



Coming together *for* food safety

Poultry experts from
processing and live production
stress the importance of
working together
to produce safe poultry

AUGUST 2020





Coming together *for* food safety

welcome

Many poultry companies are still struggling to reduce the prevalence of *Salmonella* — not only to protect public health and produce a wholesome product, but also to avoid the USDA's Food Safety and Inspection Service's Category 3 designation, which can compromise a company's reputation as a dependable supplier.

Processing plants can no longer be expected to bear sole responsibility for controlling *Salmonella*. An integrated, company-wide effort involving all facets of production is needed to control this ubiquitous foodborne pathogen and maintain consumer confidence.

To help the poultry industry meet these goals, Zoetis brought together experts in food safety, processing and live production to share their expertise and experiences developing successful programs for managing *Salmonella*. This booklet features highlights from that informative discussion.

On behalf of my colleagues at Zoetis, I wish to thank our panelists for participating in this thought-provoking roundtable.

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Coming together *for* food safety

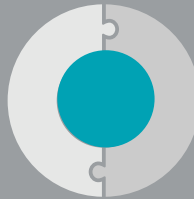


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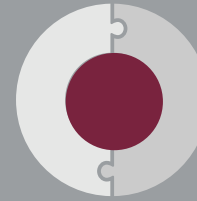
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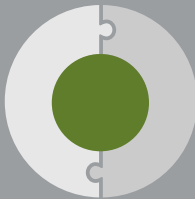
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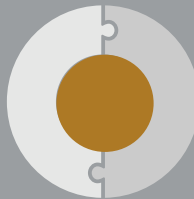
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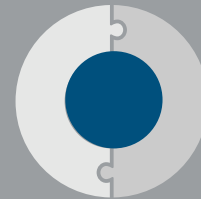
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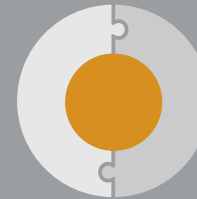
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EDITOR'S NOTE:
Because this year's roundtable was a virtual event, Poultry Health Today editors were not able to take quality photos of the panelists during this session.

1

Impact of FSIS categories on customer business

**HOFACRE**

Some of you will remember when the responsibility for food safety was left primarily to the plant. Live production didn't really worry about the plant meeting standards.

Aside from irradiation or cooking, we don't have any lethal kill steps for foodborne pathogens like *Salmonella*. But now that USDA's Food Safety and Inspection Service (FSIS) is tightening performance standards, live-side production and poultry processing are going to have to interact more.

For this roundtable, we're going to discuss the impact of the FSIS performance standards on broiler companies. We'll also address the organizational hurdles that might be in our way to further performance improvements. The questions I'll ask will hopefully stimulate us to think through how we're going to go forward.

Let's start by talking about the impact of an FSIS Category 3 result at a processing plant. Do you have any struggles with customers when this happens?

DEVILLENA

Initially when USDA started publishing results from FSIS testing at poultry processing plants, there was a lot of misunderstanding about the categories. It was not understood that Categories 1 and 2 actually meet regulatory standards.

We got a rush of requests from different customers asking what categories our

plants were in. And a lot of customers said they would only get products from plants that were in Categories 1 and 2. It was very difficult.

I believe the situation is stable now, but I also believe it's still having a big impact. There are customers who do not want products from plants in Category 3. We've been doing a lot of work with the industry and the other poultry companies explaining how the results are calculated. With a 52, 53 rolling window, it takes a year to remove a positive. So there's still an educational process that's needed, but it's definitely a burden, especially in the sales arena.



...a lot of customers said they would only get products from plants that were in Categories 1 and 2. It was very difficult.

JUAN DEVILLENA, MS

**JOHNSON**

When the standard first was released by USDA, I think customers had more questions about plants that may have been in Category 3. However, as our customers started to understand the standard, I think they became more focused on what our data was showing.

**HOFACRE**

Dr. O'Connor, you're on the West Coast. Is the situation different there? Does the customer base you have put you under any greater pressure regarding FSIS categories?

O'CONNOR

We also initially had requests from customers who wanted to know what categories we were in. We received a form letter from one large box-store customer; we replied with a form letter and never heard from them again.

So, I don't really feel like the categories are having the impact on the industry that FSIS intended them to. In my experience, I don't think the original intention of FSIS (increased pressure from customers) has occurred. Customers realize that the sampling program and the ultimate categorization are more complex and challenging to move through (from Category 1 to 3) than it originally appeared.

FULNECHEK

In my role at Zoetis, I've been asked on several occasions by a customer with a plant that just moved into Category 3 to come in and conduct an investigation and analysis similar to what FSIS would do. Then I write a report so they can provide it to their fast-food customers. That's because they have contracts with customers that specify the source material will only come from processing plants in Categories 1 or 2. So it has had an impact on those integrated companies that have contracts with fast-food services.



Organizational obstacles to integrated *Salmonella* control



HOFACRE

I often have the opportunity to sit in meetings with companies that have had an issue with *Salmonella* in a particular plant, and sitting in that room are both live and processing plant people. And it doesn't feel to me often that those two groups of people have spent a lot of time interacting with each other.

Live production and processing are generally regarded as different profit centers. Does that interfere with a holistic approach to *Salmonella* reduction?

HEEDER

Any kind of elaborate *Salmonella* control on the live side was once viewed as something that's just going to cost money. But I think maybe the performance standards have helped open the eyes of upper management who might now say, "Okay, we're going to give up something on the live side for costs to ensure we don't have some major issue coming through the plant."

I also think the *Salmonella* Infantis problem the industry had a couple of years ago — and new serotypes of *Salmonella* — has changed the game a little bit. We're not just looking at what category the plant's in but at the serotypes in the system and how to get rid of the ones that are becoming bad actors.



Any kind of elaborate *Salmonella* control on the live side was once viewed as something that's just going to cost money.

CARL HEEDER, DVM



HOFACRE

Ms. Johnson, how is communication between live production and the processing plants if you have an issue in the plant?

JOHNSON

Communication is key. One of the most valuable tools we've used is making sure we stay focused on the same goals by having our guys that work in the field come to the plant and vice versa. That way, we appreciate each other's roles and goals.



