

Expression of influenza A (H5N1) vaccine in barley grains for oral bird immunization

Bruchmüller, A.¹, C. Marthe¹, G. Hensel¹, B. Sode¹, S. Goedeke¹, N. Borisjuk², R. Brodzik², H. Koprowski² and J. Kumlehn¹

¹Leibniz Institute of Plant Genetics and Crop Plant Research, Gatersleben, Germany

²Biotechnology Foundation Laboratories, Thomas Jefferson University, Philadelphia, USA

Outbreaks of the highly pathogenic avian influenza A (H5N1) virus killed thousands of wild and domestic birds in Asia. Single human fatalities caused by the H5N1 strain have also been reported recently. The H5N1 strain has spread further, and animals infected by the virus, probably through contact with migratory birds, have been found in Europe. The development of a cost-effective vaccine for the immunization of both domestic and wild birds is mandatory. Furthermore, control of H5N1 through vaccination in the avian population will greatly reduce the risk of virus transfer across species. It is of great interest that a major outbreak in humans, as was observed in 1918, will be avoided. Our strategy to generate a vaccine against the H5N1 influenza A virus is based on the expression of hemagglutinin (HA), a major virus surface antigen, in plant tissue that may be used for massive oral immunization of birds. Various transient and stable plant expression systems have been tested. Among those, a codon-optimized HA1 antigen driven by the seed specific α -gliadin promoter of wheat resulted in the highest expression. Representative molecular and biochemical analyses of transgenic barley have been performed. Western blot analysis revealed a particularly high expression of HA1 in the seeds of two out of 84 transgenic lines. Immunological evaluations of recombinant H5N1 hemagglutinin antigen are in progress.