Drugs used to treat HIV and flu can have detrimental impact on crops

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The increased global use of antiviral and antiretroviral medication could have a detrimental impact on crops and potentially heighten resistance to their effects, new research has suggested.

Scientists from the UK and Kenya found that lettuce plants exposed to a

higher concentration of four commonly-used drugs could be more than a third smaller in biomass than those grown in a drug-free environment.

They also examined how the chemicals transferred throughout the crop and found that, in some cases, concentrations were as strong in the leaves as they were in the roots.

The study—published in *Science of the Total Environment*—was conducted by environmental chemists from the University of Plymouth (UK), Kisii University (Kenya) and Jomo Kenyatta University of Agriculture and Technology (Kenya).

It is one of the first worldwide to examine the impact of pharmaceutical compounds on agriculture, and to consider the subsequent risks for consumers.

For it, scientists focused on the drugs nevirapine, lamivudine and efavirenz—which are used to treat and prevent HIV/AIDS—and oseltamivir, which stops the spread of the flu virus in the body.

However, they say it is also relevant in light of the current COVID-19 pandemic, with antiviral medications having been approved for use to treat those affected by the virus.

Such compounds get into soils when they are irrigated with contaminated surface water, treated or untreated waste water, sewage sludge and biosolids.

Through a series of analyses, they showed there were differing levels of uptake across the four drugs with lamivudine exhibiting the lowest bioaccumulation—a level similar to that shown previously with caffeine.

However, when exposed to a combination of the four drugs (as would be

found in the wider environment) mean leaf and root mass was reduced by 34%.

Preston Akenga, Ph.D. researcher and the study's lead author, said: "The occurrence of pharmaceutical compounds in the environment is well documented. While the environmental levels measured may not pose a direct threat to human health, evidence of ecological effects in both aquatic and terrestrial systems demonstrates an environmental impact that could be significant if left unchecked."

The research team has previously suggested that failure to ensure the environmental sustainability of growing patient access to medicines in developing economies could increase the risk of adverse environmental impacts.

They also published research highlighting that the increased use of antibiotics in people with COVID-19 could be placing an additional burden on waste water treatment works and resulting in increased resistance to the drugs' benefits among the wider population.

Mark Fitzsimons, Professor of Environment Chemistry and a co-author on the research, said: "The successful trialing of antiviral drugs in the treatment of COVID-19 is positive for human health outcomes, but may result in significant additional input of pharmaceutical compounds to the environment leading to unintended ecological consequences."

Sean Comber, Professor of Environment Chemistry and the senior author on the research, added: "We hope this is the start of taking the fate and behavior of antibiotic and antiviral drugs in the environment seriously. We can therefore link the prescription and the consequences for the benefit of both the patient and the ecosystem as a whole."

More information: Preston Akenga et al, Uptake, accumulation and

impact of antiretroviral and antiviral pharmaceutical compounds in lettuce, *Science of The Total Environment* (2020). DOI: 10.1016/j.scitotenv.2020.144499