HOFACRE

What are your thoughts about how an integrated broiler company can streamline communication so the plant and the live production know where they are at all times?

DEVILLENA

What's important is the commitment from the top down. There's been a transformation of the industry during the

21 years I've been in America. The bridge between live production and processing is getting shorter. For instance, there's close communication between live operations, quality and food safety, the operations team, the wastewater team.

If you remember maybe 10 years ago when we started using peracetic acid (PAA), nobody — and I say "nobody" loosely — bothered to think about the consequences on wastewater. But little by little, everyone learned and worked closer together. There are a lot of things, for instance, that we do that involve the live-operations group, that in the past they were not part of. It's asking the question, "What do you need from us? What kind of information will be helpful to you?" That helps us get to the next level.

Rather than just looking at the plant, at chemical interventions or vaccination, it's also asking about non-traditional interventions, non-chemical interventions such as feed withdrawal, which Dr. Fulnechek helped us with. It's looking at different innovations that can affect both the plant and the live operations. It's a combination of things, but it definitely has to start up from the top down as far as commitment.



HOFACRE

Does anyone have an idea of roughly what it costs if a plant has an issue and is approaching Category 3? Or what does it cost us to try and maintain ourselves in Category 2? Or what's the cost on the live side to help results at the processing plant?

STEWART-BROWN

It's important to be clear on what you're expecting of each group — to put metrics against it. Frankly, we've struggled with that as an industry — to determine live side's job and how it can be measured. How do I hold live accountable for doing what it's being asked to do? The metrics have been hard to come up with for live production.

You have three places you're going to spend money: live, first processing and second processing. Say you have 100 bucks to spend; I'm going to say you're going to spend \$45 in second processing and probably \$45 in first processing, and then you've got 10 bucks to spend in live. And honestly, that's the best place to spend that money.

**HOFACRE**

Do first- and second-processing costs always tend to be the same?

STEWART-BROWN

What to spend on first and second processing has been a big and important question the last couple of years. Some people took some significantly different approaches on first- and second-processing costs. I was in that boat personally. I thought you could get clean enough in first processing and not need to spend too much in second processing. I don't believe that anymore. I don't believe you're going to be successful without spending significant money and energy in second processing. You can't get clean enough.

You can be in Category 1 all day long in whole birds, and you'll be in Category 3 for parts if you don't pay attention to second processing. You can see it all through the data that's publicly available. You can line up the plants that are running Category 1 in whole birds, then see how it goes in parts. There's no guarantee you'll do well with parts even if you're in Category 1 with whole birds. You're going to have to spend money in both places.

In the plant, you can see the results from what you spent. In live production, it's really hard to have a metric that shows you that kind of result, in my opinion.

DEVILLENA

In an industry that measures profits in four decimal places, every penny counts. In general with microorganisms that you cannot see, it's always hard to prove if you don't see something that is happening in front of your eyes.

continued

“How do I hold live accountable for doing what it's being asked to do? The metrics have been hard to come up with for live production.”

BRUCE STEWART-BROWN, DVM



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Organizational obstacles to integrated *Salmonella* control

Communication essentials



HOFACRE

Are poultry companies structured in a way today that fosters a good line of communication — with regular meetings and communications between the live production and the plant?

HEEDER

The COVID pandemic increased communications throughout the company. Before that, when the initial FSIS categories were coming out, we put together a task force that meets on a regular basis and goes over all aspects of production. We don't always agree, but at least we sit there and talk on a regular basis. There needs to be agreement to meet on a regular basis. That's not going to happen organically within a system.

DEVILLENA

Years ago we started having food safety team meetings. We would typically just have the meetings for the plant folks, then we started getting the live-operations guys into the meetings. We started actually making sense of several opportunities because we closed that gap.

O'CONNOR

We were talking about communication. If you've experienced a *Salmonella* outbreak, communication will flow like it's never flowed before between live production and the plant. People from sales and marketing are included — the entire company comes on board.



If you've experienced a *Salmonella* outbreak, communication will flow like it's never flowed before between live production and the plant.

ROBERT O'CONNOR, DVM



Focus on serovars



HOFACRE

I've always worried about the way that our regulatory system is structured to look primarily at Category 1, 2 or 3 versus looking at the particular *Salmonella* serovars involved. Dr. Heeder mentioned *S. Infantis*. To me that particular serovar is scarier than FSIS categories. Customers look at categories, but flocks with *S. Enteritidis* or *S. Heidelberg* or *S. Infantis* are the ones that can ultimately end up causing an outbreak or recall.

O'CONNOR

All of our testing that we do, whether it be in the field or the plant, is in a sense retrospective. You get results, but those eggs have already been laid, those eggs are already in the hatchery, those broilers already went to the processing plant or that meat is already in the marketplace.



HOFACRE

Where are you most likely to find worrisome serotypes?

O'CONNOR

If I'm going to look for emerging serotypes that are human-health concerns, I'm going to find it on the live side. And it's the live side where I really have to do something about it. Hypothetically speaking, if *S. Infantis* was uncovered in our breeder population and then I started to see it in broilers, which does happen, I might very specifically target those farms where I've seen *S. Infantis* several times for a complete clean-out. It does direct action.

I'm not just serotyping for interest. It might direct action on my autogenous

So even if you discover that you have a really bad serotype, let's say in your breeder flock, it's really too late. You're not going to go in and vaccinate breeders with an autogenous vaccine, so you have to start with pullets that are coming in. You're reacting to data.

Based on data, we start in the pullets. Every pullet flock is drag-swabbed five times. When they become breeders, they're drag-swabbed 10 times. So by the time that breeder flock ends its life, we've done 15 surveys of that population. And that's where we would pick up new or emerging serotypes. We decide if it's enough of a problem, warranting a change in our autogenous vaccine.

We also drag-swab every broiler farm 2 weeks before they process. Serotyping though is really up to live production.

vaccine, but it also might direct action in the field with the broilers in terms of clean-out. It really doesn't direct any action in the plant. Universally, you're attacking *Salmonella* in the plant. You're not going after a specific serotype. So serotyping to me is very relevant to live production.

**HOFACRE**

Dr. Smith, have you focused on particular serovars on the live side or has your focus been on *Salmonella* in general?

