

Reusing chicken litter shows benefits

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Broiler chickens raised on floor pens covered with litter composed of pine shavings at the University of Georgia's poultry research center. Credit: Adelumola Oladeinde

Chicken is the most consumed protein in the United States. According to

the National Chicken Council, the U.S. produced more than 9.2 billion broiler chickens in 2019. US consumers spent more than 95 billion dollars on chicken products.

All these broilers—chickens raised for meat—need millions of tons of [litter](#), or bedding material. Reusing [chicken litter](#) can save costs. There exists some health and safety concerns though.

Surprisingly, a new study shows that the environment in reused [poultry litter](#) can actually deter growth of pathogens like Salmonella.

"When you read or hear that [broiler](#) litter is reused to raise multiple flocks of chickens, the typical reaction is that it must be bad for food safety," says Adelumola Oladeinde, a co-author of the recent study. "Our study demonstrates the exact opposite."

Oladeinde is a researcher at the USDA's National Poultry Research Center in Athens. He and his colleagues found that 'good' [bacteria](#) in used poultry litter can hinder Salmonella growth.

"It may be worthwhile to invest time and resources to characterize the bacteria in reused litter," says Oladeinde. "We can develop the promising ones into [beneficial microbes](#) for better [chicken](#) gut health."

The study also explored litter characteristics, such as moisture and ammonia levels. These characteristics can dramatically affect the litter microbiome—the mix of bacteria, fungi, and viruses in litter.



Bacterial isolate from reused litter with competitive exclusion potential against *Salmonella* growing on sheep blood agar. Credit: Caroline Plymel

"Our findings provide new information on the relationship between the physical environment of broiler litter and its microbiome," says Oladeinde. "Management techniques that account for both factors may help reduce *Salmonella* in chickens."

Chicken litter plays a big role in determining broiler health. After a broiler chick gets to a farm, it usually spends the next several weeks pecking and living on litter.

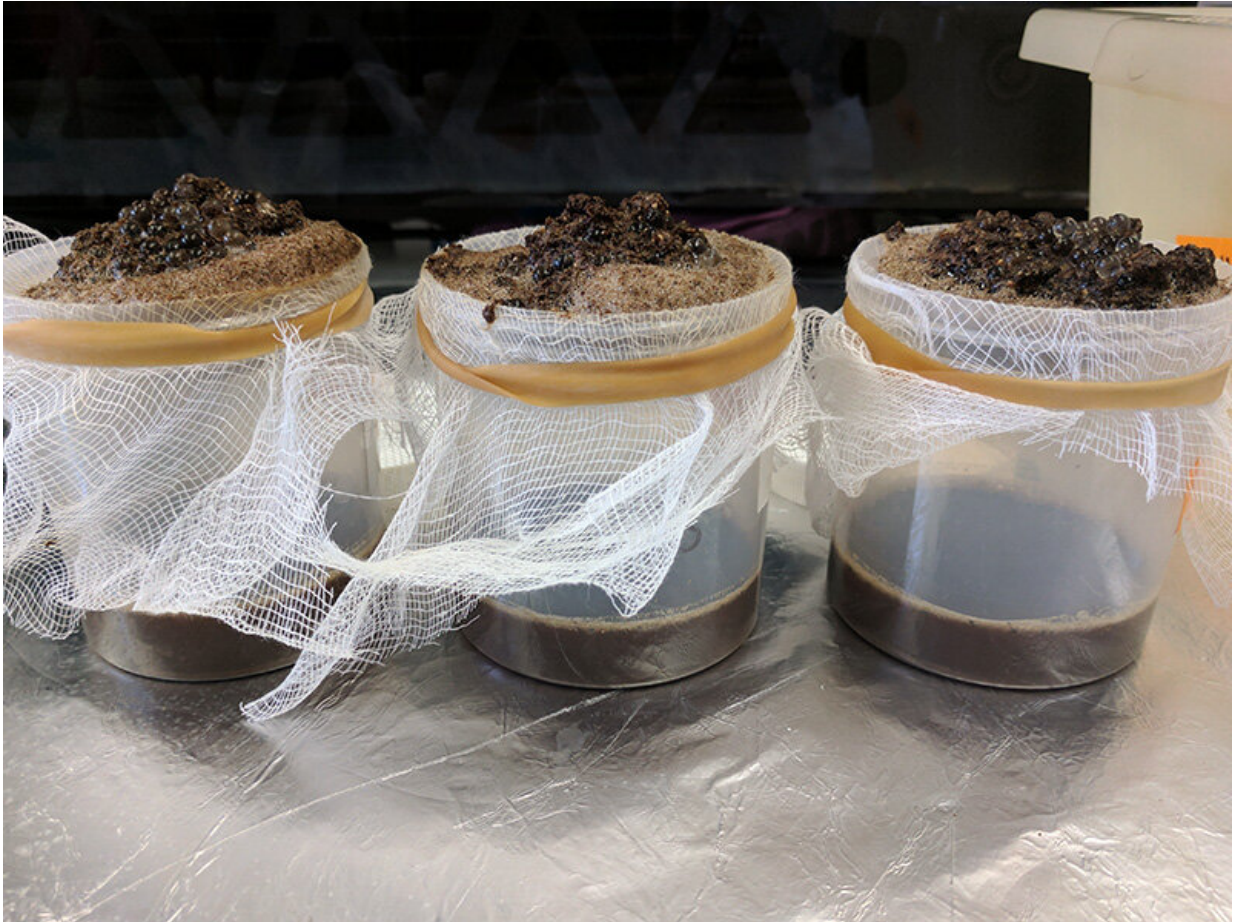
In fact, chicks begin to eat litter even before eating from feeding troughs or drinking. The microbiome present in the litter likely become the 'first settlers' in the guts of the chicks.

