

INTEGRATIVE HEALTHCARE

Children's Health; Glyphosate Generation

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What is there that is not poison? All things are poison and nothing is without poison. Solely the dose determines that a thing is not a poison. Famous words from the well-known Swiss doctor and philosopher Paracelsus (1493-1541).

Nearly sixty years ago, Dr Rachel Carson, author of the frequently referenced toxicology book 'The Silent Spring' said "It is ironic to think that man might determine his own future by something as trivial as an insect spray". With regulations of health and safety seemingly ruling our every step and action today, how relevant is this statement? Are we on the verge of creating another DDT-like disaster, some sixty years later?



Recent years have shown a significant rise in certain childhood diseases. Growing numbers of children with severe allergies, asthma, autistic spectrum disorders, eczema and other chronic illnesses cause many parents, medics and scientists to ask a simple straight forward question; why? What has gone wrong within the environment, where and when?

TRENDS & CONSEQUENCES

Why are so many young children suffering from an epidemic of chronic, difficult to diagnose and treat health issues? Why are so many kids overweight, have learning difficulties, behavioural problems, childhood diabetes or even cancer? These medical issues raise their ugly heads all over the world, especially where a Western lifestyle and economy is reigning. In its wake, this lifestyle leaves future generations with numerous health complications and most probably, highly toxic too.

Everyone agrees that the prosperity of the Western society depends largely on the health and strengths of future generations. In today's well-developed Western society, the major causes of children's health issues are no longer old-fashioned infectious diseases. In industrially-developed countries, the principal causes of growing children's health problems, disability and death are non-communicable illnesses which include developmental and chronic mental problems, allergies, asthma, autoimmune diseases, diabetes, obesity and childhood cancers, to name but a few.

The evolution and rapid growth of the chemical industry, with the discovery and use of new chemicals and materials such as plastics, has undoubtedly resulted in huge technological advances. This progress has had merit on wellbeing and lifestyle factors with improvement in numerous areas of human activities. But how safe are these new products and innovations?

According to Dr Philip J. Landrigan, 20% of chemicals have been tested for safety on human beings.¹ Little is known about the effects of simultaneous exposure to several chemicals, including a mixture

of pesticides and herbicides which may cause synergistic ill-effects, affecting children in polluted areas and even in the countryside, where the air quality is generally better but the usage of agricultural chemicals is inevitably high.

Children are susceptible to illnesses due to their immature immunity and still-developing organ and systems. They are therefore particularly vulnerable to air pollution, hazardous chemicals, climate change, poor or inadequate quality of water, food, general sanitation and hygiene. The World Health Organisation (WHO) have previously outlined the damaging impact a toxic environment can have on health and well-being.² “More than 1 in 4 child deaths could be prevented by cleaning up the environment” declares the document, noting that nearly 1.7 million children under the age of 5 die every year due to poor indoor and outdoor conditions, including unsafe water and air quality.²



Babies and young children are specifically sensitive to polluted air. The average toddler inhales up to 25 litres of air per hour and due to their still-developing lungs are especially vulnerable and prone to any respiratory conditions by breathing in aerosolized toxic mixtures of several chemical pollutants in overcrowded, unhygienic, highly industrialised or agricultural areas.

Worldwide, up to 14% of children present with asthma symptoms every year which are directly related to poor air quality, mould and dampness in living conditions. Annually, 570,000 kids under the age of five die from respiratory illnesses related to polluted air.²

Current drastic changes in our climate - generally higher temperatures, recurrent heat waves, higher levels of atmospheric carbon dioxide - pose a severe threat to children with weakened immune and respiratory systems. Annually, diarrhoea can kill 361,000 children due to polluted water supplies and inadequate hygiene and sanitation.² Acute poisonings from pesticides, herbicides, common household products such as solvents, exposure to lead and accidental ingestion of medicines are responsible for an estimated 23,000 yearly deaths in children under 5.²

Childhood cancer rates are rising with alarming speed. Research suggests 10-20% of paediatric cancers are found to be hereditary with the rest thought to be related to toxicological concerns. Emerging evidence shows a direct link between maternal and early exposure to environmental pollutants and childhood cancers.² Another worrying trend is the growing rate of Autistic Spectrum Disorder (ASD), mainly among boys, with overall worldwide figures showing that 1 in 160 children are affected by autistic traits. Figures show highly industrialised and technologically-advanced Japan ranks as one of the leaders.² According to the National Autistic Society UK, autism is more common than previously thought. In the UK for example, there are about 700,000 people affected by ASD, showing that 1 in every 100 children at present show signs of autistic spectrum.³

Scientists believe that such wide-seen health concerns result from chronic toxic exposure, be that through chemicals in our soil, air, water or food. This synergistic co-existence is causing over-exposure. Hazardous substances are found in kitchens, bathrooms, sheds, playgrounds, parks, playrooms, gyms, schools and nurseries; everywhere children spend their time.

