

Concerns around regulatory actions for pesticides

We, concerned Parkinson scientists, make an urgent appeal to governments and policy makers throughout the European Union to consider the arguments listed below in preparation for the vote the 16th of November, and to work towards an amended authorization of glyphosate for a briefer period of time, coupled to rigorous neuro- toxicological evaluations.

Our opinion is based on two main considerations, which we illustrate here using Parkinson's disease (PD) as showcase. Importantly, PD is the world's fastest growing neurological disease; the number of people affected by PD is expected to double in the next 20 years, unless we act now. Similar concerns as outlined below likely also apply to other neurodegenerative diseases, such as Alzheimer's or motor neuron disease (ALS), and intellectual disabilities in exposed children.

1. Current regulatory actions are inadequate to assess the risk of neurodegenerative diseases

It is presently impossible to estimate the safety of glyphosate in relation to PD. This is because the current regulatory actions, as defined by the EFSA, have serious shortcomings.

- a. **Current procedures to test for neurotoxicity are far too crude.** The risk of neurodegeneration is assessed primarily by evaluating the occurrence of clinically discernible neurological symptoms in exposed animals. However, in case of PD, symptoms arise only after loss of some 60-70% of brain cells. If, for example, 40% of those cells have died, the test animal would appear to be perfectly healthy, but the pesticide under study is anything but safe. Therefore, the absence of neurological symptoms in such an animal experiment does not exclude the possibility of relevant damage. Targeted post-mortem cell counts in relevant brain regions are therefore necessary, but this is not part of current regulatory actions. This shortcoming had been recognized for many years by international researchers⁵, but are now also acknowledged by the EFSA itself (work conference, September 2022).
- b. **Glyphosate doses used to date are not representative of everyday exposure.** Specifically, the present experiments test glyphosate concentrations that typically reach humans after dietary exposure. However, glyphosate can travel long distances through the air, creating another route of exposure. It has been shown by the international SPRINT study (*Sustainable Plant Protection Transition*), that residues of glyphosate were found to be present in the faeces of 70% in a sample of 700 EU inhabitants. Also, there are high concentrations of glyphosate and other pesticides found in house dust in the homes of farmers, as well as those of residents living nearby farmland, thus creating exposure via the skin and inhalation. These routes of entry and such high concentrations should be considered explicitly when assessing the neurotoxicity of glyphosate.
- c. **The effects of human exposure to 'cocktails' of pesticides is not addressed.** Currently, only isolated pesticides are being assessed. However, the reality is that farmers, nearby residents and ultimately all citizens are exposed to so-called cocktails which contain multiple pesticides. It is unclear what the summed exposure to these different pesticides means for public health, however, recent work showed that co-exposures to different pesticides results in greater neurotoxicity in the brain region involved in PD than a single pesticide¹⁰. These

findings suggest that little can be said about the safety of any of the pesticides that are currently in use, including glyphosate.

- d. **Pesticides such as glyphosate may also be associated with neurodegeneration by affecting the gut microbiome.** It is important to note that glyphosate is an antibiotic. Animal studies have shown changes in bacteria in the gut following exposure to glyphosate⁸. It is possible that such microbial changes could act as the first event triggering a cascade of neurodegenerative processes, spreading from intestinal neurons to the brain⁹. Evaluation of changes in gut microbiome and subsequent downstream neurodegenerative processes should therefore be part of improved regulatory actions.
- e. **Research on glyphosate (and other pesticides) has been conducted by industry itself.** Most of the research in the review file is funded and conducted by the industry itself. The media have recently drawn attention to the fact that industry omits and even hides relevant findings, such as a relevant study had been omitted that linked glyphosate exposure to neurotoxicity in young rats that had been exposed in utero, from the evaluation dossier.

So, taken together, there is a serious "data gap" when it comes to glyphosate and the risk of PD and other neurodegenerative diseases and this gap was not addressed at all in the reassessment dossier.

2. Glyphosate might be a cause of Parkinson's disease

There is concrete evidence that glyphosate could be a possible cause of Parkinson's disease, indicated by four cases studies and three epidemiological studies. In addition, several animal studies also showed a possible link. This evidence is not conclusive, however, there is sufficient evidence to believe that there is a biologically plausible link between exposure to glyphosate and damage to the specific brain region involved in Parkinson's disease. This evidence, taken together with the identified shortcomings in the regulatory actions as well as the rapid growth of PD, is a cause for serious concern.

Conclusion

We would offer the following advice to governments and policy makers throughout the European Union: (1) Vote against renewing the marketing authorization for glyphosate by another 10 years, but instead consider an admission for a much briefer period of time, ideally a maximum of 3 to 5 years. (2) Urge European authorities to release funding for the rapid development of improved regulatory actions, specifically targeting the risk of PD and other neurodegenerative diseases. (3) Have glyphosate evaluated according to this new framework by independent scientific institutions, and immediately include other pesticides currently used in Europe in the same evaluation process. Depending on the outcome, glyphosate can be extended for much longer if proven to be safe, should be banned if proven to be directly neurotoxic to brain areas involved in PD or other neurodegenerative disorders. (4) In parallel, alternatives to the use of pesticides must be vigorously pursued.

The outlined measures will help to protect the European population from PD and other health risks and slow the Parkinson pandemic.