SMITH

There's definitely been a focus on serovars for a couple of reasons. First, as Dr. Stewart-Brown mentioned, we don't have good tools to economically and reliably measure the true impact of live interventions on overall carcass loads coming in to the plant, which would be the metric of interest under the current category scheme. Attempting costly, disruptive and labor-intensive across-the-board live interventions to lower overall loads — without being able to clearly demonstrate the impact — is a hard sell.

We really need practical tools to measure overall carcass loads coming to the plant from live production on an ongoing basis, but in their absence, monitoring serotypes in the field to target high-risk serotypes is currently a feasible and useful approach. And as Dr. O'Connor mentioned, your results need to spur an action, and we have the practical means to respond to emerging, dangerous serotypes, such as the targeted clean-outs he recommended and, particularly, autogenous vaccine programs.

From the standpoint of public health and the liability that we all face, addressing dangerous serotypes in this manner is something that we can affect in a timely, economical and significant way in live production versus attempting to influence overall loads with the tools and economic realities we face today.

So for all those reasons, we have responded primarily by attacking specific serotypes, and we've been able to demonstrate benefits in terms of reduction of those serotypes. With the difficulties in engaging the live side on *Salmonella*, controlling dangerous serotypes is probably one of the more beneficial interventions and one that's easier to implement and document the impact.



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JOHN SMITH, DVM





Shortfalls in *Salmonella* control during processing



HOFACRE

Ms. Johnson, do you see any particular areas that are of a greater issue in processing? Dr. Stewart-Brown mentioned that first processing versus second processing aren't always linked when you're looking at the categories. Do you see similar situations?

JOHNSON

Yes, we see similar issues. With every intervention, our goal is to reduce the number by 50%. We focus a lot of effort on trying to get clean carcasses into second processing. Once we're in second processing, we make sure we have good external controls — not just using a chemical to aid in reduction, but environment controls like temperature management, time spent before going to a customer and excellent good-manufacturing practices.



HOFACRE

Does anyone else see differences between first and second processing?

WHITLEY

We've been doing a lot of testing recently at our complex and have seen cages as an opportunity. We probably haven't given cages the attention they need, but as we've done more sampling of live birds on the farm, we found ourselves to be relatively clean there. We put the bird in a cage, get it to the plant, do a check before scalding and counts are much higher.

We see good reduction in our scalders and have tried new things there with pH adjustment. From there, it's just about sanitary dress through your round

equipment and making sure you're treating that equipment with an intervention chemical of some titration.

I think the chill process is probably the biggest opportunity we have to knock down the *Salmonella* load going into second processing. As Dr. Stewart-Brown said, you can be clean on whole birds, then it's a whole new challenge once you get to second processing. You've got several hands touching the bird when you think about full hand debone. Just seems to be a lot more opportunity there to cross-contaminate. Once you come out of the chiller and start to break the bird up and go in various different directions and onto conveyers, you've got to make sure you have the right rinses, dips and things of that nature, but it's definitely a challenge. The multi-hurdle approach is what we've lived by in both first and second processing.

STEWART-BROWN

There's a big need for automation, such as automated deboning. You know, Mr. Whitley mentioned the number of hands that touch during deboning. Honestly, it scares you that some products are handled so many times. But is automation a step forward or backward for food safety? That's the question. I don't know the answer except that when I look at auto-deboners, they were not made to stay clean and are hard to clean. So is it hurting or helping? I'm not sure automation is a step forward or backward.

Having said that, I know that we need to work with equipment to make it easy to clean. Each piece of equipment needs to be assessed for its food safety viability. It's time we did that. That information should be right beside the equipment's operational efficiency.

“ I think the chill process is probably the biggest opportunity we have to knock down the *Salmonella* load going into second processing. ”

JOSHUA WHITLEY

Testing challenges



HOFACRE

Do you think that we have adequate testing tools? You know, the proceedings of discussions such as this one oftentimes land on the desk of students and faculty, and what we say here may very well give some direction to future research. Do we have adequate testing? Do we have issues with testing accuracy? Or are there issues with the speed of results? Are there areas of weakness you see in the plant?

WHITLEY

More investigatory testing would definitely benefit us. We don't see near the internal sampling positives, which are primarily done on Mondays, that we see with the more random sampling by FSIS. Not that we're in a bad spot, as both plants in my complex are in Category 1 for *Salmonella*, but *Campylobacter* is our opportunity right now, and that's really what we're trying to learn more about through additional testing.

Yes, testing can be expensive, but fortunately, we have the resources available within our company laboratories to do additional investigatory sampling, and we have our own microbiology group that can come and help on special projects and bio-mappings.

We live in a world of variability. Our industry is filled with it. We might try something on a certain day with a given broiler flock that came out of a certain hen flock or pullets and have no positives. Another test the next week using the same chemical titrations and with



Most really good, well-run chillers are capable of 1 or 2 logs of reduction.

BRUCE STEWART-BROWN, DVM



everything else relatively the same and we have totally different results.

So, that's some of what we are trying to do right now, is hone in on what's working, particularly around water treatments and housing conditions on the broiler side. So, yes, to answer your question, I think additional testing is needed. More investigatory testing anyway, and we can learn a lot from it if we go at it with a plan.

STEWART-BROWN

There are two kinds of testing really that the industry does and that most of us do — pathogen testing and indicator organism testing. I believe a number of companies are using a good amount of indicator organism.

We use total plate count (TPC) before and after each intervention. Like Mr. Whitley says, every day is important. We want to see that the intervention consistently reduces the TPC from one end to the other. They are cheap, and you can run a bunch of them and get good numbers.

If we don't have 20 samples before and after each of the interventions every week, that's a low number. So you get a good sense if the scalders reducing TPC by

2 logs. And it should. Honestly, scalders can be fantastic at knocking loads down.

Most really good, well-run chillers are capable of 1 or 2 logs of reduction. So if you hold each intervention accountable and you use indicator organisms, you can run it all day long and depend on it.

Of course, you've got to periodically check all that — the relationship between TPC versus pathogen reductions — but you're not going to run 100 quantitative *Salmonella* tests before and after each intervention every week or two. And you can run a ton of indicator testing at a really reasonable price, and it will tell you quite a bit.

