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### Purple Transgenic Tomatoes a Canadian Regulatory Shell Game

A shell game can be defined as a fraud or deception perpetrated by shifting conspicuous things to hide something else. Purple transgenic tomatoes genetically modified so as to produce quantities of purple anthocyanin pigments claimed to subdue cancer when consumed by mammals were created by the John Inness crop research institute in Great Britain. The anthocyanins in the transgenic tomato are native to the tomato while the transgenes in the tomato originated from the flower *Antirrhinum* (snap dragon) which is not eaten by rational humans because it is rich in plant defense compounds. The key snapdragon transgenes included *Delila* and *Rosea1* transcription factors under the control of the tomato fruit specific E8 promoter, showing a purple-fruited, anthocyanin-rich phenotype in the tomato. Snapdragon genes include *Delila* and *Rosea* which specify DNA binding proteins that promote transcription of anthocyanins and a number of pharmaceutically active compounds. The transgenic tomatoes were also modified with genes from bacteria including kanamycin resistance under the control of the nos promoter and a terminator genes from Cauliflower mosaic virus. These transgenes were specified in the publications Patent application title: METHODS AND COMPOSITIONS FOR MODIFYING PLANT FLAVONOID COMPOSITION AND DISEASE RESISTANCE 2011 US Patent application number: 20110126313 Enrichment of tomato fruit with health-promoting anthocyanins by expression of select transcription factors NATURE BIOTECHNOLOGY VOLUME 26 NUMBER 11 NOVEMBER 2008 : 1301 Supplementary Information Nature Biotechnology: doi:10.1038/nbt.1506.

The transgenic tomatoes were produced in a great quantity In Leamington , Ontario, Canada under the oversight and the approval of Health Canada-Canadian Food Inspection Agency (CFIA) based on a synthetic philosophy of regulation that traits will be regulated and not the recombinant DNA technology for producing the traits. A trait is a distinct variant of a phenotypic character of an organism that may be inherited, be environmentally determined or be a combination of the two. Health Canada presumes that the anthocyanin pigments are the only traits that they need to regulate but any how the anthocyanins are native to the tomato and not transgenes and no anthocyanin transgenes were introduced into the tomatoes grown in Leamington. However, the DNA binding transcription enhancers acting on the anthocyanin genes in the transgenic tomatoes along with the additional antibiotic resistance genes , promoter and terminator genes are also traits in hemizygous or homozygous state on tomato chromosomes are also traits!

Now, the problem is that 'Health Canada ' has decided to blindly ignore the transgenic traits and only focus on the traits which are not transgenic! According to the chief bureaucrat in Health Canada's food regulatory agency "Nature, traditional agriculture, and plant breeding have produced various crops containing enhanced anthocyanins, including blue- or red-flesh potatoes and purple or red broccoli, cabbage, cauliflower, carrots, and corn. Tomatoes have been bred conventionally for high anthocyanin . Would you consider those drugs? In the case you cited , the anthocyanin levels are enhanced via rDNA technology. Based on the info you provided, these tomatoes and their juice are still foods, albeit novel functional foods. But they would definitely fall under part B of the Regulations, as novel foods." Luc Bourbonnière, Section Head/ Chef de Section Novel Foods Section, BMH/ Section des aliments nouveaux, BDM.

The transgenes , particularly the DNA binding proteins enhancing anthocyanin production along with a number of toxic herbivore defense compounds from snapdragons have not yet been studied in the laboratory. Health Canada are opening the door for release into our food supply of untested transgenes and their potentially toxic byproducts. The snapdragon DNA binding genes are well known to have highly pleiotropic effects enhancing both toxic herbivore defense genes and pharmaceutical compound synthesis. Thus 'Health Canada' has initiated a regulatory 'shell game' by focusing on native genes and ignoring the toxic transgene traits !

**Production in the Leamington Greenhouse may have released unapproved transgenic pollen and seeds into the environment as well handling of the purple tomatoes unapproved purple tomatoes was questionable:** A U TUBE demonstration of purple transgenic tomatoes in Leamington, Ontario <http://www.youtube.com/watch?v=ifDr6ueBUPA> brought to light some important dysfunction in the production of the transgenic tomatoes and their juice.

The regulations are clear :

Plant Health and Biosecurity Directorate                      Field Crops Division  
Nepean, Ontario K1A 0Y9

4. contain the plant material in a facility, laboratory or greenhouse located at the Canadian destination stated in this permit. The facility, laboratory or greenhouse has to be designed or constructed in a manner that will prevent inadvertent pollen spread or other forms of gene flow.

Notice: Other Federal Acts Governing Plants with Novel Traits (PNTs)

3.Introduction of PNTs into the Canadian environment requires prior approval under the authority of the Seeds Act from the Plant Biosafety Office, CFIA

The Utube video showed clear evidence that the tomato plants in the green house had been effected by pest insects that cut the leaves of the tomato plants clearly those pests must have been in communication with outside environment. As well the huge facility appeared allow egress of pollinators and rodents. Tomatoes are sometimes claimed to be self pollinating but actually 5 to 75% may be from insect or bird pollinators. The cutting and general handling of the unapproved transgenic tomatoes was rather casual and at times bare handed cutting of the tomatoes.

I have requested that CFIA and Health Canada provide evidence of their oversight inspections but that request was refused. However, it was likely that inspections were very casual if they took place at all.

**Comments for Health Canada and CFIA:** The transgenic tomatoes were also further modified with human genes for an antiviral antibody (Neutralizing antibodies against rotavirus produced in transgenically labelled purple tomatoes ( Plant Biotechnology Journal 2011, 10, 341–352) the seeds planted in Leamington should have been proven free of contamination with the human gene because human antibodies frequently act as allergens in sensitive people. The snapdragon transcription factors inserted into tomato have a highly pleiotropic action and produce diverse responses such as the beneficial ones (Anthocyanins Double the Shelf Life of Tomatoes by Delaying Overripening and Reducing Susceptibility to Gray Mold Current Biology 23, 1094–1100, June 17, 2013). However, only the beneficial responses are being reported upon currently but it is clear anti-herbivory animal defense

compounds will also be activated in tomato by the snapdragon DNA binding proteins. Finally, I feel that I should say Health Canada shows tunnel vision on anthocyanins in the transgenic tomato. I recognize that the biotechnology industry presses government to do summary regulation on their transgenic constructions. Health Canada seem to be trying to proclaim that the transgenic tomatoes are not really transgenic and that they should not be regulated as a cancer treatment biological even though such is claimed by those producing the purple tomatoes!

**To Conclude:** 'Health Canada' has proclaimed that snapdragon , bacterial and viral transgenes in tomatoes are not traits and need not be regulated. Certainly that is a characteristically irrational bureaucratic proclamation. However, within that proclamation lies the threat that all the bizarre transgenic organisms will soon be released unregulated into the Canadian environment . That should please the biotechnology companies.