Raising awareness: The implementation of medical cannabis and psychedelics used as an adjunct to standard therapy in the treatment of advanced metastatic breast cancer

Rayyan Zafar1,2, Dustin Sulak3, Jaime Brambila4, David Nutt1,2 and Anne Schlag2

Abstract
A 49-year-old woman was diagnosed with an ER+, PR-, HER2+, BRCA- invasive ductal carcinoma which progressed metastatically to include bone, liver, and lymph node involvement. Standardised care included a 26-month treatment period with targeted chemotherapy and a ketogenic diet. The patient also began a course of cannabinoid-based therapy, consisting initially of a titrated high-dose protocol of mixed cannabidiol (CBD) and d9-tetrahydrocannabinol (THC) chemotypes, as well as psilocybin-assisted psychotherapy at macro and intermittent micro-doses. At the end of the five-month treatment period PET/CT investigations revealed no evidence of metastatic disease and chemotherapy was withdrawn. A one year follow up CT investigation concluded no evidence of residual or recurrent disease. A recurrence of disease was noted at 18 months follow up. Over these 18 months the cannabis regimen was titrated down to 60% of the initial protocol. This was subsequently increased to the initial dosing protocol following detection of recurrent disease and this titration occurred over a 10-month period where it remained stable. 16 months following the detection of recurrence of disease, favourable results were observed in the patient with evidence of receding cancer progression. Over the last 15 years there has been a considerable body of in-vitro and in-vivo evidence supporting the anti-neoplastic properties of cannabinoids and more recently psychedelics. Indeed, growing anecdotal and real-world evidence is reported of the therapeutic effect of cannabinoids and psychedelics in reducing both tumour proliferation and aiding as a palliative medicine to treat pain and psychological distress associated with cancer and chemotherapy. The data presented here indicate the potential therapeutic utility of such adjunctive pharmacological interventions in an individual with metastatic breast cancer.

Keywords
medical cannabis, psychedelics, breast cancer

Background
Breast cancer is the second most common cause of death from cancer in women in the UK and the USA and is now the most diagnosed cancer surpassing lung cancer, with 2.3 million new cases annually. Efforts to reduce the morbidity and mortality are warranted due to the large disease burden, with up to 13% of all women estimated to have a lifetime diagnosis of this condition (Howlader et al., 2020; Sung et al., 2021). The development of novel chemotherapies and targeted interventions have seen a considerable decrease in the incidence and mortality related to disease although such improvements have only been noted in countries with high sociodemographic index levels (SDIs). Consequently, the development of novel, effective

1Imperial College London, Centre for Psychedelic Research and Neuropsychopharmacology, UK
2Drug Science, UK
3Integr8 Health, USA
4Grace H&W, USA

Corresponding author:
Rayyan Zafar, Imperial College London, Centre for Psychedelic Research and Neuropsychopharmacology, London, UK.
Email: r.zafar19@imperial.ac.uk
and accessible treatments for breast cancer are warranted and plant-based medicines including cannabinoids and psychedelics have shown some promise.

To date, preclinical studies of cannabinoids and psilocybin have highlighted their ability to exert anti-proliferative, pro-apoptotic and anti-angiogenic effects (Blasco-Benito et al., 2018; Caffarel et al., 2010). The specific mechanisms of how these compounds exert these effects are still being elucidated, however interaction with the immune system and modulation of genes and proteins involved in cell proliferation, differentiation and angiogenesis have all been described (Bifulco et al., 2007; Blasco-Benito et al., 2018; Blázquez et al., 2004; Caffarel et al., 2010; Solinas et al., 2013; Velasco et al., 2015). Currently, there is limited documented clinical evidence for the therapeutic use of medical cannabis products and psychedelics to target and treat cancer. Observational and open-label evidence suggests that they are safe and effective in reducing cancer and chemo-related symptoms and side effects including anxiety, depression, pain, nausea and vomiting (Badowski, 2017; Griffiths et al., 2016; Malone et al., 2018; Ross et al., 2016). There has also been one published case-study of self-administered medical cannabis which was found to assist in tumor regression in a patient with lung cancer (Liew et al., 2021).

Here, we report a case of a patient with stage IV metastatic breast cancer that underwent successful remission following a combination of targeted chemotherapy including pertuzumab, trastuzumab and DOCETaxel with a ketogenic diet, and adjunctive treatment with self-administered medical cannabis and psychedelics.

