

Poster ja ettekanne.

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Millest me räägime?

- milline on mõjus poster?
- poster kui õpilase abimees;
- pealkirjastamine, kontekstualiseerimine, valikud;
- kujundus;
- abimehed kujundamisel.

Mõjus poster

Red Giant Eclipsing Binaries



COOL STARS 19



Exploring Non-Oscillators and Testing Asteroseismic Scalings

Meredith L. Rawls with P. Gaulme, J. McKeever, J. Jackiewicz, et al.

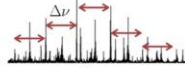
@merrdiff

Evolved benchmarks for asteroseismology

- Red giants (RGs) with solar-like oscillations are powerful beacons for studying the galaxy
- Eclipsing binaries (EBs) with radial velocities and a light curve provide an independent measure of stellar mass M and radius R



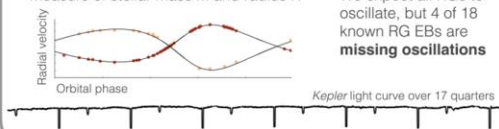
We expect all RGs to oscillate, but 4 of 18 known RG EBs are **missing oscillations**



Oscillation spectra relate to global stellar parameters via two **scaling relations**:

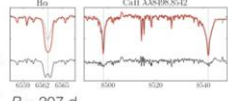
$$\nu_{\max} \propto g T_{\text{eff}}^{-1/2}$$

$$\Delta\nu \propto \rho^{1/2}$$



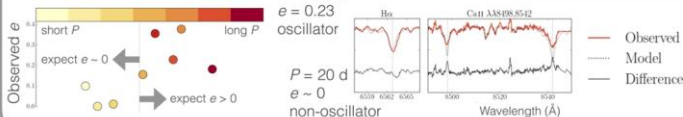
Tides and magnetism affect oscillations

- These effects **appear together** and act to suppress oscillations
- Non-oscillators tend to have short P , circularized orbits, spots, and spectral hints of magnetic activity



Rawls et al. 2016
ApJ, 818, 108
[arXiv:1608.02409](https://arxiv.org/abs/1608.02409)

Rawls et al. in prep
[arXiv:1608.02409](https://arxiv.org/abs/1608.02409)

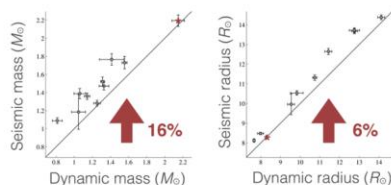


Asteroseismic scalings overestimate M , R

- Asteroseismic masses and radii are **systematically larger** than those from binary modeling
- Densities and surface gravities agree much better than M and R
- Results hold for many versions of the scaling laws and even if temperatures are off by > 100 K
- Proceed with caution!** Mass overestimates from seismology lead to stellar age underestimates

Ten oscillating *Kepler* RGs with main sequence* companions

Gaulme et al. 2016
submitted (stay tuned)



*one double RG from Rawls et al. 2016

Mõjus Poster

on...

...selge ja läbimõeldud.

...terviklik.

...haarav ja veenev.

...esitlejale toeks.

...justkui lugu, millel on algus, areng ja lahendus või lõpp.

Tähelepanu köitmine

-pealkiri või sissejuhatus või tsitaat;

-anna kuulajale kontekst;

-miks peaks kuulajat sinu uurimus huvitama?;

-keskne küsimus või hüpotees!;

MENSTRUAL CYCLE EFFECTS ON ATTITUDES TOWARDS KISSING ROMANTIC PARTNERS

Rafael Wlodarski & Robin I. M. Dunbar

“Previous research shows that menstrual cycle phases affect female mate preference, and that romantic kissing is utilised in mate assessment. This study found that women at high risk of conception place greater value on kissing in the early stages of a relationship (when it can assist with mate assessment), and that this effect is driven by levels of progesterone.”

Introduction & Background

- The menstrual cycle affects female mate choice, shifting preferences towards signals of genetic quality during high conception risk phases - such as sexual dimorphism¹, dominance², and scents related to genetic quality and compatibility³.
- Past research suggests the courtship ritual of romantic kissing aids the assessment of potential mates^{4,5} (see inset).
- The current research examined menstrual cycle shifts in attitudes towards the importance of romantic kissing.

Methodology

An international online questionnaire asking about attitudes towards romantic kissing was conducted.

Participants included 173 normally cycling women: 50 at low risk of conception (luteal phase); 34 at high risk of conception (late follicular phase).

Cycle phase was estimated using reverse day count methods⁶, with estradiol and progesterone levels estimated using mean serum reference values⁷.

Analyses

Estimated progesterone and estrogen levels were regressed onto answers to the questions “How important do you think kissing is at the [very initial stages of a relationship / established phases of a relationship]?”.

