Poster 161

Preclinical evaluation of Tumor Treating Fields (TTFields) efficacy under interrupted usage schedules

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Introduction

- Tumor Treating Fields (TTFields) are low-intensity electric fields that disrupt cellular processes critical for cancer cell division and tumor progression.[1-2]
- TTFields therapy is approved for treatment of glioblastoma (GBM), pleural mesothelioma, metastatic non-small cell lung cancer (NSCLC), and locally advanced pancreatic cancer.[1-4]
- Clinical evidence from GBM patients indicates that device usage is directly correlated with patient outcomes.[5-7]
- While the clinical recommendation for patients is to aim for maximal average monthly usage, there are no clear guidelines on how to manage treatment interruptions within the month.
- The aim of the current study was to examine the impact of treatment breaks, including their timing and duration, on TTFields efficacy in vitro.

Methods

- Human GBM (U87 MG) and NSCLC (A549) cell lines were exposed to TTFields (200 and 150 kHz, respectively; 1 V/cm RMS) under varying treatment schedules incorporating intentional interruptions.
- Initially, continuous TTFields exposure for 48 or 72 hours was compared to a 48-hour cumulative exposure delivered within a 72-hour experimental window, including either a single 24-hour interruption at mid-treatment or three distributed 8-hour daily breaks. The effect of break timing was then evaluated by positioning a 24-hour interruption at the beginning, middle, or end of the 72-hour treatment period. Subsequently, the duration of the mid-treatment break was extended to 24, 48, or 72 hours (total experimental duration of 72, 96, and 120 hours, respectively), followed by an assessment of fractionating the 72-hour break across the 120-hour period.
- Treatment efficacy across all conditions was determined by measuring cell counts using flow cytometry at experiment completion, expressed as a percentage relative to untreated time-matched controls.
- Statistical significance was tested with one-way ANOVA with Tukey's multiple comparison; *p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001

Results

FIGURE 1 Within a 72-hour window, treatment breaks totaling 24 hours produced efficacy comparable to uninterrupted 48-hour TTFields exposure, whether continuous or fractionated into three 8-hour intervals.