DEVILLENA

By the time you get the result, 2 or 3 days have gone by. The results on serovars take 5 days or so; therefore you're always working behind. You can stick a pH test strip in a solution and make an adjustment right away — that's the closest thing to real time as you can get. But we don't have anything that will tell you that you've got 50% *Salmonella* at incoming and you need to do A, B or C.

Even if you track all your incoming loads and a farm that usually has an average of about 50% comes in at 90%, what happened? Now you need to go back and try to figure out what happened in the past. When there's a sample taken by USDA, verify and check everything — all the levels — so if it comes back positive you can have a correlation and say, "Okay, every time that the sample has come back positive we have had this level low, this other level high, or this level was off." But a lot of these investigative approaches are

continued



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Shortfalls in *Salmonella* control during processing

complicated because of the non-real-time nature of the testing methods.

We are behind, and I think the area of testing is definitely something that would benefit from more research.

O'CONNOR

I honestly don't know how often other people are testing. Mr. Whitley mentioned testing on Mondays, but do you mean you're only testing for *Salmonella* on Mondays? For a plant that produces retail packaged parts, every part gets sampled 10 times. I have 10 samples — 10, 4-pound samples a day, respectively, for wings, breasts, drums, thighs, etc. That's for each plant.

You multiply that by five, because there are 5 days in a week, and I have a lot of samples to work with, but it's still retrospective.

In terms of trending — where I'm going — that's the best way for me to understand am I good, bad or neutral because what we obviously want to avoid is getting into any outbreak at all. So I explained what we do in the field, but we also do an enormous amount of *Salmonella* sampling in the plant.

Regarding indicator organisms, we do a follow-up of the sanitation shift with Enterobacteriaceae (EB) testing. So, we're looking at that to measure the effectiveness of our cleaning process. And there are certain locations in first process where we also do EB testing after an intervention. But my direction is really set by that *Salmonella* sampling.



HOFACRE

We know that testing can be expensive. Do any of you think we're not getting information as quickly due to cost? Is cost a hindrance to obtaining real-time information?

HEEDER

You don't do a test unless you know what you're going to do with the result. That's 101 Testing, right? So we do a lot of baseline testing in the plant, every day, every shift.

Then quarterly or semi-annually, depending on where we're at, we do bio mapping just to make sure that the whole process is moving along properly.

To me, the perfect test would provide enumeration and the serotype of *Salmonella* in a flock the moment I pick it up or the day before. Then I could say which flocks need to go in first and which last. I could rank every flock coming into the plant by risk. Maybe I'd crank up the PAA or do whatever else I can. But there's no system out there to do that. And it's not even a cost factor; there's just no way to do it. We've got 2 weeks to find out that information now, and by then it's almost useless.

It goes back to managing your serotypes in the breeders and controlling your risk to your customer at the closest point that you possibly can, and that's where you measure. Are we keeping the products that will end up on a grocery shelf clean? Is there anything we're introducing into the system in breeders that we need to manage better?



HOFACRE

With testing we want to be able to have interventions. Would more research help us out regarding interventions in the plant that are needed when we have birds coming in from high-load farms?

JOHNSON

Research and data on interventions is always good; however, I think we should always optimize our interventions regardless of loads coming in. Interventions — the location, concentration, etc. — are very plant-dependent.

DEVILLENA

It's more complicated than just sampling at one particular location. As Dr. Stewart-Brown said, we're always working backward.

There are a lot of new interventions that we have all tried. I personally have tried every chemical that you could possibly think of in different places. But at the end of the day, you cannot take an intervention that works in one particular plant or in one particular state and assume it's going to work elsewhere. I once believed we had to have an intervention in the scalders because it worked where I was at originally. Well, at a different plant, it didn't work at all — one reason was probably because the *Salmonella* serovars were different. Our industry and, in particular, poultry food safety are very complicated and, therefore, fascinating, but that's what makes it interesting and fun to be in.

4

Shortfalls in *Salmonella* control — live production**HOFACRE**

Dr. Smith, give us your thoughts about where we should be focusing on *Salmonella* control during live production.

SMITH

We've all heard the adage that *Salmonella* control needs to utilize a multi-hurdle approach, and the adage is very true in live production. Obviously, you've got to start with a clean pullet. The primary breeders have done an amazing job with the supply we've had, but you've got to keep the pullet clean until the hens go into lay. Then you've got to keep the hen clean during lay.

The hatchery is a huge bottleneck where you can really spread things around, so sanitation and control in the hatchery are paramount. Finally, incursions can occur all the way through broiler grow-out, up to and including catch and haul as mentioned earlier. So you've got to look at all those areas from soup to nuts. In each of those areas, clean feed; clean drinking water; clean litter and equipment; rodent, insect and other vector controls; and biosecurity are all important, and none of those are easy.

Right now, based on the tools we have available, the costs and the labor issues with applying those tools, I think that's why there's a focus on vaccination of pullets and breeders and interventions in the hatchery such as fumigation. Testing is also a big issue in all of those places. But it has to go all the way through the production chain.



In reference to communication between plant and live operations — often times we don't convey the 'why' and importance of what we're asking of the entire team.

JOSHUA WHITLEY

**HOFACRE**

Mr. Whitley, as a complex manager, you see what happens in the plant, but how do you work that back to live production? Do you see any one of the three major areas in live production as a greater challenge than the others?

WHITLEY

I've been a complex manager for about a year and a half, so I'm still learning live to some degree, but I was a plant manager for a long time, and going back

to the previous question about continuity between live production and plant processing, I'd say it's definitely an opportunity for us and our industry. I've worked to improve that over the last several months in my current role.

As for our live programs, for me, it's about focusing on cleanliness in the hatchery, better management in our broiler houses — keeping floors dry and having good ventilation — and water treatment, which has been what we've focused testing efforts on lately. We're acidifying the drinking water 3 days before harvest in an effort to knock down the *Salmonella* load coming into the plant.

In reference to communication between plant and live operations — often times we don't convey the "why" and importance of what we're asking of the entire team. I've spent time explaining the bigger picture to our live team and compelling them to ensure certain things are being done to reduce the *Salmonella* load going into the plant. Everyone needs to understand their impact on food safety and what it means to our customers and business if the plant ends up in FSIS Category 3.

continued



The hatchery is a huge bottleneck where you can really spread things around, so sanitation and control in the hatchery are paramount.