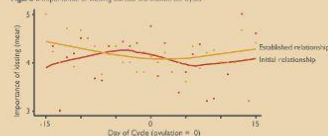
A 2x2 mixed-design ANOVA also analysed answers to these questions, with conception-risk / relationship phase between / within subject factors.

References

1. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
2. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
3. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
4. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
5. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
6. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.
7. Dunbar, R. I. M., & Brown, C. (2008). The evolution of human sexual dimorphism. *Evolutionary Psychology*, 6(1), 1-10.

Results

Figure 1. Importance of kissing across the menstrual cycle



ANATOMY OF A KISS

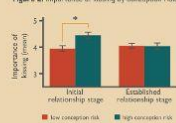
Proposed ways in which romantic kissing might mediate mate choice



Progesterone levels were a significant ($p=0.01$) predictor for kissing importance during the initial, but not established, stages of a relationship.

A significant interaction effect was found between cycle phase and relationship stage ($p=0.02$).

Figure 2. Importance of kissing by conception risk



Conclusion

- Women at high conception risk place greater value on kissing in the early stages of a relationship than women at low conception risk.
- This preference shift is driven by menstrual cycle fluctuations in progesterone.
- The courtship ritual of romantic kissing may be valuable in assessing signals of mating partner quality.

Contact Information

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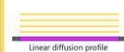
Developing and characterising a novel combined nanoelectrode system

L. P. Robinson, A. Mount



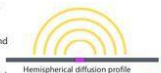
Electrochemistry at nanoelectrodes

Nanoelectrodes have several advantages for electrochemical sensing.



Transport to macroelectrodes proceeds through a relatively inefficient linear diffusion profile. They are also highly affected by convection and iR drop.

In contrast, the diffusion pattern for nanoelectrodes quickly becomes hemispherical. This profile is much more efficient, and they are not so affected by convection or iR drop. They can reliably detect very low (attomole) concentrations of analyte.



A Pt microsquare nanoband edge electrode (MNEE) array system in which the Pt nanoband acts as the working electrode has been developed. The project now aims to create a nanoelectrode device based on this system which has all three electrodes necessary for analysis on one chip.

Combined nanoelectrode system

This design consists of a microsquare at the bottom of each cavity in the array, with the nanoband around the cavity edge.

The Ag/AgCl microsquare is a combined reference and counter electrode. As its area is so much larger than the Pt nanoband, the current passing through the square is not large enough to affect its use as the reference electrode.

This could create an on-chip device for sensitive analytical detection.



Ag/AgCl as a combined electrode



Dendritic growth

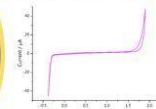
The combined reference/counter electrode is created by electroplating a thin film of Ag onto the Pt microsquare.

Potentiostatic plating causes Ag to grow preferentially at the corners, creating dendrites. A galvanostatic plating protocol is being developed to provide the required smooth, shiny Ag deposit.

To convert the newly plated Ag surface to AgCl, it must be functionalised. Chemical functionalisation by immersion in FeCl₃ has been shown to produce uniform deposits of AgCl.

Characterisation

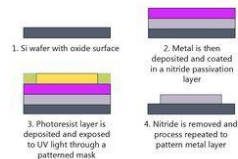
Cyclic voltammetry and electrochemical impedance spectroscopy will be used to verify that the system is behaving as predicted. The nanoband should have a similar response to the current nanoelectrode array.



Example of a nanoelectrode cycling in 100mM KCl solution. This cycle is used to determine the cleanliness of the electrode surface.

Fabrication

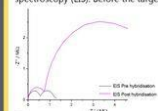
This design has been fabricated at the Scottish Microelectronics Centre using photolithography. In this technique layers of metal and insulator are deposited and patterned to produce the desired arrangement.



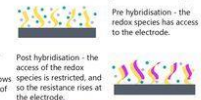
Each layer is deposited and patterned sequentially. This approach reliably produces uniform electrodes cheaply and easily.

An application

By coating the surface of the working electrode in a probe nucleic acid, the corresponding DNA sequence can be detected using electrochemical impedance spectroscopy (EIS). Before the target molecule is hybridised, the resistance measured for the redox couple is small. When the correct target is hybridised the resistance, and therefore the EIS response, is much larger.



EIS measurement of 50 nm electrode shows the increase in resistance upon addition of the target nucleic acid.



Objectives

Having made the initial measurements, the next steps will include:

- complete fabrication of the combined system, including optimisation of nanoband and cavity dimensions
- further investigation of the sensitivity of nanoelectrodes for use in DNA sensing and the relationship between the response and concentration of the target
- optimisation of a galvanostatic silver plating protocol

Many thanks to
Dr Damien Corrigan,
Jaka Schumacher,
Professor Andy
Mount, the Mount
group and the SMC
for their continuing
support and
expertise.



