

# Broccoli can prevent psychosis

A new study shows intake of a glucoraphanin dietary prevents sfi1 expression in the medial prefrontal cortex for adult offspring of maternal immune activation.

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### Abstract

Schizophrenia can be determined from genetic vulnerabilities and environmental insults in order to be diagnosed as a neurodevelopmental disorder.<sup>1</sup> A genetic abnormality of maternal immune activation can lead into the severe symptoms of schizophrenia disorder.<sup>2</sup> Maternal immune activation (MIA) occurs in pregnant women who are at a higher risk of their neonate's functional connectivity being stressed, inflamed, and weakened.<sup>3</sup> MIA increases in glutamatergic synapse and expression of suppressor of fermentation-induced loss of stress resistance protein 1 (SfI1) mRNA from the medial prefrontal cortex.<sup>4</sup> In a paper recently published in Scientific Reports, Matsuura and Hashimoto investigated the intake of glucoraphanin prevents sfi1 expression in the medial prefrontal cortex for adult offspring with maternal immune activation.<sup>5</sup>

### Background

Glucoraphanin is the precursor of a sulforaphane antioxidant and found in cruciferous vegetables such as broccoli and cauliflower.<sup>5,6</sup> Adults that were offspring of maternal immune activation have been demonstrated to reduce psychosis symptoms with glucoraphanin dietary.<sup>5</sup> Psychosis symptoms are a higher risk to develop for adult offspring such as delusional, hallucinations, and cognitive functions.<sup>7</sup> Cognitive dysfunctions and environmental stressors have shown to impair prefrontal functions such as maternal

immune activation.8

### **Methods**

Pregnant mice with embryos of 9-10 weeks old were placed under a controlled polycarbonate cage with a 12/12-hour light-dark cycle. The mice were injected intraperitoneally for 6 consecutive days with poly(I:C) in order to contract MIA in figure 1.a.<sup>5</sup> The offspring from their mothers after 3 weeks and caged into 3-5 per group.<sup>5</sup> Food pellets contained 0.1% of glucoraphanin were prepared with broccoli sprout extract powder and fed to the offspring in figure 1.a.<sup>5</sup> The Sfi1 mRNA expression levels of the offspring's prefrontal cortex were measured by an RNA extraction using an RNeasy Mini kit.<sup>5</sup> Western blot analysis of Sfi1 protein in the medial prefrontal cortex from offspring after



symptoms of the disorder in 1.c.

maternal immune activation was performed and compared to postmortem brain samples from schizophrenia.<sup>5,9</sup> Immunohistochemistry analysis of parvalbumin (PV) in the medial prefrontal cortex from offspring after MIA were observed for cognitive defects in figure 1.b.<sup>5</sup>

## Results

Expression of prenatal poly(I:C) showed a reduction of parvalbumin immunohistochemistry in offspring's medial prefrontal cortex with MIA compared to the control group. The reduction of PV resulted to cognitive impairment and psychosis.<sup>5</sup> The effects of dietary intake of 0.1% glucoraphanin food pellets on adult offspring after MIA resulted in improved cognitive deficits. Another PV immunohistochemistry was performed on adult offspring of MIA with a dietary intake <sup>5</sup>of glucoraphanin had a significantly higher amount of PV within the medial prefrontal cortex than the control group.<sup>5</sup> The RNA sequencing of the prefrontal cortex in adult offspring resulted in a significant change of suppressor of fermentation-induced loss of stress resistance (sfi1) expression.<sup>5</sup> The sfi1 mRNA expression in the prefrontal cortex was increased by the poly(I:C) injection and the dietary intake of glucoraphanin blocked the increase of the sfi1 gene expression shown in figure 1.c.<sup>5</sup> The Sfi1 protein in schizophrenia was significantly higher than the control group.<sup>5</sup> Sfi1 mRNA expression in hair follicles of schizophrenia were significantly lower than the healthy control group.<sup>5</sup>

### Conclusion

Maternal immune activation is an infection-induced during pregnancy from a cascade of cytokines and immunologic alterations are transmitted to the fetus. MIA strikes the central nervous system and causes a neurochemical and anatomic changes in the brain.<sup>11</sup> These changes result into psychosis symptoms and schizophrenia disorder in the adult offspring after MIA.<sup>10</sup> This study explored how to reduce the psychosis symptoms in the adult offspring after maternal immune activation by using a dietary intake of glucoraphanin. Intaking 0.1% of glucoraphanin for offspring after MIA prevented cognitive deficits and reduction of parvalbumin in the medial prefrontal cortex. The Sfi1 expression aided in the development of behavioral abnormalities in adult offspring, which were blocked by the glucoraphanin intake.<sup>5</sup> Comparing the sfi1 mRNA in hair follicles of schizophrenia mice to sfi1 protein in the postmortem brain expressed how sfi1 associates to the pathophysiology of schizophrenia.<sup>5</sup> This study reveals how adolescences are more vulnerable to psychiatric disorders and how psychosis symptoms can be prevented during this time period.<sup>5</sup> Looking into more nutritional antioxidants that can prevent psychosis for schizophrenia disorder can benefit future research.

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