This case highlights the plausible therapeutic role of such plant-based medicines in oncology treatment and documents pharmacological parameters in which clinical efficacy was achieved in this patient.

**Case presentation**

A 49-year-old woman patient presented to the hospital after having observed abnormalities in her breast tissue. A mammogram, biopsy and subsequent Computed Tomography (CT)-scan and X-ray were performed. The scans revealed a diagnosis of an ER+, PR-, HER2+, BRCA- invasive ductal carcinoma which progressed to metastatic disease including bone, liver, and lymph node involvement. The results of her scan indicated that she was in an advanced stage IV of metastatic breast cancer.

The patient had no previous background of any relevant prior health conditions. There were also no previous family diagnoses of breast cancer, however one 2nd degree relative died from colon cancer.

**Investigations**

In September 2018 the patient underwent Fluro-deoxy-glucose Positron emission tomography (FDG-PET) and CT examination which indicated an FDG avid tumour with a left breast mass, osseous and left axillary nodal metastases, as well as increased FDG activity in the right scapula and sternum.

In October 2018, a 50% reduction in breast tumour mass was observed with a follow-up CT scan. The patient underwent 2 further follow-up PET/CT scans in January 2019 and April 2019 showing no evidence of residual or recurrent disease, and no significant FDG uptake in the left breast mass or in the right scapula, sternum and left axillary nodes post treatment. In September 2019 the patient received a CT of their chest, abdomen and pelvis which further confirmed no evidence of residual or recurrent disease.

In June 2020 a CT scan revealed signs of recurrent disease. The scan revealed a new right mid clavicle expansile, lytic bone lesion and slightly larger left subpectoral lymph node, suspicious for malignant involvement. In July 2020 a secondary malignant neoplasm of the bone was detected, in December 2020 a destructive expansile metastases was detected at L4. A follow up was done in April 2021 showing progression of multifocal lytic osseous metastatic disease. There appeared to be associated pathologic inferior endplate fracture at T7, T8 and T9 without significant loss of height of the anterior and posterior cortices. There was lytic metastasis with probable associated pathologic fracture of the left anterior sixth rib. There was progression of L4 metastasis and pelvic metastases as above. Stable 4.3 × 2.7 cm indeterminate irregular subsolid lesion in the right lung apex. Interval tiny hypoenhancing hepatic lesions suspicious for metastases and a stable 2.2 × 2.4 cm low-density structure just superior to pancreatic body of uncertain etiology and significance.

A follow up in October 2021 from a CT of the chest indicated no adenopathy in the lymph nodes. For the lungs and pleura there was a stable area of linear scarring and ground glass in the right apex. Scattered 6 mm or less solid lung nodules are stable, largest 6 mm nodule in the left lower lobe. Additional nodules on the left upper lobe were also stable. No new or enlarging nodule, no masses or consolidations and no pleural effusions. In the bones, extensive skeletal osseous metastases are again noted, many of which have become more sclerotic (previously more lucent) suggesting interval healing, for example in the right iliac wing, and within multiple thoracic vertebral bodies, most confluent within the T7, T8, T9 vertebral bodies. Pathologic compression fractures of the T7-T9 vertebral bodies are unchanged, in addition to a pathologic compression fracture of the L4 vertebral body. Interval slight enlargement of a lytic lesion within the right sacrum abutting the sacroiliac joint now 3.5 cm, previously 3.2 cm. Deformity and sclerosis of the right clavicle, presumably related to infiltrative treated metastatic disease is not significantly changed.
Treatment

Standard care

The patient received a standardised care of chemotherapy and targeted therapy of intravenous Docetaxel (139 mg) administered three times in September 2018, November 2018 and January 2019. The patient also received five monthly administrations of Pertuzumab (420 mg) and Trastuzumab (455 mg) from September 2018 through to January 2019. Following this, the patient received intravenous Herceptin every 3 weeks (455 mg) until October 2021. The patient received targeted radiation in the clavicle and spinal areas in July and December 2020. Between June 2020 and April 2021 the patient received Kadcyla T-DM1 100 mg Intravenous injections every 3 weeks. From April 2021 to October 2021, the patient was prescribed oral chemotherapy drug Xeloda on a 1 week on-off cycle of 1500 mg as well as Tucatinib starting at 600 mg daily which was tapered to 300 mg daily by October 2021.

