

DNA ADDUCTS

DNA adducts are chemicals that are covalently bound to the genomic DNA. The source of the chemicals can be either exogenous (xenobiotic) or endogenous (including metabolites of xenobiotics).

The effect of an adduct depends on its location on DNA:

- An adduct on a gene will usually reduce or block that gene's expression.
- An adduct near (on the promoter region of) a gene may lead to over-expression of that gene.
- An adduct may block DNA repair mechanisms.
- An adduct may interfere with the current methylation pattern.

The methylation pattern on DNA acts as a template for gene expression, blocking or allowing the expression of different genes along the DNA strand. Environmental challenges, lifestyle factors and numerous metabolic feedback mechanisms influence DNA methylation. These "epigenetic" mechanisms control gene expression in a way that can be passed on to "daughter" cells without changes to the DNA sequence - even when the original cause is no longer present - so if an adduct caused the change in methylation pattern, the genetic expression continues *as if* the adduct was still there.

It has been known for decades that a very wide range of chemical substances (carcinogens) can play a major role in causing many forms of cancer. One important way that carcinogens have their effect is through DNA adducts - an adduct next to an oncogene (cancer predisposing gene) will tend to activate it, while an adduct on an anti-tumour gene will tend to block it - in both situations there will be increased predisposition to cancer.

DNA adducts and epigenetic mechanisms are now considered to be a major factors predisposing to many chronic disease processes. DNA adduct formation is dependent on 1) exposure to, absorption of, retention of and distribution of toxic substances and, 2) nutritional status, which in turn influences toxin absorption, retention, etc, antioxidant status, DNA protection and repair, detoxification pathways, etc. - this is especially true of zinc which, amongst its other functions, has multiple roles relating to DNA.

Until recently, there has been no test readily available to clinicians (anywhere in the world) to detect and measure the presence of DNA adducts in humans. Dr John McLaren Howard of Acumen (formerly head biochemist at Biolab) has developed this test that is capable of identifying and measuring a great many substances that can form DNA adducts and much of the time also identify which the genes are affected.

SUBSTANCES THAT COMMONLY FORM DNA ADDUCTS

Substances that form DNA adducts can be divided into two groups:

- Exogenous toxins - environmental pollutants: organic chemicals and metals, although some toxic metals are quite commonly found in organic forms, especially organo-mercury and organo-nickel.
- Endogenous toxins - products of one's own disordered metabolism.

The following are the most common genomic DNA adducts found by Acumen, in approximate order of frequency.

Organic chemicals:

Malondialdehyde (a product of fat peroxidation - due to one's own faulty metabolism), Halogenated phenols (many antiseptics), Halogenated benzenes (insecticides - especially for moths - soft furnishings), Aflatoxin and Mycotoxins (fungal toxins), Lindane (organochlorine pesticide - insecticide - crop treatment, timber preservatives, ant killer, scabies treatment), Chloroethylenes (solvents), Vinyl halides (plasticisers - plastics), Aldehydes (resins in

composite timbers - chipboard, MDF, plywood), Aromatic amines (burnt organic materials, fish glues), Nitrosamines (tobacco, smoked foods), Acrylamide (burnt plastics - incinerators, bonfires), Toxaphene (organochlorine pesticide - insecticide, esp. used on wheat), other Organochlorine pesticides (insecticides), Tetrachlorvinphos (organophosphate pesticide - insecticide), other Organophosphate pesticides (insecticides), Benzoates.

Metals:

Cadmium, Nickel, Lead, Arsenic, Mercury, Antimony, Manganese, Aluminium, Strontium, Copper, Chromium, Cobalt, Tin, Iron.

WHY DO THE TEST?

The reason this test is so valuable is that there is so much one can do about the information it provides - it enables one to:

- Identify the presence of, and measure the amount of, toxins forming DNA adducts (and there may be more than one present). Any toxins found adducting DNA are there because there is a raised body burden of these toxins.
- Minimise further exposure to the toxins found - the first principle of managing any toxicity is to stop/minimise further exposure.
- Institute a safe treatment regime to improve the excretion rate of the toxins from the body and clearance from DNA, or /and improve the metabolic processes that are responsible for some adducts (eg. malondialdehyde).
- Repeat the test after a few months to assess progress.

I have very rarely failed to see complete disappearance of DNA adducts following six to twelve months intensive treatment.

WHEN TO DO THE TEST?

There are very many situations where this test is useful, here are a few:

- Anyone who has ever had cancer, including unusual types of cancer.
- Anyone who has predisposing factors to cancer, eg. a family history of cancer.
- Anyone who has had known or suspected exposure to carcinogenic substances - past and present.
- Anyone who has smoked tobacco or has been a passive smoker - however long ago. (I have more than one patient in their 60's who had nitrosamine DNA adducts when have never smoked, never been a passive smoker, except during childhood living with smoking parents, and had not had other significant nitrosamine exposures - so even though the exposure was over 40 years earlier, the nitrosamines have persisted at very significant levels and in a potentially serious location.)
- Anyone with unusual, not easily explained symptoms or pathologies.
- Anyone who has had or suspects exposure to environmental pollutants at work or at home (toxic metals and other elements, pesticides, volatile organic compounds, etc.).
- Anyone who wishes to identify factors that may be undermining their health - factors that they can take positive action about.
- Anyone who has been found to have toxins affecting their mitochondria.

The test is done on a normal venous blood sample at Acumen and costs just £95

For more information, please contact my practice.

SOME INFORMATION SHEETS AVAILABLE FROM THE OFFICE

See website for full list

- Toxic metals
 - Mercury
 - Nickel
 - Cadmium
 - Lead

- Aluminium
- Arsenic
- General Dietary Advice
- Nutritional Supplementation - Recommendations for Adults
- Detoxification Program
- Epsom Salt Baths
- Mitochondrial Function Tests
- Mitochondrial Support Program