Metabolic Flexibility and Cancer

The majority of people treated for cancer will encounter metabolic flexibility of cancer even if they don't realise that is what is happening.

Metabolic flexibility is the ability to respond or adapt to conditional changes in metabolic demand. Metabolic flexibility, in the context of cancer refers to the ability of cancer cells to adapt and switch between different metabolic pathways to meet their energy and nutrient requirements. Cancer cells exhibit a remarkable ability to reprogram their metabolism in response to changes in their microenvironment, which can contribute to their survival and growth. This metabolic plasticity is a hallmark of cancer and plays a crucial role in the progression of the disease

This flexibility is what is happening when people are told their cancer is becoming resistant. The oncologist will observe this and have the next treatment planned and move on. What is vital for people with cancer is to understand these processes in order to ensure their integrative strategies contribute to preventing this. Oncology treatments, unless they cure early on, will inevitably contribute to the flexibility of cancer cells by the body's environment suffering the adverse effects that treatment brings.

Aerobic Glycolysis (Warburg Effect): One of the most well-known metabolic features of cancer cells is their preference for aerobic glycolysis, also known as the Warburg effect. Unlike normal cells, which primarily generate energy through oxidative phosphorylation in the mitochondria, cancer cells rely heavily on glycolysis even in the presence of oxygen. This inefficient metabolic pathway allows cancer cells to rapidly generate ATP and build the macromolecules they need for proliferation.

Altered Mitochondrial Function: While cancer cells continue to use mitochondria, their mitochondrial function is often impaired. Mitochondrial DNA mutations, alterations in mitochondrial dynamics, and changes in the expression of mitochondrial enzymes can compromise the efficiency of oxidative phosphorylation. This reliance on glycolysis and reduced mitochondrial function can make cancer cells less dependent on oxygen availability.

Nutrient Adaptability: Cancer cells can adapt to varying nutrient sources. They can metabolise glucose, glutamine, and fatty acids to sustain their growth and energy needs. The ability to switch between different nutrient sources provides them with a survival advantage, especially in nutrient-deprived tumour microenvironments.

Resistance to Nutrient Deprivation: Cancer cells can survive under conditions of nutrient deprivation, such as low glucose or low oxygen levels. They achieve this by upregulating

specific transporters and metabolic pathways that allow them to scavenge nutrients from the surrounding tissue or alter their metabolic preferences to use alternative substrates.

Heterogeneity: Tumours are often composed of a heterogeneous population of cancer cells with varying metabolic phenotypes. Some cells may rely more on glycolysis, while others may exhibit a more oxidative phenotype. This metabolic heterogeneity can make treatment strategies challenging, as targeting one metabolic pathway may not be effective against all cancer cells within a tumour.

Adaptation to Therapies: Cancer cells can develop resistance to therapy by altering their metabolism. For example, they may upregulate drug efflux pumps, modify metabolic pathways targeted by therapies, or switch to alternative metabolic pathways to bypass the treatment's effects.

So, it is very clear that an exclusive standard of care approach is insufficient for anyone to have long term control over cancer as the prospect of resistance is always looming on the horizon.

The challenges we have in the integrative world are to present a broad and complex approach, incorporating many different elements in a way that the medical world will understand.

The medical world struggles to know how to evaluate metabolic approaches because the research is fragmented, not well collated and involves a skill in measuring the broader aims rather than measuring one or two things at a time.

We also have the challenge of the large amount of information and advice available that is often generalized, confusing and presents difficulty in knowing what to apply. It can be very stressful when diagnosed and dealing with treatments to assimilate a lot of research and different advice. Often people will end up taking things for fear of missing out on things rather than having a clear targeted process.

The amazing advances in functional testing can now allow an individual to gain a greater idea of how their cancer is behaving from the damage, to how their immune system is coping and its detoxification capacity. Information for the individual on hormone methylation and what genetics might influence is available to the individual. Unfortunately, at some personal expense as our work to persuade the medical world of the value of individual assessment and repairing the body, detoxing etc. is still a work in progress.

For many of those things there are metabolic strategies which can help the body in controlling the situation. No longer do people have to complete cancer treatment and cross their fingers and hope.

What has been needed for some time to help people gain insight into their personal situation and also help the medical world understand the research and thinking behind metabolic oncology has been someone bringing all that research together in a way that can be usable by practitioners supporting people with cancer.

I am delighted to be working with Metacologica Life Sciences to bring together all the research and knowledge in a database that will cross reference and produce individual plans based on all the knowledge on the individual, physical, psychological, genetically, metabolically to provide a comprehensive plan for each stage of treatment and recovery.