Study finds chlorophyll can help prevent cancer - but questions traditional research methods

January 12 2012

A recent study at Oregon State University found that the chlorophyll in green vegetables offers protection against cancer when tested against the modest carcinogen exposure levels most likely to be found in the environment.

However, chlorophyll actually increases the number of tumors at very high carcinogen exposure levels.

Beyond confirming the value of chlorophyll, the research raises serious questions about whether traditional lab studies done with mice and high levels of toxic exposure are providing accurate answers to what is a real

health risk, what isn't, and what dietary or pharmaceutical approaches are useful.

The findings, published in the journal *Food and* Chemical Toxicology, were done using 12,360 rainbow trout as laboratory models, instead of more common laboratory mice. Rodent studies are much more expensive, forcing the use of fewer specimens and higher carcinogen exposures.

"There's considerable evidence in epidemiologic and other clinical studies with humans that chlorophyll and its derivative, chlorophyllin, can protect against cancer," said Tammie McQuistan, a research assistant working with George Bailey, a professor emeritus in the Linus Pauling Institute at OSU.

"This study, like others before it, found that chlorophyll can reduce tumors, up to a point," McQuistan said. "But at very high doses of the same carcinogen, chlorophyll actually made the problem worse. This questions the value of an approach often used in studying cancer-causing compounds."

OSU experts in recent years have become pioneers in the use of rainbow trout as a model for biomedical research, in part because the fish react in similar ways to those of rodents, but also because scientists can use thousands of them – instead of dozens or hundreds of mice – and do experiments that would not otherwise be possible.

In that context, this study raises questions about a fundamental premise of much medical research – expose a laboratory animal to a compound at high levels, observe the result, and predict that a proportional amount of that same result would be present at low levels of exposure.

In one part of the study, trout were exposed to fairly moderate levels of a

known carcinogen, but also given chlorophyll. This reduced their number of liver tumors by 29-64 percent, and stomach tumors by 24-45 percent. But in another part of the study, using much higher and unrealistic doses of the same carcinogen, the use of chlorophyll caused a significant increase in the number of tumors.

In other words, traditional research with small numbers of animals fed very high doses of a carcinogen might conclude that chlorophyll has the potential to increase human cancer risk. This study, and other evidence and trials, concludes just the opposite.

It also found that the protective mechanism of chlorophyll is fairly simple – it just binds with and sequesters carcinogens within the gastrointestinal tract until they are eliminated from the body. At the lower carcinogen doses and cancer rates relevant to humans, chlorophyll was strongly protective.

"The central assumption of such experiments is that intervention effects at high carcinogen dose will apply equally at lower carcinogen doses," the researchers wrote in their report. "Contrary to the usual assumption, the outcomes in the major target organ were strikingly dependent on carcinogen dose."

OSU experts have argued that in some studies rainbow trout can produce better, more accurate, real-world results compared to traditional rodent animal models and relevant to humans, because many more specimens can be used and lower doses of toxins studied. Experiments done with fish may be about 20 times cheaper and, in the end, more scientifically valid, they say.

"Results derived at high carcinogen doses and high tumor responses may be irrelevant for human intervention," the scientists said in their conclusion.

Provided by Oregon State University