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Effect of climate change on mycotoxins contamination in grape must

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Background and objectives: Mycotoxins are among the most toxic and dangerous chemicals that can be potentially present in food. Public awareness of the mycotoxin contamination is mostly related to nuts, cereals and legumes. However contamination of wines and apple processed food (i.e. apple juice) by mycotoxins is well documented. Mycotoxins are produced by a range of fungi mostly described as secondary or storage pathogens. These fungi appear toward or at harvest and grow on the product if the conditions are suitable. If the product is consumed directly the rotten part are commonly discarded. If processed these parts and possible undesired substances end in the final product. In grape *Aspergillus* spp. mostly *A. carbonarius* is known to produce ochratoxin A (OTA). In cold-temperate environments little relevance is given to the potential presence of mycotoxins on grapes and in wine as the problem is rather marginal and restricted to southern Italy and other wine producing countries with warm climate. The distribution pattern and the seasonal variation of OTA quantities suggest that hot and dry summers are favourable to the development. The grape moths act as vectors for conidial dispersal of OTA-producing fungi. The inoculum derives from the soil where the fungus survives ubiquitously on organic matter. The Trentino region located in northern Italy in the Alps is a high quality vine producing area where overseas export is relevant and mycotoxin contamination would hamper profitable production. Climate change has and will affect the alpine valleys as the average temperature over the past 20 year shows a clear increase. Our objective is to test if and at what amount an increase in temperature increases the presence of OTA in grape must. In particular we aim to develop local scenario for risk of contamination of wine with mycotoxins based on a temperature driven model of the pathogen development and on the production of mycotoxins and to deliver a rapid and highly sensitive test for detecting the fungus and mycotoxin production in risk areas.

Results: A sampling, giving the base line was performed in 1999 in Trentino on the cv. Chardonnay, Merlot and Nosiola. No *Aspergilli* potentially producing OTA were identified. In total in the samples from 13 vineyards only two *Aspergilli* isolates were obtained, both determined as *Aspergillus niger* whose strains are known to be poor OTA producers. No trace of OTA was found in the musts. Artificial inoculation shortly after harvest with a strain of *Aspergillus ochraceus* isolated from raisins and able to produce OTA in vitro of must did not lead to the presence of detectable quantities of OTA. Currently black mould-causing *Aspergilli* strains are isolated from a range of vineyards and situations such as late harvest and tested for presence of genes of the biosynthesis of OTA, the expression of the genes and the production of OTA under varying temperature conditions.

Conclusions: permanent small changes, often only perceived as a trend such as the temperature increase of the past 20 years may lead to unexpected problems. Presence and contamination of grapes by OTA producing *Aspergilli* such as *A. carbonarius* known from southern areas may become frequent. Presence alone does not signify automatically production OTA. The climate change may create the conditions for OTA production and accumulation. Unknown mycotoxins contamination in a high value product can lead to high economical losses. A risk assessment of the effect of climate change on the presence and development of black mold and the potential mycotoxin contamination of grape must is part of the needed adaptation measures to climate change.