JOHN SMITH, DVM



4

Shortfalls in *Salmonella* control — live production

Role of hatcheries



HOFACRE

What about the role of the hatchery regarding *Salmonella*? Can it be an issue?

O'CONNOR

Yes, I think it can be at hatch. I believe it was Dr. Nelson Cox who long ago showed that when you took specific-pathogen-free eggs, seeded down five out of 100 with *Salmonella* and then hatched those eggs, you could isolate *Salmonella* from 85% of the chicks. So the hatching process, in my mind, is probably the biggest area for intervention. I think that's very important, whether it be using hydrogen peroxide or some sort of fumigation during the hatch process. And obviously cleaning the hatchers after that process is finished, cleaning the conveying belts — I've seen some real disasters in servicing rooms. So yes, the hatchery needs to be a focus.



HOFACRE

Dr. Smith, you had one of the largest hatcheries and one of the newer ones. Were there any areas that you saw or see as opportunities for us in the hatchery to reduce *Salmonella*?

SMITH

We actually designed that hatchery with *Salmonella* control in mind, in addition to other goals such as increased automation. A prominent design feature was repeated circular flow patterns that attempted to

minimize opportunities for cross-contamination among the different phases (incubation, hatching, processing and delivery) and in which there was at least one disinfection step in each phase to attempt to break the cycle.

In general, the hatchery had a one-way flow pattern with eggs coming in one end and chicks exiting the other, with dedicated one-way paths for equipment to return to its starting point with a disinfection step after each use and no cross-over.



A prominent design feature was repeated circular flow patterns that attempted to minimize opportunities for cross-contamination...

JOHN SMITH, DVM



HOFACRE

Give us a few more details. How was the incubation part of the hatchery designed?

SMITH

In the incubation phase, we had a completely separate egg-receiving dock and driver entrance with a purpose-designed fumigation chamber

for the incoming eggs before they entered the egg cooler. Automated transfer of disinfected eggs and flats into the incubation buggies occurred in the egg cooler, with the farm racks exiting via a separate door through a rack washer into the farm-rack storage room, which also had its own separate dock and entrance on that end of the building.

The one-way incubation halls emerged directly off the egg cooler, so there was no cross-traffic in central hallways between incubation and hatching. At transfer, the incubator buggies exited the opposite end of the incubation halls from the egg cooler into the central transfer room, where they remained on one side of the room, and exited through a separate door immediately into a rack washer, into the clean-rack storage, that then fed one-way back into the egg cooler.

The trays followed a separate path on the incubation side of the transfer room, through a tray washer back to the farm-rack storage. Similar, completely separate, circular patterns with washing and disinfection points occurred on the opposite, hatching side of the transfer hall, in chick processing and in farm-box handling.

I think there are a lot of opportunities with our common, older T- or H-shaped hatchery designs for cross-contamination, and efforts to minimize those issues could be fruitful.

Dr. O'Connor hit on hatching, which can be a huge issue. There are some interventions there such as fumigation,

but it would be nice to have better ones. Chick processing is a huge opportunity for cross-contamination among flocks, similar to Dr. Stewart-Brown's observations about second processing in the plant. You clean it up the afternoon after hatch and the next morning we start processing again, and after the first contaminated flock goes through the system, all subsequent flocks are exposed. Some practical means to control contamination during processing would be a huge step forward.

Additional tools



HOFACRE

Are there any interventions that you've tried that could lower the *Salmonella* load coming into the plant immediately?

DEVILLENA

Dr. Fulnecek helped us with water acidification, but there are still a lot of questions. How many hours of acidification is needed — 72 or 48 hours?

Does water acidification mean if the drinking water has a pH of 9 I need to reduce it to 8? Or does it mean from 7 to 5 or 4? At what point do the birds stop drinking the water? Here I think the scientific approach is extremely important, but we need to understand what it means.

We're currently running a trial at one of our locations. We're actually measuring the water pH and gathering data. I'm hoping to have results in the very near



You need to lower [pH] to the lowest level that does not affect water consumption.



DOUGLAS FULNECEK, DVM

future that I can share with everybody in the industry. But I think the key there is knowing what we are trying to accomplish. I know Dr. Stewart-Brown said that before, too. Do we have a clear goal and what are we trying to achieve? What are the As, Bs and Cs of the plan? I think that will help.

For instance, my instructions regarding water acidification are to reduce the pH by a specific amount. Dr. Fulnecek, can you add anything?

FULNECEK

I'm often asked what the pH of water should be, and what I tell all of our customers is that you need to lower it the last few days — from 48 to 72 hours — somewhere in that neighborhood. You need to lower it to the lowest level that does not affect water consumption. That's somewhere around a pH of 4.

Depending on the water system, there are some companies that can get it below 4. On very well-managed broiler farms, growers will titrate the pH, so they really know where they're going with the water. They might even do that over a period of 5 days, so they can get it lower without affecting water consumption.



HOFACRE

Besides water treatment, what other tools do we have on the broiler side that can help us try to reduce the level of *Salmonella* going into the plant?

SMITH

Dry litter is huge. Litter amendments such as acidifying agents not only reduce *Salmonella* but also have other benefits such as ammonia control that clearly justify their use, so that's a win-win and consequently an easy sale in live production.

The live *Salmonella* vaccines can have a rapid impact in the broiler house, but due to the added expense and lack of economic benefits directly to the live side, it is my impression that they tend to be used mainly when a complex is in a bind — for instance, when they have fallen into Category 3 and someone brings processing and live together to look for critical, rapid responses.

Competitive exclusion, good coccidiosis control and maintaining good gut health in general all contribute to *Salmonella* control and also provide other economic benefits to the live side that make them easy to promote.

continued



4

Shortfalls in *Salmonella* control — live production

STEWART-BROWN

I agree with Dr. Smith's comments. You're really looking for things that are double wins — something that's a step forward in food safety and a step forward in operational efficiency.

Dry litter, for instance, gives you less ammonia and better respiratory health. Dry litter also gives you good footpad health. And good footpads, of course, are sellable.

