

24 May 2019

ASX Code: MXC

## Research Publication on the Effectiveness of Cannabinoids on Glioblastoma

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- Study is conducted by the National Institute of Biology (NIB) and University Medical Centre Ljubljana with MGC Pharma R&D Division.
- The general aim of the research was to develop formulations to define the protocols for the treatment of high-grade brain tumours, i.e. glioblastoma with cannabinoids.
- Study evaluated cannabinoid receptor proteins that may add to identify the most effective cytotoxic cannabinoids, known so far, e.g. CBD and THC ratios and further their possible synergistic effects with chemotherapeutic Temozolomide ('TMZ') with regards to the treatment of glioblastoma patients.
- **Conclusions of the study - highlights**
  - ✓ Cannabinoids, especially at increasing THC concentrations, reduce the viability of glioblastoma cells.
  - ✓ Targeting glioblastoma stem cells (GSCs) that are more resistant to chemotherapy. GSC has so far proved to be more vulnerable to cannabinoids than were differentiated cell (publication in preparation).
  - ✓ At optimal concentration for each patient, the defined cannabinoids composition represents promising tool to reduce tumour burden.
- Research collaboration is part of MGC Pharma's strategy of partnering with leading research institutions to examine opportunities to develop new pharma products based on proven cannabinoid formulations in pre-and clinical studies.
- The study results can be viewed on the Company's website by clicking [here](#) and will be presented by the NIB at the 2nd International Annual Congress on Controversies on Cannabis-Based Medicines in Barcelona, Spain on 23-24 May 2019.

**MGC Pharmaceuticals Ltd (ASX: MXC, "MGC Pharma" or "the Company"**, the European based 'Seed to Pharmacy' bio-pharma company focused on developing and commercialising cannabinoid derived medicines. National Institute of Biology (NIB), the largest independent Public Research Institution for life sciences in Slovenia, are pleased to announce the publication of research on the positive effects on targeting cannabinoid receptors in glioblastoma, the most aggressive and so far therapeutically resistant primary brain tumour.

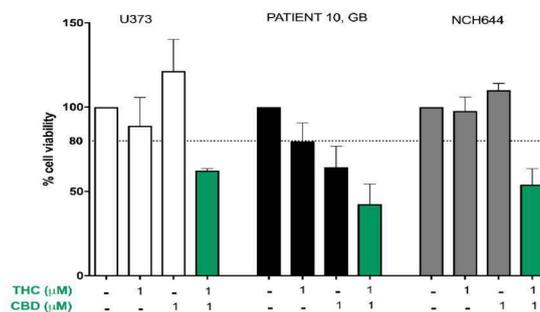
Extensive research using standard and novel analytical approaches was undertaken by MGC Pharma in tandem with several institutions including the Department of Genetic Toxicology and Cancer Biology at the National Institute of Biology, Ljubljana and the Department of Neurosurgery of University Medical Centre, both from Ljubljana, Slovenia.

The MGC-NIB study has **two objectives**:

- Evaluate cannabinoid receptors. CB1 and CB2 protein and mRNA expressions in prospective study of larger cohort of GB patients, and patients-derived primary glioblastoma and respective stem cells 3-Dimensional cultures models for cannabinoids screening.
- Identify the most effective cannabinoids, CBD and THC, ratios and their combinations with chemotherapeutic Temozolomide ('TMZ') in affecting cells' viability, reducing proliferation –cell division and triggering cell death, all key end-points of successful cancer therapy.

**Results** from the study support previous pre-clinical studies showing that cannabinoids induce the processes leading to antitumor responses in some types of cancer, including glioblastoma.

Figure 1: Synergistic effect of THC and CBD resin on GB and GSC cells



Currently, survival of patients with GB ranges from 12 to 15 months after the diagnosis, despite improved treatments in irradiation and chemotherapy. This is mainly due to inefficient targeting of the cancer origin, glioblastoma stem cells that can be improved by cannabinoids. **Thus, we believe that with the development of potential adjuvant cannabinoids treatment we would be effectively targeting both, the stem cells and the overall systemic response of glioblastoma patients that may improve patients' survival rates.**

**Roby Zomer, Co-founder and Managing Director of MGC Pharma, commented:**

*“The research into Glioblastoma and the effectiveness of cannabinoid proteins has successfully improved our understanding of what concentrations have the potential to be an adjuvant strategy to reduce the tumour’s growth. This highly encouraging, ground-breaking research is part of our efforts to increase the use of cannabinoids in the treatment of multiple diseases, that are currently unresponsive to conventional medicines.*

*“We operate a seed to pharmacy strategy, which includes our extensive R&D activities and already have product formulations including CannEpile™ targeting epilepsy and CogniCann™ for dementia and Alzheimer’s. The recently signed distribution agreements with Grow Biotech and IPS Specials in the UK represented a key milestone in the marketing and development of these products.*

*“The research undertaken in conjunction with academic institutions including Department of Genetic Toxicology and Cancer Biology, the National Institute of Biology in Slovenia, and the Department of Neurosurgery, University Medical Centre Ljubljana, Slovenia, is a key element and differentiator for the Company. It not only serves to increase our understanding of the potential of the cannabinoid products we can produce but also keeps us at the forefront of medical cannabis innovation.”*

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## About MGC Pharma

MGC Pharmaceuticals Ltd (ASX: MXC, OTCQB: MGCLF) is an EU-based BioPharma company with many years of technical clinical and commercial experience in the medical cannabis industry. The Company's founders were key figures in the global medical cannabis industry and the core business strategy is to develop and supply high quality cannabinoids-based pharmaceuticals products for the growing demand in the medical markets in Europe, North America and Australasia.

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## About National Institute of Biology (NIB)

National Institute of Biology (NIB) is the largest independent Public Research Institution for Life Sciences in Slovenia. The Institute was established by the Government of the Republic of Slovenia in 1960. The basic activity of the Institute has been and continues to be basic, developmental and applicative research in the fields of biotechnology, biophysics, biomedicine and system biology. NIB works in close cooperation with affiliated higher education and research institutions in Slovenia and abroad. This synergy ensures that the knowledge produced at the Institute is widely accessible to the society through education and outreach activities and is beneficial to the economy by being transferred into practice