Evaluation of a Campylobacter-N-glycan presenting Salmonella Typhimurium for vaccination of broiler chickens against Campylobacter

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Key words
Campylobacteriosis, broiler chicken, live-attenuated vaccine, campylobacter-N-glycan, humoral immune response, maternal antibodies

Aim of the study
„Proof-of-concept" study. A newly created live-attenuated S. Typhimurium vaccine strain, expressing the Campylobacter-N-glycan (a heptasaccharide) on its surface, was tested in broiler chickens.

Material and methods
102 commercial day-of-hatch broiler chickens were used in this study. Animals vaccinated on day-of-hatch were kept in isolators for 25 to 35 days with feed and water ad libitum. Blood samples for immunoblot analysis were collected on day 10, 15, 20, 25, (30 and 35). At the end of the experiment, chickens were killed and dissected. Caecal contents was used for quantitative Salmonella detection and in the challenge experiments also for quantitative Campylobacter counting. Real-time PCR standards were set for C. jejuni (Hong et al. 2007) and S. Typhimurium (Park et al. 2008) and used for quantitation of the vaccine strain and the challenge strain in liver, spleen and caecal contents.

Results and significance
The first four days after vaccination self-limiting diarrhoea was observed. The S. Typhimurium vaccine strain was found in liver and spleen 25 days after vaccination using bacteriology and real-time PCR. Up to 3 x 107 cfu/g S. Typhimurium were detected in caecal contents at the end of the experiments. In immunoblot analysis maternal anti-N-glycan IgY were present in sera of all animals until day 15. No anti-N-glycan IgM and IgY were detectable until day 25, thus the vaccine could not stimulate an active humoral immune response against the Campylobacter heptasaccharide. In sera from challenged animals specific IgM and IgY antibodies were detected on day 25 or 35, proving an elicited immune response presumptive to the challenge C jejuni strain. In challenge experiments no biologically significant reduction of C jejuni in caecal contents was observed. In conclusion, the vaccine S. Typhimurium was able to colonise the chicken without provoking severe disease. The commercial broiler chickens used had maternal IgY against the Campylobacter-N-glycan. Chickens did not produce an immune response to the vaccine, however did produce anti-N-glycan IgM and IgY following p.o. inoculation of C. jejuni.The experiments showed that the vaccine is safe in broiler chicken and that the Campylobacter-N-glycan is immunogenic in chicken. However presentation on the Salmonella surface and timepoint of vaccination needs to be adjusted.

Publications, posters and presentations
Presentation: Campylobacter Plattform 2010, Bern, 4. November 2010 (Schweizer Zoonosebericht 2011 Seite 9-11)
Presentation: Geflügelseminar der Fachsektion für Geflügelkrankheiten, Zürich, 23. März 2011

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