This chemo and targeted therapy regimen were supported by a low carbohydrate and high fat ketogenic diet. Additional supplements including borage and omega oils, glucosamine (1200 mg), vitamin D (500 IU), vitamin B12, (1200 mg). Palmitoylethanolamide (1200 mg) was taken daily from October 2018 to January 2020, was stopped for 3 months due to supply issues and then reinstated in April 2020 through to present day.

Cannabinoid therapy

The patient self-administered a regimen of cannabinoid and psychedelic medicines as an adjunct to the abovementioned treatment. Full spectrum ethanol base extracted cannabis concentrated oils and tinctures were used daily from August 2018, following diagnosis of ER+, PR-, HER2+, BRCA- breast cancer before the CT scan confirming metastatic disease, and before chemotherapy initiation whilst the patient was undergoing clinical observations for diagnosis, until present day. The doses were respectively adjusted and titrated to high doses as per routine clinical procedure with medical cannabinoids and also based on available supply from manufacturers at the time. The cultivars of cannabinoids used were subsequently analysed and the specific dose of each major and minor phytocannabinoid are reported in Table 1.

This is considered a high dose protocol that was titrated up. The formulations are patentable and are the IP of Grace H&W therapeutics. These are all whole plant concentrate extracted with ethanol. The frequency of use was daily.

Psychedelic therapy

In addition to daily cannabinoid treatment, the patient underwent four psychedelic-assisted psychotherapy sessions from November 2018 to October 2021. Each time the patient received 4 g of Psilocybe cubensis with assisted sensory deprivation and a post-treatment reintegration session with a trained psychotherapist. The psychedelic-associated psychotherapy model used included preparation and integration with a trained therapist. In addition, the patient also undertook intermittent microdosing of 10–20 mg of psilocybe cubensis between February and April 2019. The psychedelic regimen undertaken by the patient is presented in Table 2.

Side effects of psychedelic and cannabinoid therapy

No serious adverse events were reported in relation to medical cannabis or medical psychedelics. As the patient slowly titrated up to the target dose with cannabinoids, there were psychoactive effects perceived in particular with the whole plant formulations that contained THC. Using a cannabis titration protocol created by one of the patient’s treating physicians, the patient was able to create enough tolerance by systematically increasing the dose, and when psychoactivity was perceived, the dose was maintained until the psychoactive effect subsided to a tolerable level, then the patient would be able to keep increasing and working up to the target dose.

When mushrooms were introduced at microdose levels, the effect of the cannabis became more tolerable. With the combination, there was a sense of calm, clarity, and a sense of overall well-being that was perceived. The patient experienced less anxiety and more tolerability to the psychotropic effect of THC when psilocybin was combined with it. The patient was able to deal much better with the emotional burden of going through the cancer experience and reported it became easier for them to feel a release from their emotional burden. The patient described it as if they were witnessing the experience rather than having a distressed emotional reaction to what they were going through.

Outcome and follow-up

In October 2018, one month following on from initiation of treatment, there was an observable 50% reduction in breast mass as observed with a CT scan. In January 2019 and April 2019, two further FDG-PET/CT scans were performed showing no evidence of residual or recurrent cancer. In June 2019 the patient attended a clinical visit where this was also confirmed and in September 2019 a CT of the chest, abdomen and pelvis was taken with no evidence of residual or recurrent disease. Follow up CTs in October 2019 confirmed stability of metastases and signs of improvement. Images showing reduced FDG uptake can be observed below.

Evidence of recurrence of disease between June 2020 and April 2021 was found and confirmed with CT scans,
and is detailed above. Following reinitiation of chemotherapy, targeted radiotherapy, and adjunctive cannabinoid and psychedelic-assisted psychotherapy as described above, the clinical impression from a final follow up in October 2021 is that of decreased conspicuity of multiple liver metastases since the April 2019 exam, and increased sclerosis of numerous previously lytic metastatic osseous lesions (suggesting interval healing), although slight interval enlargement in one of the metastases in the right iliac extending into the right sacroiliac joint. There are also stable bilateral lung nodules, presumably through metastases. Overall the picture is one of the disease having stabilised and going into remission again. A tabulated summary describing the details, dates and nature of diagnostic measures, results and therapeutic interventions can be found in Appendix 1.