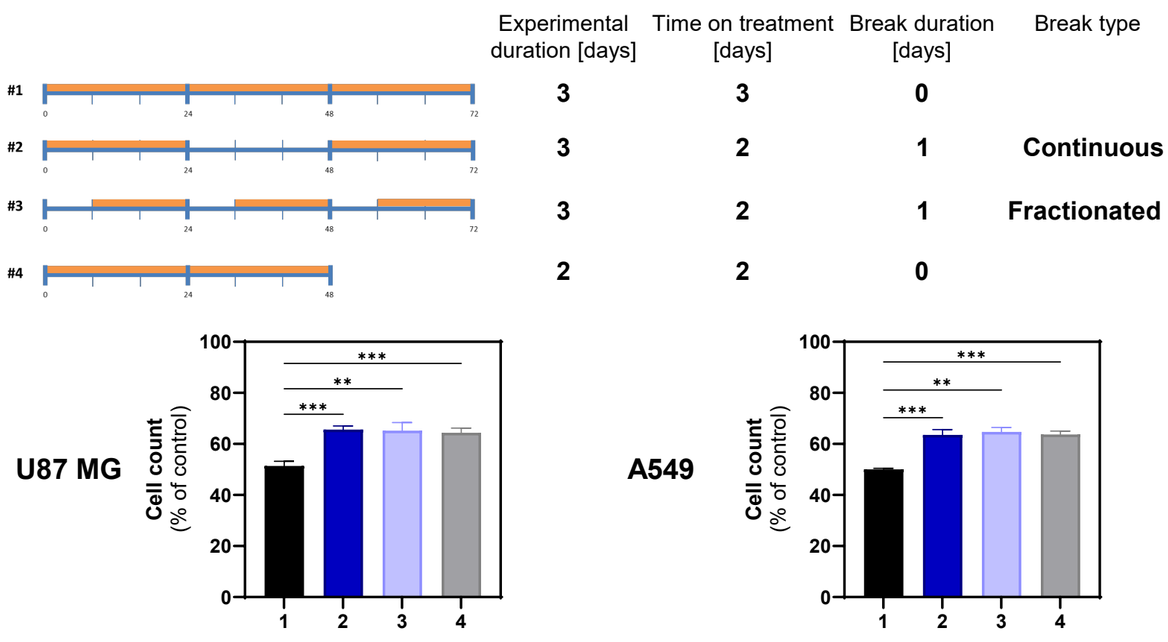


FIGURE 2. Within the 72-hour window, 24-hour breaks produced comparable efficacy regardless of timing (start, middle, or end).

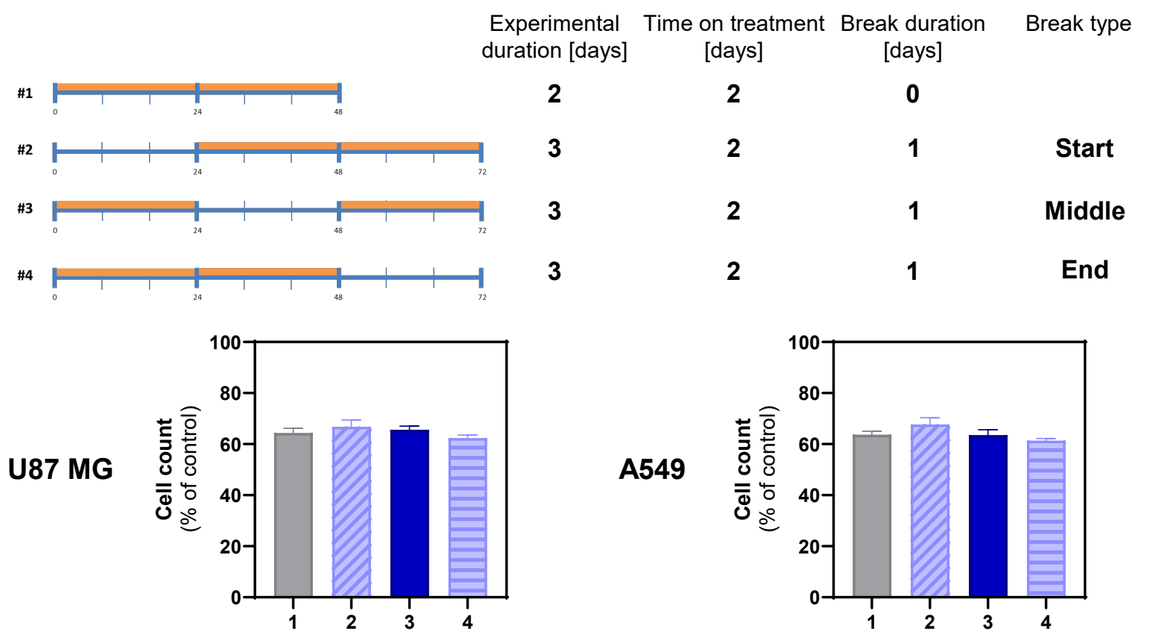


FIGURE 3. Extending the mid-treatment break from 24 to 48 to 72 hours had little effect in U87 MG cells but markedly reduced efficacy in A549 cells at 72 hours.