If there's a No. 1 indicator for live-side food safety, it might be footpad health because really good feet generally mean there's really good litter and fewer microorganisms in the chicken house.

The other metric that's interesting in broilers is soiled-feather scores. You might have started using soiled-feather scores to assess bird welfare. The Europeans do quite a bit of soiled-feather scorings. Well, it seems pretty clear that birds coming into the plant that are dirty are carrying a lot of microorganisms, and that's just eating up your interventions. Bring in clean birds. Get them cleaner.

If you've got some farms that are typically dirty-feather farms, figure out what that's about and bring them in cleaner. If you can reduce the amount of organic material being brought to the plant each day, the plant's operational interventions for *Salmonella* control will work better.

The double wins in live production are really easy to justify. And they are typically your food safety interventions that can

operate every day, all the time, and that you can hold live production accountable for as well.

We spend a lot of time on footpad health charts. That probably started years ago as it relates to selling feet. But having said that, those charts need to be in the food safety meeting as well.

Shifting costs



HOFACRE

If we implement these interventions on the live side and spend money on them, will it translate into use of less PAA at the plant? Does that discussion ever come up? Have any of you heard that increased cost during live production can reduce costs at the plant? Do companies have that discussion?

O'CONNOR

Not really, except for the topic of irradiation, which I know is anathema to most of the people in the industry. But we conducted a very substantive irradiation study in 2014, and I can tell you it's a very, very effective, absolute, end-of-processing intervention.

I know R&D will tell you there's a slight off odor and maybe some discoloration but put it this way: I ate it and I didn't have a problem.

One thing I really agree with is that while we can wait around for research to be done, veterinarians can rely in certain situations on our empirical observations.



But we conducted a very substantive irradiation study in 2014, and I can tell you it's a very, very effective, absolute, end-of-processing intervention.

ROBERT O'CONNOR, DVM



Wet litter time and time again will drive up your *Salmonella*. It absolutely will. I've seen it and it doesn't matter whether it's broilers in Louisiana or California or breeders in Colorado. Wet litter definitely has an effect on the prevalence of *Salmonella* all the way through to the plant.

JOHNSON

I think that the discussion comes up frequently. I am just not sure that we have found the balance.

FULNECHEK

We have at least one customer focusing all *Salmonella* intervention efforts on the live side, and they have very little cost for interventions in the plant other than some at first processing. They have no interventions in second processing, and they are in FSIS Category 1 for carcasses and parts. They don't have a comminuted product, so I can't judge how well this approach would work there. They are

focusing on *Salmonella* control on the live side using all the tools available, including testing and vaccination against *Salmonella*, and they're being successful.

Going this route requires a high-functioning, well-coordinated, committed team. Everyone has a critical role. Since *Salmonella* does not originate at the processing plant, its mitigation has to begin with the pullet chick. You must have the immune system's help in addition to all the other management tools. The goal is for the hen to pass *Salmonella* immunity, as opposed to *Salmonella*, to the broiler chick. That makes immunization/vaccination critical.

The pullet chick needs to receive a live ST [*S. Typhimurium*] vaccine on day 1 of age and again about 2 to 4 weeks later. If there is an overwhelming *Salmonella* challenge, a third ST vaccination can be given at about 6 to 8 weeks of age. Then at the first handling, between 10 to 12 weeks of age, administer a commercial killed Enteritidis vaccine — and administer an autogenous vaccine at about 20 weeks of age. If there is an overwhelming *Salmonella* challenge, give another round of killed vaccine in either the first or second handling.

Remember the primary goal is to minimize *Salmonella* exposure and passively protect the broiler chick during its first 14 days. But the broiler chick can also be vaccinated to stimulate active immunity in order to minimize late shedding and load carriage into the plant. For best results, the broiler chick needs to be vaccinated with a commercial ST

vaccine on day of hatch and then again in a field boost. Vaccination can be regarded as a way to protect the broiler chick from the inside out.

“

Pullets need live *Salmonella* vaccinations to minimize any wild-type infections and shedding early — before the killed vaccines can be applied.

DOUGLAS FULNECHEK, DVM

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HOFACRE

What vaccines do pullets need?

FULNECHEK

Pullets need live *Salmonella* vaccinations to minimize any wild-type infections and shedding early — before the killed vaccines can be applied. They may also help prime birds to respond better or more uniformly to killed vaccines later. There are two types of killed *Salmonella* vaccines — commercial and autogenous — and they help protect hens during production and limit early broiler *Salmonella* exposure. Commercial killed vaccines have proven efficacy against *S. Enteritidis* while autogenous vaccines are designed to help protect against the most common, problematic serotypes in a given complex.



HOFACRE

Dr. Heeder, at Mountaire, have you tried to bring those two cost centers — live production and processing — together so that if we can lower what's coming into the plant, we may be able to reduce our costs for interventions in the plant?

HEEDER

This question comes up at least once a year during budgeting when we see what's being spent on PAA. Could we spend less on PAA if there was less *Salmonella* in live production? Live production asks how much of a reduction in *Salmonella* is needed before the plant could stop using PAA — but there isn't an answer.

As Dr. O'Connor has said, everything's retrospective. You assume everything's positive. Or you assume everything coming in is hot and treat it as such.

Realistically, how long is PAA going to be available and will OSHA (Occupational Safety and Health Administration) stop or limit its use? That's a whole other discussion. Unfortunately, the poultry industry has seen a lot of effective tools disappear. Just because they're effective and useful doesn't mean they're going to keep them around. That's in the back of my mind, always.



Bringing processing and live production together for the common good



HOFACRE

Let's focus on bringing live production and the plant together. Think about it this way: If you were the owner of a broiler company, how would you go about bringing live production and processing together? What would you do to improve communication and how different parts of a company can work together so they can be successful and not end up in FSIS Category 3?

O'CONNOR

Back in the early 2000s, we had a president of operations who was very direct and even abrupt but a really, really good leader. We'd failed a sample set in our biggest processing plant. That's about the time I got involved in food safety and *Salmonella* control.

Coming from the live side of it was sort of like hitting a brick wall every time I went into the plant and asked them to do anything. The best meeting that I ever sat through was when that president of operations brought every single plant manager into the same room and basically said, "Your responsibility is to bring your plant's *Salmonella* prevalence to zero."