ENDOCRINE DISRUPTORS

Prof. Theodora Colborn, an environmental health analyst, coined the term *endocrine disruptors* in 1991. Endocrine disruptors are chemicals which may, in specific circumstances, disrupt the body's endocrine functions thus causing adverse reproductive, developmental, immune and neurological effects. Her extensive studies showed the adverse effects of certain chemicals caused to offspring during developmental and growth stages. This disruption causes a poor foundation for wellness. During the last number of decades, man-made chemicals have further impacted the environment, revealing serious concerns for human health, wildlife and threats to the health of future generations. Prof. Andrea Gore, University of Texas, added further weight to the significant findings, stating that exposure to chemicals during pregnancy affects the brain even two generations later.⁴

Another recent study, led by Dr Alan Brown, published in the American Journal of Psychiatry, found "the first bio-marker evidence that maternal exposure to insecticides is associated with autism among offspring." This study shows the health impact of insecticides, including DDT and its possible pathway to autism development due to prenatal exposure. Even though DDT was banned decades ago, its residues can still be found in wildlife and the food chain. This chemical, crossing the placental barrier, causes potential prenatal exposure in a specific set of expectant mothers and is linked to autism in offspring. While it is still unclear whether these mothers are genetically or biologically more susceptible to insecticides, it does warrant additional research. It also highlights that DDT, banned fifty years ago, is still affecting future generations.⁵

Endocrine disruptors mimic naturally-occurring body hormones such as estrogens, androgens and thyroid hormones, causing potential overproduction and consequent disorder within the body. They are capable of interfering or blocking the way of natural hormonal pathways, disrupting signals and altering the function of the whole endocrine system. Any organ or system in the body directed by hormones can be derailed by endocrine disruptors and we are coming into contact with these chemicals every day.

A wide range of chemicals and substances including dioxin and dioxin-like compounds, bisphenol A, flame retardants, pharmaceuticals, plasticisers, DDT and other synthetic pesticides are thought to be responsible for adverse endocrinal interference. These substances are found in most household products – plastic bottles, food containers and wrappings, children's toys, detergents, pesticides, herbicides, insecticides, cosmetics, toiletries and certain foods. Medical studies confirm a strong link between endocrine disruptors and the risk of developmental issues in foetuses and babies.⁴ Birth defects are also being considered a leading cause of infant death.¹ With growing evidence directly relating health concerns to environmental toxic exposure, despite having progressed from the days of the DDT disaster, we are still being afflicted by modern poisons.

GLYPHOSATE

In 1950, Dr Henri Martin, a Swiss chemist, discovered glyphosate N-phosphomethyl glycine. In 1970, Dr John Franz discovered the herbicidal potential of glyphosate, which led to production of a product called Roundup by Monsanto in 1976. Roundup is widely used throughout the world - on fields, private and communal gardens, sport grounds and public parks. Its purpose; to kill weeds in the production of genetically modified grains and crops. Studies have found that high doses of glyphosate in animal testing can cause cancer but carcinogenic evidence in people has so far been exposed as

“weak”.^{7,11} In 2015, the International Agency for Research on Cancer (IARC) classified glyphosate as a Group 2A Carcinogen considering it a ‘probable carcinogen’. It is surmised that the active component of glyphosate on its own is less toxic than in a mixture of commercial formulations.

Glyphosate is the world’s most widely used herbicide. It is used in over 140 countries and its production is expected to rise. Agricultural glyphosate use in the US alone has risen 300-times from 1974. Over the last decade, 6.1 billion kgs of glyphosate has been used worldwide.⁷ Numerous studies performed on laboratory animals show the link between high doses of glyphosate and nephrotoxicity, liver enlargement and gastric disorders. Research also relates it to non-Hodgkin’s lymphoma, childhood leukaemia, multiple myeloma and neurodegenerative diseases such as Parkinson’s. It is also highly toxic to aquatic life.⁷

