

# AfrAbia's silent struggle: Pesticides and Parkinson's disease unveiled

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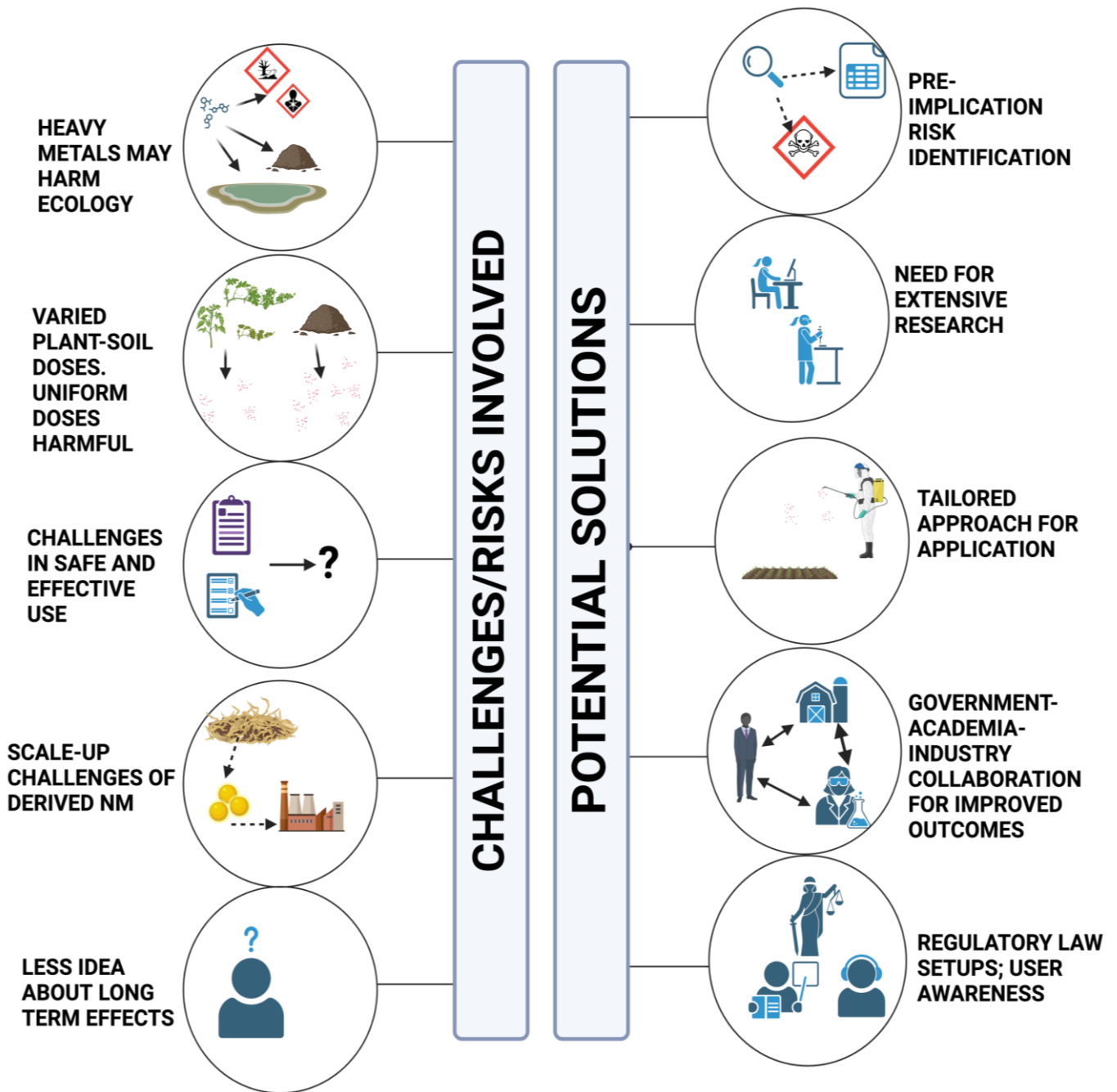
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AfrAbia consists of members from both the Arab League and the African Union. The historical and geographical effects connect the neighbouring regions of Africa and the Arab world on a cross-cultural level ([Mohamed, 2023](#)). AfrAbia experiences a greater prevalence of autosomal recessive neurodegenerative disorders because of elevated rates of consanguinity. The AfrAbian neuroscience community has unique problems due to the widespread occurrence of mental, neurological, and substance-use disorders ([Feigin et al., 2017, 2019](#)). The limited physician-to-patient ratio can lead to heavy workloads per clinician, fostering expertise in their field due to increased practice opportunities arising from the demanding workload. The heightened clinical exposure leads to the emergence of study topics relevant to the local context. It improves the feasibility of clinical research, benefiting both the African population and the Global North. To summarise, there are abundant prospects for clinically focused neuroscience research to enhance healthcare in AfrAbia.

Most human studies, particularly genetic investigations, focus on individuals of Northern European heritage ([Sirugo et al., 2019](#)). Incomplete ancestral representation in genetics impedes precise genetic mapping, limits the deployment of tailored therapeutics to studied populations, and complicates comprehension of disease biology. It also leads to the unsupported generalisation of current genetics to under-represented groups ([Wojcik et al., 2019](#)). A similar lack of variety has

been seen in studies on Parkinson's illness. In 2020, the Global Parkinson's Genetics Programme (GP2) was launched in response to the need for more diverse research. GP2 aims to advance global understanding of Parkinson's disease (PD) genetics and its architecture. The establishment of the AfrAbia Parkinson's Disease Genomic Consortium (AA-PDGC) in 2023 directly resulted from this work. The research is focused on investigating the genetic determinants contributing to PD and its many phenotypic expressions, such as the age of onset, probable clinical subtypes, and their correlation with those seen in persons of northern European ancestry. The partnership aims to facilitate the growth of research in other locations by involving organisations outside of AA-PDGC.