Now, I think we all know zero is pretty extreme. But the president telling plant managers they were part of the process of eliminating *Salmonella* changed my job overnight. Now folks had to comply with things that I was wanting them to either measure or do.



...there has to be a common goal; it has to come from the top and be clear about what is expected of the company.



BRUCE STEWART-BROWN, DVM



HOFACRE

And if you were the owner of a poultry company, would you do the same thing?

O'CONNOR

I would do the same thing. I would have live production and the plant managers in the room at the same time. I would say, "This is our mutual goal," but I'd say the goal was to be in FSIS Category 1 and "Everyone in this room is responsible for that."

Everyone really needs to be part of that, whether they are in sales or marketing or R&D, live production or the plant. Again, to have a mutual goal throughout the organization related very specifically to *Salmonella* control has made my job a lot easier.



HOFACRE

Dr. Stewart-Brown, does Perdue have the type of system where live production and the plant have a common goal?

STEWART-BROWN

Yes, and it's about the leadership saying out loud what is expected from each group in the company — the breeders, the hatchery, the growout side and the plant. And as Dr. O'Connor said, there has

to be a common goal; it has to come from the top and be clear about what is expected of the company.

We have tried to describe the expectation from each area of the company. There are generally three or four things that are the most important things we currently know about that will help us in food safety. An example for each group might be: *Salmonella* vaccination in breeders, fumigation in the hatchery, pellet temperature of 180° F in the feed mill and dry litter in the growout area. We have tried to say the important things and implemented a process to check on it.

So, say the things you expect, check on them and discuss compliance to them in the same meetings you talk about operational efficiency metrics. If they are important, they deserve the same kind of attention as feed conversion and hatchability.

We as a company and as an industry in general are moving that way. You can feel it. It's with some resistance and some variation in the industry, but it only takes lost business due to Category 3 or a recall or human illness to raise it up to the level of operational metrics. But it can and will work the same way.

**HOFACRE**

Dr. Smith, if you had your own company what would you do? Would metrics for food safety be the ultimate concern versus metrics for performance?

SMITH

As Dr. Stewart-Brown has said, bringing all the players together and making sure everybody understands their role is important. It's helpful if those people know each other and understand the issues that they each face in their segments.

I think that I would have regular meetings with people from the live side — the live-production manager, pullet-breeder-hatchery manager, broiler manager — and on the processing side, the plant manager, first-processing manager, probably the quality-control and second-processing managers. I'd have those people meet on a regular basis, maybe quarterly, so they get to know each other and know each other's concerns. You articulate your expectations at those meetings.

A lot of companies may have various bonus programs. In live production they are tied to performance and feed conversion. Something similar could be done for food safety.

**HOFACRE**

Would it help to have processing-plant people spend time in live production and have people from live production spend time in the plant? Would that help with communication?

HEEDER

I think it's beneficial to build relationships and trust any way you can, to be open to



Some of our most successful field service technicians and processing plant supervisors have spent time in each other's roles. I think that's one of the ways we've really helped live production understand food safety in the plant.

ERIN JOHNSON



communication, talking through issues and knocking down barriers between live production and the plant.

Knowing one another is really important because if the first time they get together is in the midst of a disaster situation, it's going to go pretty bad. We're spending a lot of time trying to build those relationships. It's very important. The most successful solutions and outcomes I've been involved with happen when people stop telling you why it's not their fault and telling you what they can do to help. It's that simple mindset change that generally gets you to the outcome you need and in the fastest way. It's critical to have them know what's going on on both sides.

JOHNSON

Some of our most successful field service technicians and processing plant supervisors have spent time in each

other's roles. I think that's one of the ways we've really helped live production understand food safety in the plant. Otherwise it's difficult to get them to understand why feed withdrawal is so critical for birds coming into the plant.

FULNECHEK

When I make a site visit to help both the live production and the plant people understand the consequences of decisions, one of the things I encourage the live-operations people to do — either the broiler manager or the live-operations manager — is to attend the weekly USDA plant-management meeting at least once a month. Come to that meeting prepared to talk about things that are going on and how what they're doing in live operations will affect the processing plant. It's also a good way to develop a relationship with the FSIS veterinarian.

O'CONNOR

I want to put in a plug here for our profession, which is the veterinary profession.

It was a holistic team effort when we had a *Salmonella* outbreak, but we would not have gotten through it without one of our veterinarians, our microbiologist and one of our food safety managers who has a food science degree. It was really the combination of those skillsets that got us through.

Looking back 10 years, it was myself, Dr. Stewart-Brown and not very many other folks who were actually involved in food safety. It's very beneficial to add the problem-solving mindset of a veterinarian to food safety.



'Are we going to win this battle?'



HOFACRE

We're drawing to a close. Thanks to all of you for your comments. Could we wrap this up by having each of you take just a couple of minutes to look into your crystal ball and just give us an idea of where you think the industry's going to be in 5 years with regard to *Salmonella*? Are we going to win this battle and make *Salmonella* go away? Will we ever be able to stop worrying about *Salmonella* every day?

HEEDER

The technology and sampling process for the epidemiology of outbreaks is going to continue to ratchet down on what we need to do as an industry, and the goal line will keep shifting. I think serotypes will continue to be the most important piece. I think we'll get much better at managing *Salmonella* within the system and probably have a lower prevalence.

But I also think we will have to keep chasing serotypes responsible for the next major outbreak and that the government — FDA, FSIS, Centers for Disease Control (CDC) — will continue wanting involvement in live production.

STEWART-BROWN

I'll cite four things. We need to remember that something that works in one part of the world might not work in another. We need solutions built around the US industry. I don't think we're going to cement floors in all of our chicken houses. I don't think we're going to fumigate in between each flock. Our solutions in the

US industry will require some innovation around our current business set up — dirt floors, 2- to 3-week layouts, mostly multistage hatcheries, a lot of pressure on antibiotic use, to name a few things that will not likely change much in the next 5 years.

I don't think we'll get rid of *Salmonella*, but the *Salmonella* that's in a product will be very, very low. This idea of all positives are the same needs to be rethought. Low levels are generally lower risk, and some recognition of that would be a step forward for public health. Our regulatory guidance will hopefully reflect this in the next 5 years.