As previously noted, the increase in autism is alarming. In the 1990s, 1 child in 5000 was identified with an Autistic Spectrum Disorder (ASD). Today, according to the Centre for Disease Control’s Autism & Developmental Disabilities Monitoring (ADDM), it is approximately 1 in 59. It is predicted to rise further, reaching 1 in 3 by 2025.⁷ The exact cause of this condition is still unclear but according to some scientists, in many cases pesticides may be responsible. “Knowing the effect that glyphosate can have in the human body, particularly in the gastrointestinal tract, and comparing it with autism bio-markers such as alteration of intestinal bacteria, intestinal inflammation, lack of serotonin and melatonin, disorders to the mitochondria, iron and zinc deficiencies; the correlation between the two factors is evident. The risk of having autistic children increases in mothers who have been exposed to it during pregnancy”, says Vincenzo Torretta.⁷

Pesticide formulations contain adjuvants, also called inerts by the manufacturers. “Often kept confidential...Adjuvants in formulations are generally declared as inerts and therefore are not tested in long-term regulatory experiments. It is thus very surprising that they amplify up to 1000 times the toxicity of their active principles in 100% of the cases tested. The role of adjuvants is to increase active principle (AP) solubility and to protect it from degradation, helping cell penetration, and thus enhancing its activity and consequently side effects.”^{7,8}

In addition to secret contents, the formulations contain active principles which are tested alone, and not in combinations with inerts. After testing the toxicity of the active principles of three major herbicides, three insecticides and three fungicides on human embryonic cells well below agricultural dilutions, the conclusion was that all formulations were cytotoxic and “despite of relatively benign reputation, Roundup was among the most toxic herbicides and insecticides tested...It is commonly believed that Roundup is among the safest pesticides, but was found in this experiment to be 125 times more toxic than glyphosate”. The idea of safe Roundup is distributed by manufacturers but contradicts the scientific findings of combined toxicity of AP and the so called “inert”, posing “endocrine –disruptive effects below toxicity threshold”.⁸

Another group of researchers who tested the potential toxic effect and endocrine disruption of Roundup on human embryonic and placental cells, concluded that the cytotoxic and endocrine disruptive effect is amplified with time and exposure to this formulation. “It may affect human reproduction and foetal development in case of contamination”. It was found that “glyphosate acts directly as a partial inactivator on microsomal aromatase in a dose-dependent manner and Roundup is more efficient than its active principle, glyphosate, suggesting a synergistic effect provoked by the adjuvants in Roundup”.⁹

Similar to DDT traces, residues of Roundup are found in a wide range of everyday food and drink including wheat, oats, beans, legumes, wine, orange juice, potatoes and even ice cream. In 2016, a Boston University study found the presence of herbicides in 62% of honey. Glyphosate has been found in human urine samples, breast milk, drinking water, beer and feminine hygiene products. The fact that glyphosate is found in breast milk is alarming, confirming it can be passed to babies. Infants and young children have a limited capacity to detoxify chemicals, making them vulnerable recipients to this dangerous chemical. But despite growing evidence showing hazardous effects on the environment, soil microbial community, monarch butterflies, honeybees, aquatic life, mammals and humans, it is argued that low doses are safe.

However, widespread exploitation of chemical herbicides has created another issue; herbicide-resistant weeds. Pesticides don't distinguish between helpful and harmful wildlife and so while the crops are being sprayed, useful bugs including bees are also being terminated. As we fight against intrusive enemies with growing amount of pesticides and herbicides, we also expose our children to a toxic mix of substances which have harmful effects on health.

It is important to understand that several factors can influence risk for environmentally related illnesses, such as chemical exposure prior to conception, prenatal care, mother's age, lifestyle, nutrition and overall health condition. Children as they grow and develop, differ from adults considerably. The toxicodynamic processes – absorption route of the chemicals, metabolism, excretion, tissue and organ vulnerability are all age-related, making children vulnerable to foreign or synthetic substances.^{10, 11, 12}



Recently, a lawsuit against Monsanto, the manufacturer of Roundup highlighted the potential dangers of excessive and continued use of certain chemicals. Health regulators will actively continue to consider the impact of a toxic environment. That is good news. Doctors acknowledge cases of children whose growth, development and unusually high levels of chronic illnesses are not resembling those of past generations. Regardless of chemical and pharmaceutical advances, children are weaker and sicker than their parents and if we don't act now, their life span will be shorter as well. A comprehensive and relevant health strategy is required to stabilise the good health of today's children, and safeguard future adults. WHO have acknowledged that integrative concepts – nutrition, acupuncture, homoeopathy and homotoxicology have pragmatic and appropriate potential. The question now is, how do we actively harness that to fulfil the needs of today's health landscape.

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