Another batch of eggs was hatched at temperatures of between 36.7 and 38.9, did not get immediate access to food and drink, and were kept in a cage. These conditions are common in the poultry sector. When the chicks were exposed to an intestinal parasite at the age of 53 days, the chicks in the first group were affected much less severely. “All the chicks fell ill, but the first group lost less weight than the second group”, says Walstra.

Poultry farmers obtain more resilient laying hens if more care is taken at the hatchery over the temperature in the hatching machine and the living conditions for the young chicks, concluded Walstra. It can be difficult to make the second improvement because standard hatcheries do not have space for chicks to free-range before they are delivered to the poultry farmers.

Walstra calls her experimental research a first step towards an alternative method of improving animal health without using drugs. She does add that the resistance of the laying hens is also influenced by the conditions in the barn, the virulence of the pathogens concerned and the poultry farmer's management.

Research on Horizontal Transmission of Salmonella in Caged and Floor Housed Hens
* Hannah, J.F. et al  
The September 2011 edition of *Avian Diseases* contains an article of significance to the U.S. egg production industry with respect to transmission of Salmonella*.  
Hens were infected under laboratory conditions with either *Salmonella Typhimurium* or *Salmonella Enteritidis*.  Either oral, intravaginal or intracolonic routes were used.

Hens were held for seven days after inoculation and were then comingled with susceptible hens in either cages, or on slats or on litter. After ten days of comingling hens were sampled using drag swabs. Twelve days after the initiation of the contact component of the trial all hens were sacrificed and organs were examined for the presence of *Salmonella* using routine bacteriology.

Approximately 15% of the non-challenged contact hens in cages yielded *Salmonella* from the cecum compared to 20% on slats and 30% on wood shavings. Among the challenged hens, 20% yielded *Salmonella* from the cecum and 13% from the lower reproductive tract. The challenged hens on slats yielded *Salmonella* in the range of 12% through 25% from the cecum, spleen, liver, and the upper and the lower reproductive tracts but not from ovarian follicles. Hens on wood shavings yielded *Salmonella* ranging from 8% through 15% from the same sites but again not from follicles.

The significant conclusions from the trial were:
Horizontal transmission was lowest in cages followed by slats. Floor systems were the most likely to support horizontal transmission between shedder hens and susceptible contacts.

The rates of recovery of *Salmonella* Enteritidis from tissues following infection or from contact hens were extremely low. This is consistent with previous literature reports which show ranges of 2.5% to 7% recovery following administration of large doses of *Salmonella* Enteritidis (10⁹ cfu/ml) which is far in excess of what might occur under commercial housing conditions.

The fact that hens appear relatively resistant to intestinal colonization and extension to organs following controlled infection suggests that protection can be enhanced by durable immunization and administering combinations of prebiotics and probiotics in feed. It is hoped that the research team at the Richard B. Russell Agricultural Research Center will review these aspects of protection in subsequent studies since this would have profound commercial implications.

The significance of this article is that it refutes the conclusions derived from studies in Europe that implicate cages as a risk factor for SE infection in comparison to floor systems.

**Addressing the Challenges of Alternative Housing Systems for Poultry**

The Poultry Site, November 2011

'Alternative Systems for Poultry – Health, Welfare and Productivity', organised by the UK Branch of the WPSA

**Development of Furnished Cages for Laying Hens**

"Directive 99/74/EC has made the biggest impact on animal welfare in the EU in the shortest time," said Arnold Elson of ADAS Gleadthorpe in the UK in the introduction to his presentation, which was prepared with Dr Ragnar Tauson of the Swedish University of Agricultural Sciences.

The majority of hens have been – or will be – moved to furnished cages (FC) as a result of the Directive, which comes into effect on 1 January 2012, he said, increasing production costs. In fact, FC were conceived more than 30 years ago when welfare deficiencies of barren conventional cages were realised. Their use was intended to enhance hens' behavioural repertoire and welfare without the disadvantages of non-cage and extensive housing.

Since then, their design has been refined and improved, resulting in much improved performance and hen welfare. With 750 square centimetres per bird, FCs offer hens more space than conventional cages, as well as perches, nest boxes and a scratching area, in addition to the feed trough and drinkers.