(Figures 1 and 2)

### Discussion

This case study, we understand to be the first published of its kind, highlights the adjunctive role of cannabinoids and psychedelic-assisted psychotherapy to standardised chemo, radio and targeted therapy in successfully treating advanced metastatic breast cancer.

From August 2018 at the time of diagnosis of stage IV metastatic breast cancer through to October 2018, a regimen of cannabis-based medicinal products was used by the patient to supplement their standardised chemotherapy and targeted therapy regimen. This was successful and lead to a reduction in breast tumour mass of 50% by October 2018. From October 2018 the cannabinoid regimen was maintained and psychedelic assisted therapy was introduced to the patient. The outcome in January 2019 was no evidence of residual or recurrent disease as determined with a FDG-PET/CT scan. This highlights in the first phase of treatment the possibility of the therapeutic adjunctive effect of both psychedelics and cannabinoids in treating metastatic breast cancer. From January to September 2019, doses of chemotherapy were removed and cannabinoid and psychedelic assisted psychotherapy was maintained. No evidence of residual or recurrent disease was confirmed in September 2019 with a CT scan. Following this period, cannabis was titrated back to 56% of the initial targeted dose and psychedelic-assisted psychotherapy was stopped. In June 2020, there was evidence of recurrent disease and hence this brings up the possibility that withdrawal of the cannabinoid and psychedelic therapies may have contributed to the return of the cancer. This describes an ABA design wherein a treatment is removed

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**Table 1.** Daily dose of oral cannabinoids (mg) used by the patient during self-administration regimen.

|            | August 2018 | Sept-October 2018 | November 2018-January 2019 | July 2019-December 2020 | January 2021 | February 2021 | March 2021 | April 2021 | May 2021 | Jun 2021-present day |
|------------|-------------|-------------------|-----------------------------|-------------------------|--------------|---------------|------------|------------|----------|---------------------|
| CDB        | 245         | 130               | 294                         | 176                     | 250          | 263           | 340        | 580        | 865      | 1064                |
| CBD-A      | 245         | 960               | 701                         | 398                     | 600          | 855           | 1200       | 2000       | 2780     | 3271                |
| CBD-V      | 16          | 16.6              | 9.96                        | 16.6                    | 122          | 180           | 220        | 240        | 268      |                     |
| CBC        | 1.24        | 34                | 50                          | 30                      | 50           | 65            | 73         | 84         | 90       | 95                  |
| THC        | 157         | 317               | 509                         | 280                     | 409          | 580           | 640        | 640        | 640      | 640                 |
| THC-A      | 226         | 475               | 499                         | 270                     | 480          | 530           | 670        | 780        | 800      | 812                 |
| THC-V      | 1.25        | 1.25              | 1.25                        | 0.75                    | 1.25         | 15            | 23         | 27         | 29       | 37                  |
| CBG        | 20.97       | 74.73             | 53.76                       | 32.25                   | 53.76        | 65            | 83         | 120        | 170      | 198                 |
| CBGA       | 1.25        | 1.25              | 1.25                        | 0.75                    | 1.25         | 15            | 23         | 27         | 29       | 37                  |
| CBN        | 0.3         | 0.1               | 0                           | 0.1                     | 0            | 5             | 10         | 11         | 11       | 14                  |
| Total cannabinoids | 896.46 | 2008.28 | 2124.71 | 1196.96 | 1860.71 | 2500 | 3219 | 5722 | 7025 | 7779 |

**Table 2.** Doses of psilocybe cubensis taken by the patient.

| Dates               | Dose (Psilocybe cubensis) | Complimentary therapy                      |
|---------------------|---------------------------|--------------------------------------------|
| October 2018 – January 2019 | 10–20 mg | Fadiman protocol microdosing               |
| June 2019 – September 2019 |                     |                                            |
| July 2020 – December 2020 |                     |                                            |
| March 2020 – October 2021 |                     |                                            |
| November 2018 | 4g | Sensory deprivation and post-session integration |
| April 2019 |                     |                                            |
| April 2021 |                     |                                            |
| August 2021 |                     |                                            |
and there is a resurgence of symptoms. This is a powerful demonstration of the temporal and dynamic nature of clinical prescribing. Whilst this is a sample of N = 1, it provides valuable insights into the real-world prescribing of medical cannabis indicating appropriate therapeutic doses and a range of adjuvant medications which would be very difficult to reflect in a randomised controlled clinical trial. Following evidence of recurrent disease, both cannabis and psychedelics were reintroduced with a stronger cannabinoid profile introduced gradually (Appendix 1). In October 2021, a stabilization of a stabilization of response was noted and the patient was sought to remain stable. The overall picture of the case presents the strong possibility that cannabinoids and psychedelics have played an important modulatory or additive role to standardised treatment, which warrants further exploration.

