEC, or *Listeria monocytogenes*.

The results of antimicrobial resistance testing show that resistance rates in farm animals are highest in the broilers and fattening turkey food chains, which reflects the relatively wider use of antimicrobials in these animals, compared to cattle and pigs. Similar to findings in the broilers food chain in the 2016 Zoonoses Monitoring programme, the 2018 programme showed that bacterial isolates stemming from ecological turkey fattening farms and from ecologically produced turkey meat displayed significantly lower rates of resistance than isolates stemming from conventional farming. This is probably attributable to the fact that antibiotics are used less in ecological than in conventional poultry farming. The findings make clear that efforts for animal health improvements must be strengthened, in order to further reduce the use of antimicrobials in poultry farming, and thus finally achieve lower resistance rates. A focus should be placed on reducing the use of critical antibiotics. The

very high rate of resistance to fluorochinolones underlines the urgency of reducing the use of these substances. At the same time, use of colistin must also be further restricted, because transmissible resistance genes have been identified, and the substance's importance in human medicine has increased.

The results of the Zoonoses Monitoring programme indicate where official food surveillance has to place highlights, and they yield important information helping government authorities to take suitable measures to reduce the prevalence of zoonotic pathogens.

Having the overriding objective to reduce consumers' exposure to zoonotic pathogens, the Zoonoses Monitoring programme significantly contributes to health protection of consumers.

Consumers can protect themselves from food-borne infections by thoroughly cooking meat and strictly observing kitchen hygiene, which prevents transmission of pathogens from raw meat to ready-to-eat food (such as salad) during preparation of the food. In order to prevent or bacterial growth in meat and certain ready-to-eat foodstuffs, care should be taken to maintain cooling chains and fix appropriate, short best-before or use-by dates. Vulnerable consumer groups, namely small children, elderly and immune-deficient people, and pregnant women, should refrain from consuming raw minced meat and other raw meat and raw milk products, as well as certain ready-to-eat foods, as these foods harbour a potential health risk. The Federal Institute for Risk Assessment BfR has published information leaflets on how to minimise the risk of infections with Campylobacter, STEC, and Listeria, as well as on how to protect from food-borne infections in the private household (https://www.bfr.bund.de/de/start.html).