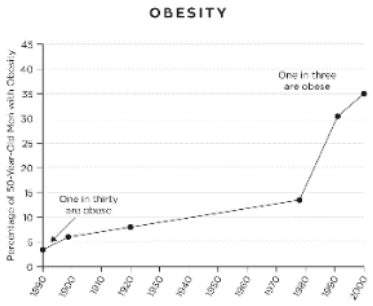
MILLHOUSE INTEGRATIVE MEDICAL CENTRE
PARTNERING IN HEALTH AND HEALING

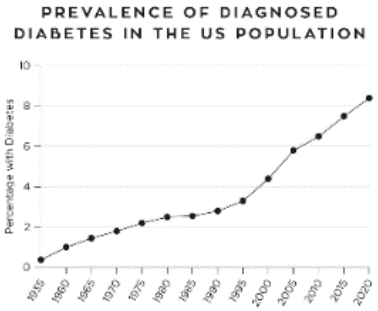
NEWSLETTER OCTOBER – NOVEMBER 2024

FACT SHEET 31 – FRUCTOSE AND EPIDEMIC OBESITY, DIABETES & HYPERTENSION

100 years ago, it was infectious diseases that ravaged humanity. In the USA in 1890, and I presume also in New Zealand, obesity affected just 3% of the adult population, only 2 or 3 out of 100,000 individuals had diabetes, fewer than 5% had hypertension (blood pressure), and heart disease was a rare event. Today in New Zealand and the USA, 1 in 3 adults and 1 in 10 children are obese, about 10% of the population have diabetes; Sadly, in Polynesia the prevalence of obesity and diabetes is very much higher. The graphs alongside show the rising incidence of obesity and diabetes. Despite the innovations of pharmaceutical companies generating new medicines, we still don't have a good understanding of the underlying drivers of these epidemics. (I will write about anti-obesity GLP-1 agonist drugs (Dulaglutide & Liraglutide) in an upcoming newsletter).



Obesity has increased dramatically during the twentieth century



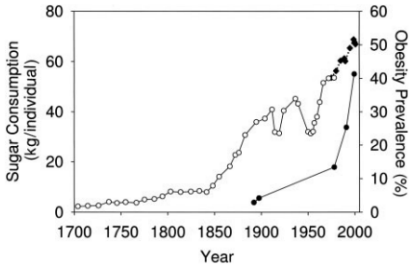
What is causing the obesity-diabetes epidemic? In his 2022 book *"Nature wants us to be Fat"* Professor Johnson reports on research initially focussed on kidney disease, then later explored blood pressure, diabetes, gout, and obesity, and explored genetics, exercise medicine and nutrition. All these areas brought critical clinical insights. The team studied animals in nature, especially those that hibernate during winter, and human history from the Ice Age till now. In these animals they identified a biological process they called the ***survival switch***. This mechanism is commonly triggered by food, especially ***fructose,*** a common sugar in our diet. It seems fructose activated physical, metabolic and physical changes that protected the animal when food was unavailable. One feature of the *survival switch* was that when food was plentiful, the animal stored body fat, but when food became scarce, the fat tissue would be used to survive. This process is also embedded in human physiology. In times of plenty, food energy is stored as fat in anticipation of a famine. When that shortage does not come, the *survival switch* becomes a ***fat switch*** and a driver for obesity.

SURVIVAL SWITCH triggers:
→ Hunger & Cravings
→ Foraging behaviour
→ Increased food intake
→ Reduced metabolism at rest
→ Fat accumulation
→ Glycogen accumulation
→ Thirst
→ Insulin resistance
→ Increased blood pressure
→ Salt retention
→ Low-grade inflammation
→ Reduced oxygen needs

FAT (ENERGY, INSULATION, WATER) & INSULIN RESISTANCE

Fat provides food for survival and insulates against cold. Take, for example, the male Emperor penguin in Antarctica, which eats marine food voraciously for about two months for fat storage, then wanders up to 40 miles inland to mate, and sits on the female egg for another two months until hatching. Fat is also a metabolic source of water. Consider the camel with few sweat glands which lives in a hot dry environment but can survive for days or weeks without food or water. Fat in the camel's hump is broken down for energy, but also releases water for it to survive.

When food supplies are low, starving animals reduce their energy consumption. An agile brain is needed for survival; in humans one-sixth of food calories ingested are used by the brain. Its preferred fuel source glucose is essential to that responsivity. The hormone insulin is needed to catalyse the transport of glucose fuel to muscles and liver cells, but insulin is not required for glucose use in the brain. Animals have evolved to respond to food shortage by making insulin less effective, which ensures a greater supply of glucose can reach the brain, a phenomenon called ***insulin resistance (IR)***. IR is a prediabetic survival response to the lack of food and water, also occurring with rapid fat accumulation in the liver, observed in hibernating bears and long-distance migrating birds. In autumn, bears forage for high-fructose foods, fruit, berries and even honey, temporarily gaining enormous amounts of weight (fat) and becoming prediabetic before they enter winter hibernation. Many migrating birds change their diet from insects to fruit before migrating. Johnson's research proposes that fructose sugar in particular triggers weight gain and fat accumulation and signals the action of the survival switch.



SUGAR-FRUCTOSE & OBESITY CONSUMPTION

White sugar or sucrose is a simple carbohydrate made up of two sugars, fructose and glucose. The graph shows the climbing UK consumption of sugar from 1700 and after 1900 the increasing obesity which parallels the rise in diabetes mentioned above. Since 1970, fructose consumption has increased dramatically with the introduction of higher fructose (55% fructose) corn syrup, which is cheaper and simpler to manufacture than white sugar and is now added liberally to processed food and drinks. However, it is not just the fructose in our food and drinks that is the culprit, we also produce fructose in the body under stress conditions which include raised glucose levels (prediabetes & diabetes), dehydration, low blood pressure, impaired blood supply, and high uric acid (a cause of gout).

I will write more about fructose and the metabolic diseases (raised lipids, prediabetes, diabetes, obesity, gout and blood pressure & other conditions) in the next newsletter.

General reference: 'Nature Wants Us to be Fat' by Dr Richard Johnson (2022).