

Identification of Mucin 2 as a Strong Promoter for Gut-Specific Genes

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As per capita consumption of poultry continues to increase, it is necessary for the poultry industry to optimize production to accommodate the growing demand. Discovery of gut-specific genes could significantly improve poultry production. In the present study, the mucin 2 promoter is used to drive overexpression of green fluorescent protein (GFP) in intestinal tissue. Through comparison of gene expression in different tissues, the gut specificity of mucin 2 expression was confirmed in mice and humans. RT-PCR data indicates that poultry have mucin 2 expression exclusively in their small and large intestines, suggesting the mucin 2 promoter can be used to drive expression of target genes in the gut. Lentiviral particles were generated to contain the 2.9kb mucin 2 promoter and GFP gene downstream of the promoter. The vector was then transfected in a human intestinal epithelial cell line (Caco-2 cells) and confirmed to exhibit green fluorescence in these gut cells. A microneedle and injector was used to inject the lentiviral particles, containing the target gene constructs, into the subgerminal cavity of the blastodisc. Fifteen chimeric founder lines were generated after injection of 107 wild type quail eggs. Chimeric hatchlings were grown to sexual maturity and mated with wild type quail to determine which chimeras had the transgene present in their gametes. Their offspring are currently being genotyped by PCR to detect vector integration. Currently, one transgenic offspring has been confirmed. Transgenic birds will be maintained as generation 1 (G1) lines. The offspring of G1 lines will be analyzed by Western blot and immunofluorescence imaging to confirm GFP expression only in gut epithelial cells. Following confirmation of gut-specificity, the promoter can be utilized to drive overexpression of target genes in intestinal tissue that could improve production and reduce the impact of the poultry industry on the environment.