Effects of occupational exposure to glyphosate in winegrowers

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Abstract

Glyphosate is a non-selective systemic herbicide used in agriculture. For almost half a century, the International Agency for Research on Cancer has run a Monographs program, the conclusion in March 2015 that glyphosate is “probably carcinogenic to humans” in addition to being genotoxic and carcinogenic in animals, while the regulatory European Food Safety Authority have asserted that glyphosate poses no public risk. The scientific debate is still lively. Until now, there are no studies simultaneously evaluating, in winegrowers exposed to glyphosate and other pesticides, indicators of exposure and effect through biological monitoring, immunological indicators, genotoxicity and regulators of gene expression.

Our study aimed to investigate exposure to glyphosate and other pesticides in winegrowers as well as potential effects regarding genotoxicity, immunomodulation and gene expression. The study was carried out within the framework of the Regional Plan for Prevention 2014/18 denominated “Prevenzione degli infortuni e malattie professionali in agricoltura”.

Materials and Methods

By means of questionnaires, we collected detailed socio-demographic, occupational exposures and health surveillance information for 26 winegrowers; quantities, timing and ways of glyphosate and pesticides use were also collected through official health authority registers. As for biological monitoring of exposure, 24-hour urine glyphosate was chosen as the indicator which was evaluated pre and post application. The following analyses were performed before and after the use of glyphosate during the period of pesticides treatments: we monitored general blood chemistry parameters, immune function (IL-4, IL-5, IL-8, IL-12, IL-17, IL-33, IFN-γ), possible transcriptional and post-transcriptional alterations (miRNA), potential genotoxic effects (Comet assay on lymphocytes DNA). Statistical analysis used Wilcoxon signed-rank test and three-way variance analysis with repeated measures after normalizing the outcome variables with appropriate linearizing transformations.

Results

In our study population, glyphosate exposure was low in quantity, limited in duration and appropriate in mode. Biological monitoring did not show high absorption rates; immunologic tests seemed to show some modification (after vs before usage), limited to IL-4, IL-5, IL-8 and IFN-γ. Genotoxic alterations were not evident. Further statistical analyses are in progress for the remaining indicators.

Conclusions

The exposure conditions in our winegrowers, as referred to the parameters so far analyzed, did not reveal a significant glyphosate absorption nor significant health concerns. Potential effects due to the use of glyphosate and other pesticides on immunomodulation, as well as on gene transcription and post-transcriptional regulation are currently under investigation.

References

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