

Chickens are a crucial source of protein for people worldwide. Just like humans, a chicken's digestive system is filled with billions of tiny organisms, mostly bacteria, collectively known as the "gut microbiome". This microbiome plays a vital role in the chicken's health, affecting everything from its immune system to how it digests food. Chicks that have contact with adult hens may pick up beneficial bacteria from them. However, in large-scale chicken farms, chicks are often raised separately. We're planning to investigate how this separation from adult birds affects the chicks' gut health. We want to understand how the gut microbiome develops in young chicks and how it impacts their overall welfare.

We will study two groups of chicks: one group raised with the adult hen and another group raised separately. Our goal is to see how their gut microbiome changes over time during development. To do that we will collect faecal samples from chicks and hens at multiple timepoints. We'll extract DNA from faecal samples and use a method called "whole metagenome sequencing" to read all the DNA of microorganisms from these samples. This will allow us to look at the genetic code of all the microbes and by using computational methods we will reveal the organisms, and their genes present in the original samples. Compared to previous studies, which focused on selected regions of DNA characteristic for certain types of bacteria (species), we're doing something new: looking at the chicken gut microbiome with super-fine detail until we not only can see different species of bacteria, but different versions of those bacteria (strains). This is important because even small differences can mean big changes in what those bacteria do. By building complete genetic profiles and comparing them, we can pinpoint the exact bacterial strains shared between hens and chicks or chicks and the environment. We will develop advanced computational methods to trace these bacterial strain transmissions and see how long they remain in the chick's gut. We'll also compare the chicks' health in both groups by looking at things like, for example, biomarkers of gut inflammation.

We expect that chicks raised with hens will develop a healthier gut microbiome because they receive beneficial bacteria directly from the adult hens. We believe these chicks will have stronger immune systems and better gut health compared to chicks raised separately. We also expect the microbiome of chicks raised with hens to be more capable of processing certain nutrients than the microbiome of chicks raised separately. We aim to identify specific strains of bacteria that are associated with good health in chickens. These "good bacteria" could potentially be used as probiotics to improve the health of chickens raised in commercial settings. We'll also develop user-friendly computer tools to help other researchers study similar type of data from other organisms, even if they don't have extensive computer skills.

By understanding how transmission of gut bacteria from adult hen affects the development of gut microbiome in chicks, we can facilitate development of strategies to improve chicken health and welfare. This research could lead to more efficient and sustainable chicken farming practices, reducing the need for use of antibiotics. Healthier chickens mean safer and more reliable food for everyone, as well as reduced financial risks for farmers.