

Testimony of Dr. Norman E. Borlaug

before the

House Committee on Agriculture

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Congressman Tom Foley, Chairman, The House Agricultural Committee and other Distinguished Members of the Committee.

I am Dr. Norman E. Borlaug, an agricultural scientist, who was born and reared on a small Iowa farm. I have spent the past 36 years working in food deficit developing nations--based in Mexico but working in many different Latin American, African and Asian countries. Although I have been concerned about and worked in many disciplines that affect crop production including agronomy, soil science, plant protection and economic policy; however, the greatest part of my time and effort has been devoted to genetics and plant breeding. This involves primarily developing heterogenous populations and thereafter selecting the individuals that possess the unique combination of characteristics that make them valuable for use as superior varieties to increase food production.

In the process of developing new varieties one must classify each generation and select the best several hundred individual plants--among several million.

During the past decade I have watched with dismay the confusion, emotionalism and lawsuits that have evolved, on issues covering food, agriculture, water and air pollutions and environmental issues in the broadest sense.

It is my personal opinion that much of this confusion could have been avoided had there been a better understanding of the great genetic variation that exists in the human species and the fact that there is no such thing as zero risk in the real biologic world--be it plant, animal or human species. We are all different genetically. No two of us are alike with the exception of identical twins.

The average life expectancy at time of birth, in the developed nations, has increased dramatically during this century and especially during the past five decades. Currently in the U.S.A. it has reached approximately 73 years. Nonetheless, despite this achievement there has been surprisingly little increase, if any, in longevity. During biblical and early historical times references are found of individuals living to the ripe old age of four score and ten years, with an occasional individual passing the century mark.

The dramatic increase in average life expectancy has been achieved, in a large part, by the spectacular reduction in infant and childhood mortality. This has been achieved through the composite effect of improvements in nutrition, better public sanitation and personal hygiene and especially from the dramatic improvements in control of infectious diseases resulting from the discovery and widespread use of sulfadruugs, antibiotics and improved vaccines.

Today there are those who apparently believe that we are on the verge of being poisoned out of existence. They visualize an endless, array of carcinogens in the air we breathe, in the water we drink and in every bite of food we eat. Despite such emotional pessimism, in fact, we live a longer and more pleasant life than our parents or grandparents. Since the conquest of infectious diseases that formerly

took the lives of many in infancy, childhood, youth and early adulthood have been brought under control during the past 40 years, more people die at a later age from other diseases such as heart and circulatory diseases and cancer. Many that a generation ago might have died at an early age because of genetic susceptibility to one or another of the infectious diseases, survive to die at a later age from the still bewildering and poorly understood group of cancer diseases, giving the laymen the feeling, in part caused by sensationalism in the press---perhaps often designed primarily to sell newspapers and magazines---that there is a startling increase in the incidence of cancer. Nevertheless, with two exceptions on the incidence of cancer an examination of the data currently available adjusted for age in the U.S.A. over the past 30 years does not bear this out. The exceptions are the increase of lung cancer associated with cigarette smoking and an unexplainable reduction in incidence of stomach cancer over the same period.

Much of the confusion, fear and emotionalism surrounding the incidence of cancer is worsened by the inflexibility of the Delaney Clause--the "47 little words" appended to the 1958 Food Additive Amendment of the Food, Drug and Cosmetic Act of 1938--which denies the Administrator of the Food and Drug Administration the needed flexibility to consider and weigh the mass of all evidence in the process of deciding to ban or not to ban the use of a food additive or contaminant. The clause states specifically "that no additive shall be deemed safe (and must be banned from use) if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives to induce cancer in man or animals...."

The clause fails to take into consideration dosage effects--and seems to convey the impression that we can achieve complete elimination of carcinogens in our food chain by strict imposition of this law. It implies that we can greatly reduce or reduce to zero the risk of cancer by eliminating completely all compounds from our food supply, water and air that have been shown to be carcinogenic under a wide variety of tests. It fails to recognize: (1) that there is no such thing as zero risk in the real biologic world, (2) it fails to recognize the tremendous genetic variation in the biologic system--including the many shades of tolerance and susceptibility in the human species to infections, allergies and cancer, (3) it ignores the fact that many of the "natural foods" that have sustained mankind from the beginning of Civilization have within them infinitesimally small amounts of compounds which in animal tests have been shown to be carcinogenic, and (4) it does not take into consideration that great recent advances in modern analytical methods and technology which today can measure infinitesimally small quantities of compounds--both natural and synthetic which went unidentified when the Delaney Clause was enacted.

Finally, it ignores the growing body of evidence that indicates that there is an increase in the number of chromosome aberrations in human tissue cell cultures, with aging, even when grown in the laboratory presumably in the absence of any known carcinogens. This seems to imply that there probably exists at cellular (or chromosomal) levels some biologic clock or timing mechanism that controls aging and longevity of life. This seems to imply that we will never discover the ephemeral Fountain of Perpetual Youth as some people seem to think is possible. Perhaps it's better it is so, for imagine the chaos on the

population and food production front and on the social, economic and political scenes were this impossible dream to come true.

As I reflect on the confusion that has developed in the saccharin and nitrite issues in recent years it seems evident that the Delaney Clause needs to be amended to provide the Administrator of the Food and Drug Act the flexibility to weigh all of the available experimental evidence, and epidemiological evidence and arrive at a reasonable judgment based on benefit versus risk.

It is obvious that we have used such judgments in arriving at using X-ray properly as a valuable diagnostic tool in identifying and setting bone fractures in early diagnosis of internal tumors and infections and also as one of the treatments for cancerous tumors, even though X-rays are known to induce cancer if improperly used. It is a well known fact that the discoverer of X-ray, which has become a valuable scientific tool in many fields of science, Madame Currie, died from cancer which she contracted from her work with radioactive substances, when knowledge of its harmful effects were largely unknown. Yet today it can be and is used effectively and safely as a tool and treatment in modern medicine. Such judgments certainly are not based on zero biological risk but rather on a balanced judgment weighing benefit versus risk.