Residual feed intake (RFI) is the difference between observed and expected feed intake, and can be used as a measure for dietary efficiency. Non-efficient R+ animals may partition their energy towards maintenance and production processes differently than efficient R- animals. Moreover, partitioning may also be affected by an infectious challenge that forces animals to direct more resources to maintenance processes, such as the immune system. Therefore, we investigated energy partitioning and immune reactivity in phenotypically selected R+ and R- chickens during a *Salmonella enteritidis* infection or in a control situation.

We measured energy partitioning each week during 5-wk trials in 15-wk-old R+ and R- pullets. Blood samples were taken at day 0 before and at day 7 and 21 after infection, and were evaluated for *Salmonella* somatic O and flagella H antibodies in agglutination tests, for antibodies against *Salmonella* LPS in an ELISA, and for T-cell activity.

There were no *Salmonella* effects and no interactions in energy partitioning parameters between RFI group and *Salmonella* treatment. R+ chickens had a higher metabolizable energy (ME) intake, heat production, and ME for maintenance than R- chickens. There were (tendencies towards) interactions between RFI group and *Salmonella* treatment in day 7 plasma samples tested for anti-LPS antibodies, H agglutination, and T-cell activity: R+ chickens had a higher immune status in uninfected conditions, whereas R- chickens had higher immune responses in infected conditions. In day 7 plasma samples, R- chickens showed significantly more O agglutination than R+ chickens.

We conclude that R+ chickens have a more active metabolism, which is possibly linked to a more active immune system in an uninfected state. However, R+ chickens do not respond as strongly as R- chickens, 7 days after infection. Keeping immune activity high in an uninfected state, as R+ chickens do, can be considered as an act of inefficiency at the cost of a lower immune reactivity after challenge, but the strategy of an accelerated immune response, as in R- chickens, may be more dangerous when an animal contracts a highly pathogenic antigen with a high risk of mortality. It is unclear, whether the lower immune reactivity after challenge in R+ chickens is a matter of not needing or not being able to mount a stronger response.

**Keywords:** dietary efficiency; *Salmonella enteritidis*; energy partitioning; immune reactivity