A recent study in patients with HER2-positive metastatic breast cancer found that the addition of pertuzumab to trastuzumab and doxetaxel significantly improved median overall survival to 56.5 months, compared with 40.8 months in the placebo arm, showing the increased efficacy of this novel drug combination (Baselga and Swain, 2010). This study also found 37% patients were alive at 8 years follow up and 16% did not progress on this combination. A separate analysis of over 500 patients with metastatic breast cancer indicated that only 16% of such individuals achieve no evidence of disease status (Bishop et al., 2015). Hence, the prognosis for this patient based on the available clinical data was poor, and so investigation into the possible causes for achieving no evidence of disease is pertinent to improve survival chances in such patients. In our discussion we will explore how adjunctive cannabinoid and psychedelic treatment may confer a clinical advantage to individuals using routine chemotherapy and radiotherapy.

The standard of care received in this treatment followed standardised protocols for the treatment of ER+, HER2+ breast cancers. Trastuzumab is one of the most effective and advanced interventions for individuals expressing this particular endophenotype and although remission was achieved in this case study, 75% of individuals with ErbB2-overexpressing tumors, such as this patient, do not
respond to this intervention (Hynes and Lane, 2005). Recent pre-clinical work has suggested that cannabinoids can work synergistically with HER2-targeted therapies, such as trastuzumab, resulting in additive antiproliferative responses (Blasco-Benito et al., 2018). Cannabinoids have also been found to independently reduce ErbB2-driven breast cancer progression through inhibiting cell-signaling pathways (Caffarel et al., 2010).

Notably, angiogenesis is another critical mechanism for tumour growth and cannabinoids have also been shown to inhibit hypoxia-inducible factor 1 (HIF-1) which is an essential mediator for downstream nuclear signalling that modulates cancer-cell growth (Bifulco et al., 2007; Blázquez et al., 2004; Solinas et al., 2013). Psilocin, which is the active metabolite of psilocybin, has also been found to block the activity of HIF-1 via activation of the Sigma-1 receptor (Szabo et al., 2016). These lines of pre-clinical evidence support the mechanisms of action of anti-neoplastic effects of both cannabinoids and psychedelics. These theorised cellular and molecular mechanisms are illustrated in Figures 3 and 4, adapted from Mangal et al. (2021) and Szabo (2015).

Complementary to the disease-modifying evidence presented, it is becoming increasingly established that these compounds can provide additional palliative and psychological support to individuals suffering from cancer. Recent studies have shown the efficacy of psilocybin in cancer patients in treating depression and cancer-related anxiety, caused by the side effects of standard care and due to psychological distress from such a diagnosis (Badowski, 2017; Malone et al., 2018; Ross et al., 2016). There are a breadth of studies that have established psilocybin and other classic psychedelics to have low levels of toxicity and abuse liability (Schlag et al., 2022a). A study by Johns Hopkins University analyzed the effects of psilocybin-assisted psychotherapy on 51 patients diagnosed with advanced cancer. The study found that high doses of psilocybin produced a substantial decrease in depression, general anxiety and anxiety towards death. It also produced increases in patients’ quality of life and optimism. These results were sustained 6 months after treatment and highlight the adjunctive therapeutic role of psychedelics in treating the psychiatric sequelae observed in more than 75% of individuals with a diagnosis of cancer (Griffiths et al., 2016).

Figure 3. Potential anti-cancer mechanisms of cannabinoids.
In addition to psilocybin, both CBD and THC are anxiolytic, and cannabis-based medicinal products (CBMPs) are increasingly being used by patients to treat various anxiety disorders. Within Project Twenty21, the largest UK registry of medical cannabis patients, about a third of patients are prescribed a range of CBMPs to treat anxiety, the most common condition treated after chronic pain in this registry (Schlag et al., 2022b).

