

Eco-Toxicological Consequences

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Glyphosate –basic information I

Glyphosate: Registered USA 1974

Now used world-wide

Glyphosate-based herbicides (GBHs)

Glyphosate is always used **together with other chemicals**, added to improve its physiochemical properties and/or herbicidal action.

Unfortunately the full list of these chemicals are **trade secret** by the manufactures and available data on the hazards posed by these mixtures remains limited

As of May 1st a total of 2420 references were found in PubMed.

Many report do not state whether glyphosate or GPHs were used.

GLYPHOSATE -basic information II

How is it used?

Originally it was introduced to kill weeds in fields *prior* to the planting of crops.

It was also approved for weed control in several non-agricultural settings, as along roads, railways, etc.

Introduction of genetically modified crops (soy wheat etc) drastically increased usage of glyphosate as it could be used all through the growth season

Glyphosate – basic information III

How is it used:

Nowadays, glyphosate/GBHs are also often used **prior to harvest** to stop further growth and/or accelerate natural drying of seeds.

That increase dramatically the possibility for reaching the food chain for domestic animals and *man*.

How much is used?

2014:nearly 0.5 kg/hectare cropland on the planet

GLYPHOSATE – basic information III

How does it work?:

Primary effect is that it **blocks synthesis of aromatic amino acids** – most important is tryptophan - in all plants and in many bacteria –i.e plants and bacteria die

Animals and man do not have this biochemical pathway.

Therefore, tryptophan is a so-called **essential amino acid** for us: we have to get it from external sources i.e. from plants.

GLYPHOSATE - bacteria

Principally, two groups of bacteria:

- A. Those that **can** produce tryphopan
- B. Those that **can not** produce tryphopan

GLYPHOSATE – bacteria II

Does glyphosate influence upon bacteria?

Already in 1979 a publication regarding glyphosate showed that it could kill cyanobacteria (blue-green algae).

This is a very important group of microbes, especially in watery environment

Hutber GM et al: Z. Al Microbiol. 1979;19:397:402

In 1980 it was shown that glyphosate influenced upon E.coli and other enterobacteria, i.e. important microbes in gut microbiota of animals and man

Rois U, Lingens F, Hoppe Seylers Z. Phys Chem 1980;361:1049-1058

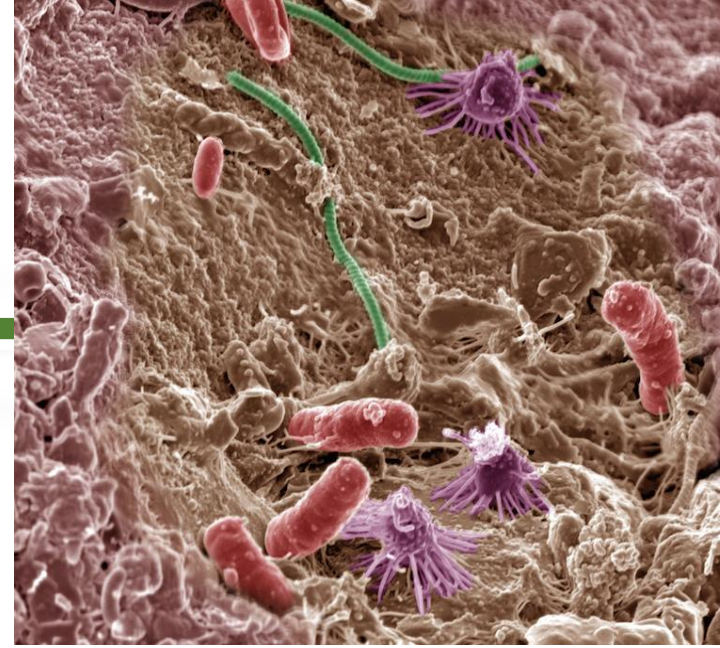
Glyphosate – bacteria III

Glyphosate and soil microbes

In summary, glyphosate influences upon soil microbes utilizing the shikimate pathway for making tryptophan, causing qualitative –i.e. dysbiosis - but not quantitative alterations in soil microbiology.

A depletion of tryptophan is very likely to take place.

In this setting it is important to underline that indol-3-acetic acid, a bacterial breakdown product of tryptophan - is a very important plant «hormon», causing increased growth of root hair in all plants.



GLYPHOSATE – various organisms

Earthworms : **Reduced activity**, probably caused by intestinal dysbiosis

Insects: Species variability. In general, **reduced n**

Bees: Probably two ways of influencing

a. **Direct toxicity**

b. Indirectly, by influencing upon **pollen** microbiology and thereby causing intestinal dysbiosis in the bees



GLYPHOSATE – various organism



Toad: Age dependent sensitivity. «*Younger tadpoles*

were more sensitive to the herbicide in all measured traits than the older one, and this age-dependence was especially pronounced at the high herbicide concentration».

*«The observed age-dependence of sensitivity to herbicides draws attention to the fact that results of toxicity tests obtained for one age-class are not necessarily generalizable across ontogeny» **

Assumingly these findings can be applied on all amphibians

* Mico et al. Aquat Toxicol 2017, March 21

GLYPHOSATE – various organisms

Wild birds:

To the best of my knowledge,
the effects of glyphosate-containing plant products on wild birds in
Europe have never been studied.