We need a big change regarding comminuted products. If there is any type of product that needs some recognition, it's these and that load is important.

My last point is about serotype changes, which are humbling and make it feel like

we take two steps forward then one step backward. In 5 years, another serotype we aren't currently discussing will likely be quite prevalent in our chickens. Thankfully, many of our interventions that are relatively effective for multiple serotypes of *Salmonella* are and will continue to be helpful.

DEVILLENA

I think we'll win this battle. We have proven it time after time. When I started in this industry, the biggest bug was *Escherichia coli*, and now nobody talks about it anymore. So, I think we'll win this battle because we have a great group of professionals.

There definitely will be new testing methods available. We'll probably go to enumeration, and that's going to be the standard, I predict, in the next 5 years because, as Dr. Stewart-Brown said, if you have one cell it's not the same as having a million cells so the risk of it causing illness is very low. There will be new serovars.



I think we'll win this battle.



JUAN DEVILLENA, MS

I think the key to our industry lies in the commitment of complex managers. If the complex manager makes it clear to other folks that food safety is important, it becomes important for everybody in that plant. If the complex manager does not attend a food safety team meeting, or does not attend a USDA meeting, then it's not that important. Commitment from the top down is going to change this industry. But the key player is going to be the complex manager who puts all these different groups together.

O'CONNOR

My crystal ball is pretty big. I think PAA will eventually be banned by OSHA or some other entity. I think we are totally, completely reliant on that one compound in the plant, and we're going to be really hurting when it does get banned. That's my first prediction.

My other prediction — and this is going to be a reality, not even a prediction — is that whole-genome sequencing, which is a favorite technology of the CDC, will attribute our industry to more outbreaks of *Salmonella* because that's what *Salmonella* genome sequencing does.

If you believe that *Salmonella* as a bacteria is inherent in bird and reptile species, which it is, then you really should see salmonellosis in humans as a zoonotic disease. We're taught in school that pregnant women get toxoplasmosis from their cats. Where does the consumer get *Salmonella* from? From the chicken.

So instead of putting the emphasis on cooking temperatures, we need to flip it

“...I see irradiation as a fantastic innovation...
I just think how great it would be if we could
get rid of an inherent pathogen with one step.”

ROBERT O'CONNOR, DVM

and educate people on how to handle raw chicken. We don't emphasize food handling enough in both the industry as well as regulatory agencies. We have to focus on the handling of raw chicken.

And then lastly, I see irradiation as a fantastic innovation. Maybe it has to be tweaked so it doesn't discolor chicken. Maybe it has to be remodeled so the cost is less. But I just think how great it would be if we could get rid of an inherent pathogen with one step. Consumers could handle it whichever way they wanted, and we wouldn't have to put so much money, time, effort and energy into interventions. So that's my vision.

WHITLEY

I believe we'll see a paradigm shift of sorts with more collaboration between live production and processing in the future. They both play a major role in food safety.

I also think we could see PAA go away. It might be replaced with another chemical, but I would hope it's replaced with best management practices on the live side and in the plant. We've done some

testing with chlorine, and I've done some research on ultrasonic steam impingement. It's another big piece of technology that would allow us to get away from chemicals.

We need more emphasis on the live side, and I think we'll see that in the next 5 years. So replacing PAA, employing best management practices and better continuity between live and processing is where I see us in the next 5 years.

SMITH

There's an old Danish proverb that says it's very difficult to make predictions, especially about the future. I don't know where we'll be in 5 years. I'm also a big believer in science, and I think we'll see gradual progress. If we have a final kill step in the package that did not alter the organoleptic properties of the product, we wouldn't be having this discussion.

If we do lick *Salmonella*, I'm sure it'll be replaced by something; obviously *Campylobacter* is the big one in the room at the moment.

continued



5

'Are we going to win this battle?'

Another interesting thing to watch is going to be the interplay between groups that do not want us to eat meat and their allies who are opposed to industrial-scale agriculture and the pressure they're putting on FSIS to declare these things adulterants and to have mandatory recall power. I believe FSIS is actually relatively gently attempting to lead us on down the path with gentle, continuous pressure and raising the bar. So that interplay is going to be interesting to watch.

So, the bottom line is that I think in 5 years we'll still be far from where we need to be, but I'm hopeful that we'll be farther down that road.

JOHNSON

I can't disagree with anything anybody said. In the next 5 years, I think that some of the tools that we use today will be in the past.

If I'm focusing on just the plant, we're going to have to think out of the box on PAA, because the very thing that is helping us right now is also destroying our plants as far as floors and equipment. I think PAA is going to be taken away from us. It's good because maybe we can find something that keeps our plants in better shape. When auditors walk into our plants, the floor conditions are one thing that they pick on.

Communication is a must between our veterinarians in live production and the processing people, and we have to learn from each other. We have to have a good food safety culture throughout the whole organization.

“ If I'm focusing on just the plant, we're going to have to think out of the box on PAA, because the very thing that is helping us right now is also destroying our plants... ”

ERIN JOHNSON

FULNECHEK

In the next 5 years, there are three things I think are going to play significant roles. Dr. O'Connor mentioned whole-genome sequencing. That's going to put pressure on the industry because it's a very specific tool and a very sharp tool that will identify the sources of *Salmonella* outbreaks and the sources of the infection in the human population. That's pressure. And in response, I think the industry's going to be employing more analysis. Science and technology give us the information we need to make sound decisions about things that are contributing to your success and things that are not.

At Zoetis, corporate senior management from two of our customers have asked us to help them comply with FSIS performance standards. We've helped design pullet and broiler vaccination programs and then sampling programs. We are finding that data gathering and analysis are very effective in reducing

Salmonella recovery at the plant and helping processing plants move toward Category 1.

My last point is about research ongoing at the University of Georgia indicating there are multiple serotypes at each stage of the production process. It just happens that each has a little better ability to compete at different stages of production, which helps us understand why the type we find at the pullet level and the breeder level is different from what we find at the hatchery and different from what we find at the plant.

HOFACRE

It's been really fun to get all this brain power in one discussion. Thanks to all of you for being a part of this roundtable.