PD prevalence has surged significantly in recent decades, making it the fastest-growing neurological disorder worldwide ([Dorsey et al., 2018](#); [GBD, 2016](#)). Furthermore, the development of PD is influenced not only by the natural process of ageing and hereditary variables but also by long-term exposure to low-level risk factors such as environmental toxins ([Dorsey et al., 2023](#); [Paul et al., 2023](#)). Pesticides are a kind of environmental pollutants that have been associated with the cause of PD. There is evidence to suggest that farmers have a notably higher likelihood of acquiring Parkinson's disease compared to the general population ([Dorsey et al., 2023](#)). Additionally, those who live near farms where pesticides are used may also be at an



**Figure 1. Challenges and solutions for using pesticides in AfrAbia countries.** "Varied plant-soil doses" refers to applying different amounts of nutrients or substances to plants or soil based on their specific needs. This approach acknowledges that different plants may require varying levels of nutrients or other substances for optimal growth and health. On the other hand, "uniform doses harmful" suggests that applying the same amount of nutrients or substances uniformly across all plants or soil can be detrimental. This is because not all plants or soil have the exact requirements, and applying excessive amounts of certain substances can lead to imbalances, nutrient deficiencies, or even toxicity, which can harm plant growth and soil health. In essence, the former approach recognises and responds to the individual needs of plants and soil. At the same time, the latter can lead to negative consequences due to over-application or under-application of necessary substances. NM: Nano-materials. The figure was generated by BioRender.

elevated risk (Paul et al., 2023). Pesticides have a toxic effect on dopamine-producing cells in the substantia nigra, resulting in Parkinsonian symptoms in animals that are exposed to them (Dorsey et al., 2018). The prevalence of PD in AfrAbia is not exempt from the worldwide increase in cases, although it is lower than in Canada and the United States, according to a 2016 GBD study. The age-adjusted PD prevalence in AfrAbia is around three to four times lower than in Canada and the United States. Data on the occurrence of PD is scarce (GBD, 2016; Dotchin et al., 2008).

Considering the epidemiological and experimental evidence that shows a clear connection between pesticide exposure and PD, it is expected that rural AfrAbia areas will experience an increase in the prevalence of PD due to the longer life expectancy (Figure 1). The future generations of AfrAbian may see a higher prevalence of PD due to the escalated utilisation of pesticides and subsequent exposure. Several interrelated elements contribute to this phenomenon: (1) The AfrAbia area has rapidly grown agricultural intensification, which may have resulted in higher levels of pesticide use. With the intensification of agricultural operations to fulfil the rising demand for food, farmers are using pesticides to manage pests, weeds, and illnesses, which unintentionally leads to higher levels of exposure; (2) Insufficient rules: Inadequate or ineffectively implemented rules for pesticide use and safety precautions might lead to excessive and inappropriate application of these substances. Lack of sufficient training and supervision may lead to excessive or improper application of pesticides, increasing the likelihood of farmers and communities being exposed to them. (3) Insufficient provision of protective equipment and lack of awareness: The lack of adequate access to personal protective equipment (PPE) among farmers and agricultural workers, along with little understanding of the possible health hazards linked to pesticide exposure, heightens susceptibility to negative consequences. Insufficient safeguards may lead to persons being exposed to pesticides directly as they handle, spray, or engage in post-application activities. (4) Pesticide Persistence and Accumulation: Certain pesticides used in agricultural techniques have prolonged environmental persistence, resulting in their

gradual accumulation in soil, water, and food crops. Prolonged exposure to these enduring pesticides might increase the likelihood of adverse health consequences, such as neurological illnesses like Parkinson's disease (PD). (5) Environmental Contamination: Pesticides have the potential to pollute water supplies, soil and air as a result of runoff, leaching, and spray drift. Individuals living in close proximity to agricultural regions may come into contact with pesticide residues via the intake of polluted water, inhalation of airborne particles, or eating of food crops cultivated on soil treated with pesticides. (6) Insufficient healthcare infrastructure in the AfrAbia area may impede the timely identification, diagnosis, and treatment of PD patients. Restricted availability of medical facilities, proficient healthcare practitioners, and diagnostic instruments may cause intervention delays and worsen the illness's consequences on affected persons and communities.

To tackle these challenges, a comprehensive strategy is needed. This strategy should involve implementing more stringent regulations and enforcement measures for pesticide use, promoting safer agricultural practices, providing adequate training and protective equipment for farmers, raising public awareness about the risks associated with pesticides, and investing in healthcare infrastructure to facilitate early detection and treatment of neurological disorders such as Parkinson's disease (PD). In addition, implementing sustainable agriculture methods that decrease dependence on chemical pesticides and prioritise the well-being of ecosystems might effectively address environmental pollution and protect human health in the future.

The use of pesticides in AfrAbia presents a complex issue since safety has been compromised in favour of increased output. Pesticides play a crucial role in ensuring food security and the prevention of acute human infectious diseases. There is a pressing need for cost-effective and less harmful pesticides or non-chemical alternatives like biological farming to replace neurologically damaging pesticide use. As the Parkinson's pandemic persists, it will undoubtedly provide further insight into the crucial impact of pesticides on PD in AfrAbia and elsewhere.

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