In Northern Europe, we are especially concern about the birds flying
north/south in spring/autumn



GLYPHOSATE - resistance

Weeds: «The adoption of glyphosate resistant cropping systems in major crops such as corn, soybean, cotton and canola coupled with excessive use of glyphosate herbicide has led to evolved **glyphosate resistance** in several important weeds» Molin WT et al .Mol Gen 2017, jan

Own comment:

Mother Nature strikes back!!!

May be we don't have to wait for the politicians?

Bacteria: A growing number of bacterial species are developing **plasmid born resistance** to glyphosate.

Continued usage of glyphosate will create microbial soil dysbiosis.



GLYPHOSATE – exposure to human

Can glyphosate reach us?

Well documented, especially when given at the end of the growth season.

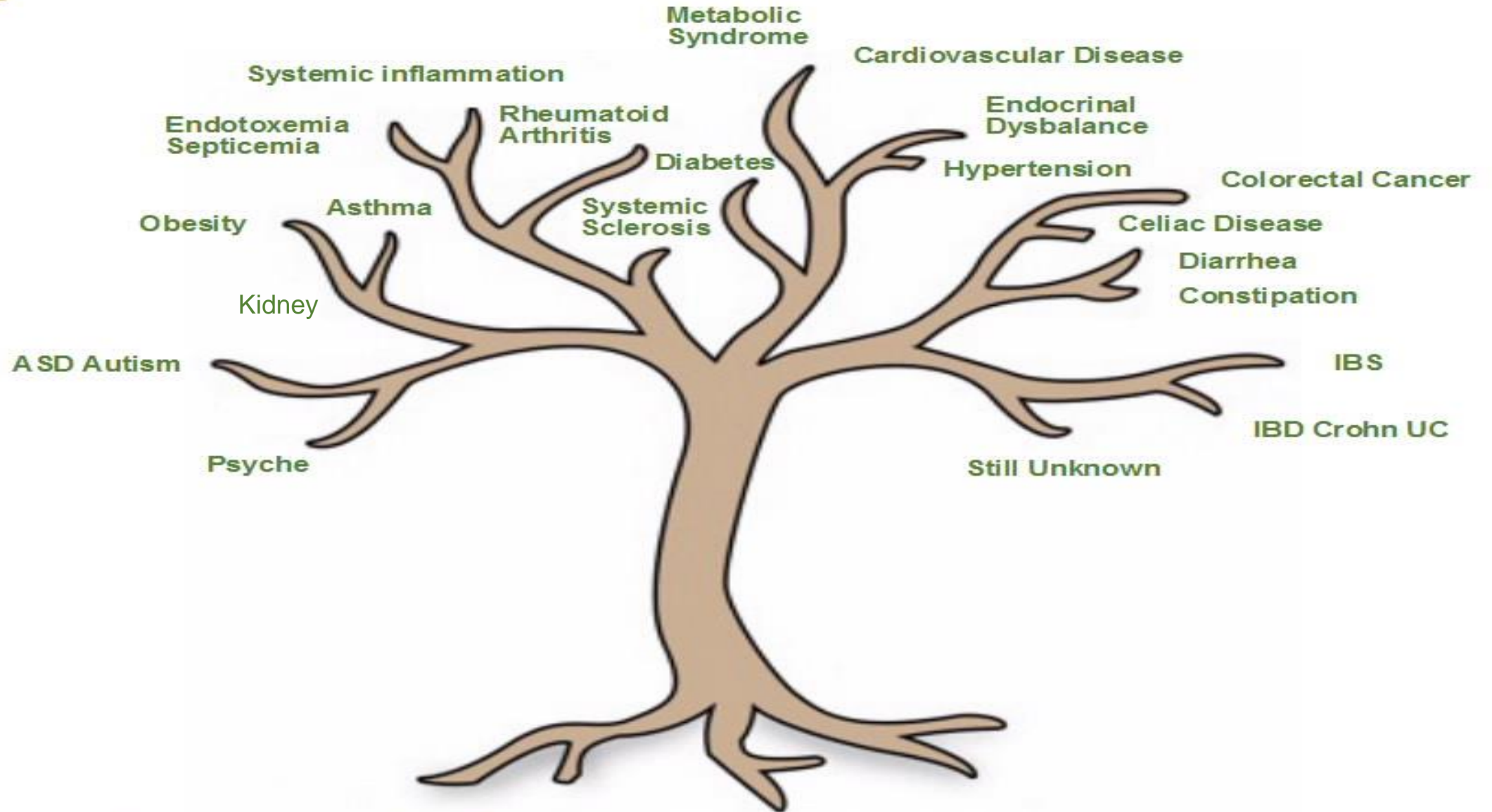
Also through drinking and ground water (prolonged t 1/2 in water)

The exposure to us will continue as long as we are exposed to glyphosate-containing food and/or water. Acute and chronic toxic kidney damage is well documented.

In the environment, the main adverse effect of glyphosate is dysbiosis.

There is a growing body of concern that the same may take place in humans!

Healthy State: Eubiosis



The Gut – Our Inner Soil

Tore Midtvedt 2016

From an ecological point of view

GLYPHOSATE
is throwing a nasty
ECOSHADOW!



CONCLUSION

GLYPHOSATE

is a

SNEAKY POISON!