Although Bahji et al.’s (2020) meta-analysis indicates that the routine use of CBMPs to treat anxiety is insufficiently supported by the available RCT evidence (Bahji et al., 2020), national and international databases of Real World Evidence repeatedly highlight the potential value of CBMPs for patients’ well-being (Couch, 2020; Sakal et al., 2022). While it is evident that CBD in particular has considerable potential to treat anxiety disorders (Blessing et al., 2015), further research, including details on the ratio of THC and CBD in products, is vital.

Cannabinoids have also shown efficacy in reducing chemotherapy-related emesis with nabilone, a synthetic derivative of THC, being an FDA, EMA and NICE recommended intervention (Badowski, 2017). A recent randomized-controlled trial investigating the impact of medical cannabis on pain and opioid use in stage IV cancer patients showed a significant reduction in opioid use and improved pain control, adding relevant evidence to the positive effect of medical cannabis in standard oncology care (Zylla et al., 2021). Furthermore, there is an increasing body of literature supporting the use of various cannabis-based medicinal products (CBMPs) to treat cancer-related pain. A helpful summary can be found here (Blake et al., 2017).

However, a recent systematic review did not find any evidence that the addition of cannabinoids to opioids reduces cancer pain (Boland et al., 2020).

The re-integration of cannabinoids and psychedelic-assisted psychotherapy into western medicine has been well documented in scientific and popular culture. Over recent years there have been several notable clinical trials to test the safety and efficacy of these compounds for a range of disorders. Early results from such controlled clinical trials are complemented by a significant and non-inconsequential number of observational, anecdotal and case reports that support the therapeutic efficacy of these compounds.

Figure 4. Potential anti-cancer mechanisms of psilocybin.
This case study offers an important example of how such medicines can be integrated into standard care to provide adjunctive physiological and psychiatric benefit in similar patient groups, and also highlights the importance of conducting further clinical studies, both on psilocybin and CBMPs, to treat cancer.

**Learning points/take home messages**

1. Presentation of patients suffering with cancer utilising self-administered cannabinoids and psychedelics is common-place and is increasingly being reported in clinical practice.
2. Several pre-clinical, clinical and observational research studies have supported the disease modifying capabilities of psychedelics and cannabinoids in therapeutically targeting breast cancer as well as other cancers.
3. Mechanistically, there are several lines of evidence to support the pharmacological effects of such compounds on angiogenesis, cell proliferation and apoptosis that could provide an understanding for the molecular mechanisms involved in targeting neoplastic pathology.
4. These compounds have also shown considerable efficacy in controlled clinical research for a range of neuropsychiatric symptoms which often present co-morbid with cancer. These, in combination with potential disease modifying activity, could provide additional therapeutic value.
5. More research, spanning pre-clinical through to observational and randomised controlled trials are warranted to fully elucidate the value of cannabinoids and psychedelics in the treatment of breast cancer and other cancers.

**Patients’ perspective**

In September 2018, I was diagnosed with stage IV metastatic breast cancer. My first thought was, “what am I going to tell my mother?” I immediately began incorporating cannabis into my daily treatment plan. By January 2019, I was found to have no evidence of disease according to my scans. This was absolutely unexpected. When one is diagnosed with cancer, the mental, physical and emotional events which consume and slowly chip away at ones humanity become a daily routine. Everything changes in a heartbeat, and suddenly death becomes your daily counterpart. It’s dehumanizing, demoralizing, and just plain horrific. Cannabis changes all of this. It will ease the suffering of so many, as it eased mine. Cannabis provides hope. It provides help when you feel you can’t go on. I was able to eat. I was able to sleep. The nausea was almost non-existent. I could function. I could work. I was no longer slave to my disease. Imagine a world that embraces cannabis as a true medicinal plant that heals those afflicted with illness. That is the hope cannabis provides. It heals. It restores. It gives life. And access should NEVER be in question.

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**Declaration of conflicting interests**

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JB is CEO of Grace H+W Therapeutics and husband of the patient presented in this case study. DS is a medical cannabis prescriber, and owns the clinic Integr8, which specialises in holistic medicinal practices.

