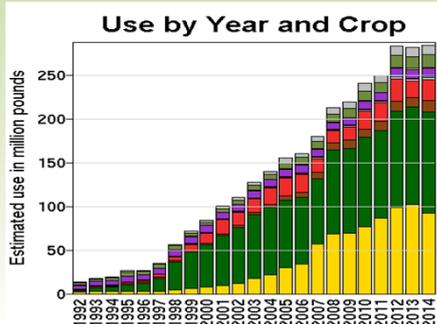
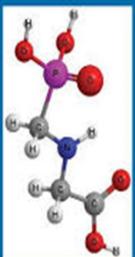


## Toxicity of Herbicide: Glyphosate

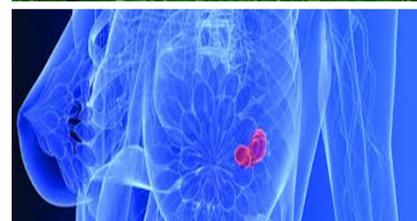
### GLYPHOSATE



**CAUTION PESTICIDES**

### Glyphosate

Glyphosate is widely used as an active ingredient of herbicides products to control weeds in cropped and non-cropped fields around the world. It is believed to be less toxic than other pesticides. However, several recent studies showed its potential health effects to human such as the increased frequency of pregnancy problems in applicators. Glyphosate-based herbicides were suggested to be of human health concern as they were found to be endocrine disruptor. The present study aimed to evaluate the growth promoting effect of glyphosate at the biological concentrations in human breast cancer cells, hormone-dependent T47D and hormone-independent MDA-MB231. Estrogenic and/or antiestrogenic effects of glyphosate was investigated in comparison with endogenous estrogen. Since glyphosate-based herbicides have been used intensively in soybean cultivation. Soybean contains phytoestrogen, genistein. The synergistic effects of these two compounds also were studied.

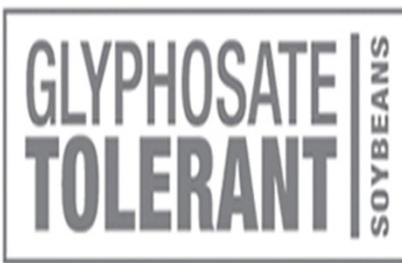


### Estrogenic effects of glyphosate in breast cancer cells

Glyphosate only exerted the proliferative effect in T47D not MDA-MB231 cells at biological concentrations;  $10^{-12}$  to  $10^{-6}$  M in a hormone estrogen withdrawal condition. Glyphosate induced the activation of estrogen responsive element (ERE)-transcription activity approximately, 5-13 fold of the control. The ERE activation can be inhibited by an estrogen antagonist, ICI 182780 indicating that the estrogenic activity of glyphosate is mediated via estrogen receptors. Glyphosate could also alter estrogen receptor expression. The study indicated that glyphosate is a weak estrogen receptor agonist.

### Glyphosate and genistein in soybean

Glyphosate is widely used in soybean cultivation. It is well known that soybean contains phytoestrogen genistein. Additive effects of glyphosate and genistein on ERE-transcriptional activity and breast cancer cell proliferation had been indicated in this study. In this case, it should be much concerned because the low levels of glyphosate residue in soybeans may exert the stimulating effect and this effect may be added with genistein. This finding should raise concern about the existing of more than one xenoestrogens such as phytoestrogen and contaminant in plant derived food which may be beneficial or harmful depending on the hormonal and pathological status of consumers. However, this additive need further study in the *in vivo* model.



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### Glyphosate induces human breast cancer cells growth via estrogen receptors

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