The Genotoxic Portfolio of Cannabis –The Growing Research

Coalition of Alcohol and Drug Educators
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The genotoxicity of Cannabis has long been suspected, even acknowledged, be it only in part. Research over the last 5 to 10 years has confirmed the case. Much of this important research has been 'buried' in the deluge of 'hopeful' and even spectacular claims of the potential therapeutic capacity of cannabis. Claims and promises that have persisted for well over 20 years, yet with little to nothing to show for it. However, the harms associated with the use of this now heavily engineered plant/product are mounting, and the research is not only monitoring, but discovering these harms. If science and health matter, then all research must be thorough and properly vetted to ensure that health is advanced, not mere 'symptom abated' whilst disease, disorder or other harms grow.

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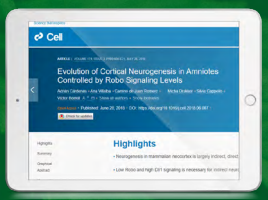

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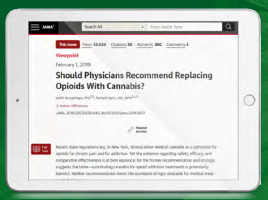

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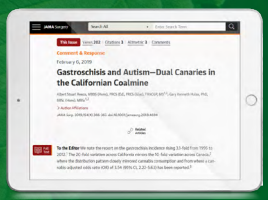

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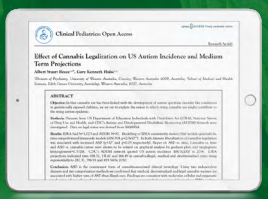

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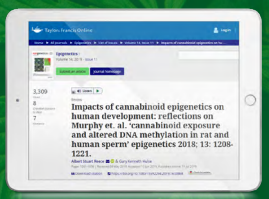
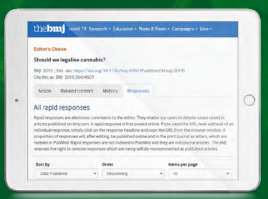


8. "Impacts of Cannabinoid Epigenetics on Human Development: Reflections on Murphy et. al. "Cannabinoid Exposure and Altered DNA Methylation in Rat and Human Sperm" Epigenetics 2018; 13: 1208-1221." Accepted Epigenetics 14th June 2019.



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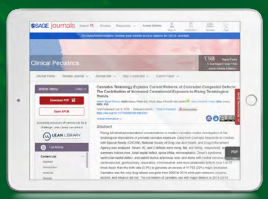
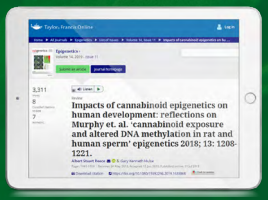


10. "Cannabis Teratology Explains Current Patterns of Coloradan Congenital Defects: The Contribution of Increased Cannabinoid Exposure to Rising Teratological Trends." Clinical Pediatrics. Published online 9th July 2019.



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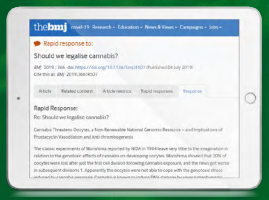

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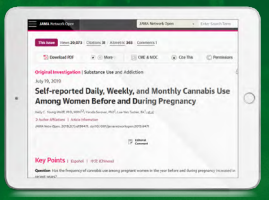

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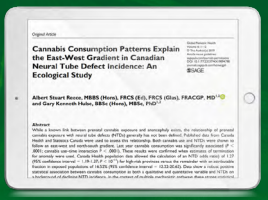

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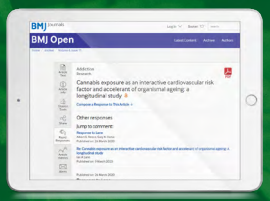

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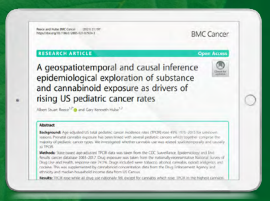

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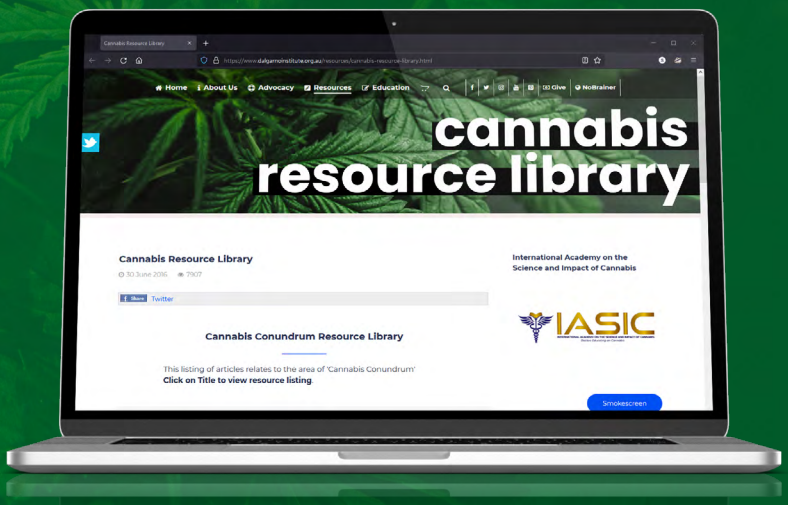

23. Cannabis Resource Library.

Whilst it is obvious that low birth weight has been noted by many papers looking at the effects of cannabis in pregnancy a much more serious pattern is also emerging which has been replicated now in five jurisdictions namely Hawaii [1], Colorado [2], Canada [3], Australia [4]and USA [5-7]. In fact in 6 it was shown that cannabinoids are genotoxic for at least 20% of the human genome by way of chromosomal toxicity. Moreover cannabis has been shown to inhibit sonic hedgehog signalling by several mechanisms [8] which has profound implications for foetal development as sonic hedgehog is one of the most important human embryonic morphogens of all [9]. Sonic hedgehog inhibition alone both implies and accounts for elevated rates of the numerous birth defects in which prenatal cannabis exposure is now implicated.

Cannabinoids also have a heavy epigenetic footprint. This has serious and multi-generational impacts. Moreover, cannabinoids have also been shown to inhibit mitochondrial metabolism by many means including direct inhibition through a full complement of endocannabinoid signalling machinery held on their inner and outer mitochondrial membranes and in the intermembrane space.

Both the epigenomic and metabolic effects of cannabinoids are critical and are also closely related as metabolic state controls epigenetic state both directly through substrate supply and indirectly through small molecular signalling shuttles which have the effect of coordinating nuclear and mitochondrial genomic expression and signalling mitonuclear stress[10]. That is to say that metabolic state and epigenomic state – and hence multigenerational inheritance – are closely and intimately related.

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