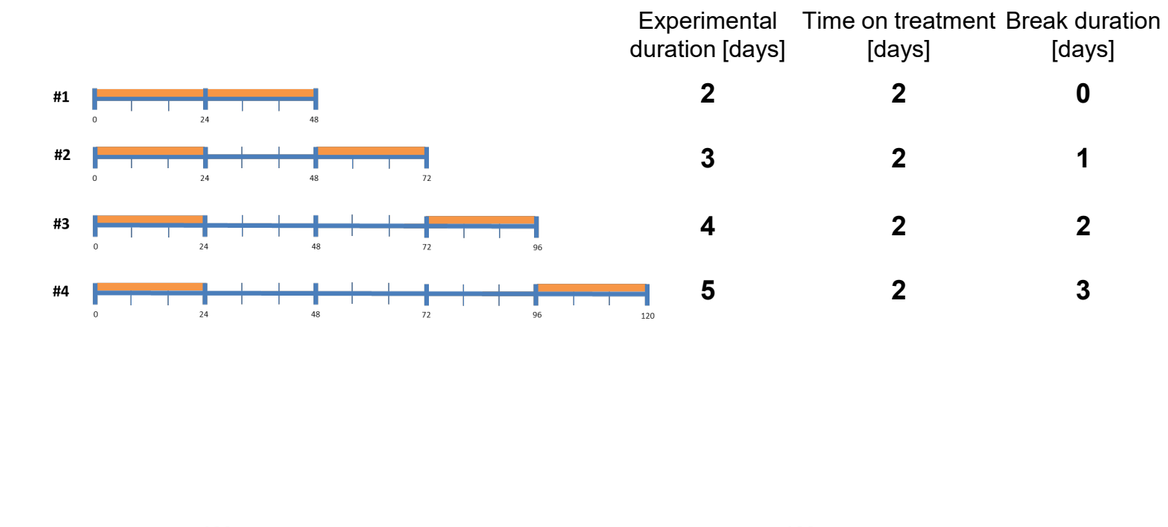
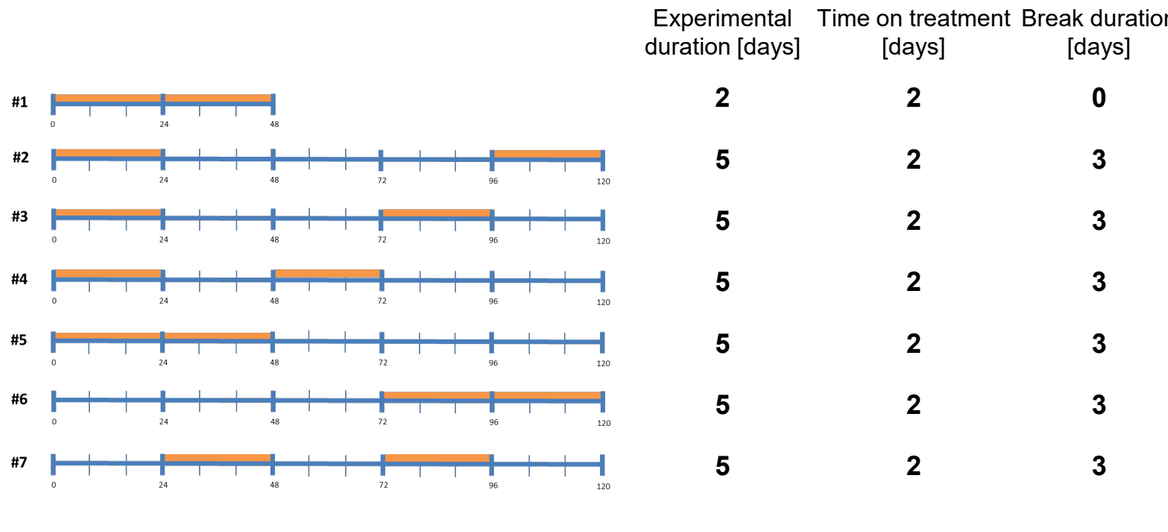


FIGURE 4. Fractionating the 72-hour break across the 120-hour experimental duration partially restored efficacy in A549 cells.



Conclusions

- TTFields efficacy is maintained with short or fractionated (24-hour) treatment interruptions but declines with extended (72-hour) interruptions.
- Establishing interruption patterns or treatment breaks which preserve TTFields efficacy may encourage device usage and improve patient outcomes while reducing treatment burden.

References:

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