"These first microbes play a key role in determining gut health," says Oladeinde. "Therefore, it is critical to determine what a beneficial litter microbiome looks like."

The team collected samples of reused poultry litter from the University of Georgia Poultry Research Center. The litter was used to raise three flocks of [broiler chickens](#) under conditions like those used in broiler farms. "Each [sample](#) represents a unique broiler litter environment," says Oladeinde.

In the lab, researchers measured characteristics of the litter samples. Then they added Salmonella to each sample. After that, the samples were tested for levels of Salmonella, other bacteria, and physical characteristics.

Within two weeks of adding Salmonella, most samples developed predictable microbiomes. Certain microbes, such as Nocardiosis bacteria, seemed to reduce growth of Salmonella.



Eluate recovered from reused litter microcosm after extraction with glass beads and sieving through cheese cloth. Credit: Caroline Plymel and Gregory Zock

That makes sense, according to Oladeinde. Some species of *Nocardiosis* bacteria are known to produce antibiotics and toxins. These compounds could be keeping *Salmonella* levels low in the litter samples.

A key aspect of reusing broiler litter is how long to wait before reuse. This waiting period is called litter downtime.

"For farmers, a shorter downtime will result in growing more birds

through the year," says Oladeinde. However, we know little about how downtime affects litter microbiome.

Results from the study show that surveying levels of specific bacteria could help determine if litters have had enough downtime. That could be of big help to farmers.

"Poultry litter is a complex environment to study," says Oladeinde. "We showed that the reused litter after two weeks of downtime had a [microbiome](#) that was unfavorable to Salmonella."

Oladeinde aims to repeat these experiments with litter from various sources. He also wants to test for multiple Salmonella strains. "These studies will tell us about the underlying mechanisms behind reusing litter and reducing Salmonella," he says.

More information: Maite Ghazaleh Bucher et al. Reused poultry litter microbiome with competitive exclusion potential against Salmonella Heidelberg, *Journal of Environmental Quality* (2020). [DOI: 10.1002/jeq2.20081](#)

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