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| Date           | Diagnostic measure | Therapeutic intervention | Cannabinoids                  | Percentage of the target dose titration | Psychedelics | Palmitoylethanolamide (PEA) | Result                                                                 |
|---------------|--------------------|--------------------------|--------------------------------|----------------------------------------|--------------|-----------------------------|------------------------------------------------------------------------|
| August 2018   | Mammogram & Biopsy |                          | Type 1, Type 2 and Type 3    | 40%                                    |              |                             | Diagnosis of ER+, PR-, HER2+, BRCA- breast cancer                      |
| September 2018| FDG-PET & CT scan  | Chemotherapy + Targeted therapy | Type 1, Type 2 and Type 3    | 94%                                    |              |                             | Evidence of metastatic disease                                        |
| October 2018  | CT Scan            | Chemotherapy + Targeted therapy + Spinal fusion surgery. | Type 1, Type 2 and Type 3    | 94%                                    | Micro-dosing | 1200 mg                     | 50% reduction in breast tumour mass                                   |
| November 2018 | Targeted therapy   | No Chemo due to spinal fusion recovery                          | Type 1, Type 2 and Type 3    | 100%                                   | Micro-dosing | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| December 2018 | Chemotherapy + Targeted therapy |                               | Type 1, Type 2 and Type 3    | 100%                                   | Micro-dosing | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| January 2019  | FDG-PET/CT scan    | Targeted therapy          | Type 1, Type 2 and Type 3    | 100%                                   | Micro-dosing | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| April 2019    | FDG-PET/CT scan    | Targeted therapy          | Type 1, Type 2 and Type 3    | 100%                                   | 1x Macro-dose | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| June 2019     | Targeted therapy   |                          | Type 1, Type 2 and Type 3    | 100%                                   | Micro-dosing | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| September 2019| CT Scan            | Targeted therapy          | Type 1, Type 2 and Type 3    | 56%                                    | Micro-dosing | 1200 mg                     | No evidence of residual or recurrent cancer                            |
| October 2019  | Targeted therapy   |                          | Type 1 and Type 3            | 56%                                    | Dosage stopped | 1200 mg                     | Recurrent disease                                                      |
| June 2020     | CT Scan            | Targeted therapy          | Type 1 and Type 3            | 56%                                    | Dosage stopped | 1200 mg                     |                                                                         |

(continued)
| Date       | Diagnostic measure | Therapeutic intervention                                      | Cannabinoids          | Percentage of the target dose titration | Psychedelics | Palmitoylethanolamide (PEA) | Result                                      |
|------------|--------------------|-------------------------------------------------------------|-----------------------|----------------------------------------|--------------|-----------------------------|---------------------------------------------|
| July 2020  | CT Scan            | Targeted therapy + Targeted radiation                        | Type 1 and 3          | 56%                                    | Micro-dosing |                              | Secondary malignant neoplasm                |
| December 2020 | CT Scan          | Targeted therapy + Targeted radiation                        | Type 1 and 3          | 56%                                    | Micro-dosing | 1200 mg                     | Destructive expansile metastases            |
| January 2020 |                 | Targeted therapy + Oral chemotherapy                        |                       | 87%                                    | Dosage stoped |                              |                                              |
| February 2020 |                 | Targeted therapy + Oral chemotherapy                        |                       | 117%                                   | Dosage stoped |                              |                                              |
| March 2020  |                   | Targeted therapy + Oral chemotherapy                        |                       | 151%                                   | Micro-dosing |                              |                                              |
| April 2021  | CT Scan            | Targeted therapy + Oral chemotherapy                        | Type 1, Type 3 and CBG cultivar | 268%                                   | 1x Macro dose | 1200 mg                     | Multifocal lytic osseous metastatic disease |
| May 2021    |                   | Targeted therapy + Oral chemotherapy                        | Type 1, Type 3 and CBG cultivar | 334%                                   | Micro-dosing | 1200 mg                     |                                              |
| Jun 2021    |                   | Targeted therapy + Oral chemotherapy                        | Type 1, Type 3 and CBG cultivar | 362%                                   | Micro-dosing | 1200 mg                     |                                              |
| August 2021 |                   | Targeted therapy + Oral chemotherapy                        | Type 1, Type 3 and CBG cultivar | 362%                                   | 1x Macro dose | 1200 mg                     |                                              |
| October 2021 | CT Scan           | Targeted therapy + Oral chemotherapy                        | Type 1, Type 3 and CBG cultivar | 362%                                   | Micro-dosing | 1200 mg                     | No adenopathy in lymph nodes. Stable nodules. No new masses. Interval healing of skeletal osseous masses. No progression of metastatic disease. |