Abstract

Development of a test method for transgenerational effects of genetically modified crops in food using the zebrafish model.

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Ever since **genetically modified (GM) crops** were introduced, their safety regarding human consumption has been questioned. One of the main concerns is that the current methods for GMO evaluation do not specifically assess effects on development or reproduction. Therefore, the goal of this study is to develop a **new method**, using the zebrafish model, to assess **transgenerational effects** of GM crops in food.
Since **GM maize** was selected to develop the new method, the first step was to determine the **maximum percentage of maize** tolerable for zebrafish. Fish were fed for 4 weeks with 3 controls and 6 experimental feeds ranging from 0% to 25% of **non-GM maize**. Growth slightly decreased when fish were fed with 0% or 25% of maize. The hepatosomatic index (percentage liver weight/total body weight) of males significantly increased when fed with 20% or 25% of maize. Feed digestibility analysis showed a decreasing carbohydrate uptake when fed with an increasing percentage of maize. Based on these outcomes, we selected **15% maize** as maximum tolerable percentage.
Furthermore, it is important that any potential effect of a GM crop is interpreted relative to the **natural variation,** found in response to feeding with non-GM varieties of the same **crop species**. We therefore fed zebrafish for 12 weeks with 10 different non-GM maize varieties (15%). The fact that we observed some significant differences highlights the importance of defining the response variation as even feeding with non-GM varieties can cause significant differences.
Next, a **transgenerational** experiment was initiated to investigate whether the test system allows us to assess potential transgenerational effects. After 16 weeks of feeding with an experimental and a commercial GM maize and their corresponding non-GM controls (15%), no significant differences were observed. We continued by producing the first generation. Since there is no GMO available that causes adverse effects due to the genetic modification itself, a true positive control cannot be included in the experiment. Therefore, we opted to expose a subset of every generation to a well-known toxicant, more specifically **cadmium,** as a **positive experiment control** to monitor the sensitivity of the zebrafish over the different generations.