Poster on õpilase abimees

O⁶-Benzylguanine Inhibits Tamoxifen Resistant Breast Cancer Cell Growth and Resensitizes Breast Cancer Cells to Anti-Estrogen Therapy

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Abstract

Endocrine therapies using anti-estrogens are least toxic and very effective for breast cancers, however, tumor resistance to tamoxifen remains a stumbling block for successful therapy. Based on our recent study on the involvement of the DNA repair protein MGMT in pancreatic cancer (Cline Cancer Res 2009), here, we investigated whether MGMT overexpression mediates tamoxifen resistance. Specifically, we determined whether administration of MGMT inhibitor (O⁶-benzylguanine (BG)) at a non-toxic dose alone or in combination with the anti-estrogens (tamoxifen/hydroxytamoxifen) curtails human tamoxifen resistant breast cancer cell growth. Further, we also determined whether BG sensitizes breast cancers to tamoxifen using tamoxifen resistant cells.

MGMT expression was found to be increased in breast cancer cells relative to normal breast epithelial cells. Also, MGMT levels were significantly higher in tamoxifen resistant MCF-7 compared to the parent cells. Silencing of the ER-α expression using a specific siRNA resulted in augmentation of MGMT mRNA and protein levels by 2 fold. We also observed an inverse correlation between MGMT and p53 levels in breast cancer cell lines; moreover, p53 downregulation was accompanied by increased MGMT expression. Other experiments showed that ER-α knockdown in combination with tamoxifen or hydroxytamoxifen decreased ER-α expression, whereas tamoxifen alone and hydroxytamoxifen alone increased and decreased the same respectively. However, all these treatments increased the p21^{waf1} mRNA and protein expression significantly. BG inhibited tamoxifen resistant breast cancer growth in a dose-dependent manner and also decreased tamoxifen resistant breast cancer growth in tamoxifen sensitive breast cancer cells. These combinations also enhanced the cytochrome C release and the PARP cleavage, indicative of apoptosis. In breast cancer xenografts, BG alone or a combination of BG with tamoxifen or hydroxytamoxifen caused significant tumor growth delay and immunohistochemical analysis revealed that BG inhibited the expression of MGMT, ER-α, Ki-67 and increased p21^{waf1} staining. These findings suggest that MGMT inhibition may provide a novel and effective approach for overcoming tamoxifen resistance in breast cancer.

Introduction

Recent advances in breast cancer research have identified key pathways involved in the repair of DNA damage induced by chemotherapeutic agents. The ability of cancer cells to recognize DNA damage and initiate DNA repair is an important mechanism for therapeutic resistance and has a negative impact on therapeutic efficacy. A number of DNA-damaging alkylating agents attack the nucleophilic O⁶ position on guanine, forming mutagenic and highly cytotoxic interstrand DNA crosslinks. The DNA repair enzyme O⁶-methylguanine DNA alkyltransferase (MGMT), encoded by the gene MGMT, repairs alkylation at this site and is responsible for protecting both tumor and normal cells from alkylating agents. MGMT is expressed constitutively in normal cells and tissues. In breast tumors, MGMT gene expression is elevated and levels are up to 4-fold higher than in the normal breast. It has been shown that tamoxifen resistance is associated with increased degradation of MGMT in human cancers. In 1991, Pegib, Moschel, and Dahan observed that O⁶-benzylguanine (BG) inhibited AGT and potentiated the cytotoxicity of both chloroethylating agents and methylating agents. In a series of important observations, they fully characterized the interaction between BG and AGT and its therapeutic impact. They showed that BG binds AGT, transferring the benzyloxy moiety to the active-site cysteine [19]. The reaction is very rapid and more potent than any other previously known AGT inhibitor. BG is not incorporated into DNA in living cells and reacts directly with both cytoplasmic and nuclear AGT. Because BG is a pseudosubstrate for MGMT which results in the covalent transfer of benzyloxy group to the active site cysteine, the MGMT protein is degraded after each reaction. This stoichiometric reaction mechanism effectively depletes the AGT content in tumors and the associated repair of DNA damage. BG is currently undergoing clinical trials in various cancers to increase the efficacy of alkylating agents.

Interestingly, several observations suggest an inverse correlation between the levels of MGMT and p53 tumor suppressor protein where wild-type p53 suppresses transcription of human MGMT expression. Unfortunately, p53 function is often inactivated or suppressed in human cancers; therefore, restoration of wt-p53 activity is essential for the success of these treatments. However, whether or not this is mediated by suppression of MGMT expression has yet to be determined. To date, the cross-talk between MGMT and ER-α (the link to p53 expression) has not been explored in drug (i.e., tamoxifen) resistant breast tumors. The anti-estrogen tamoxifen is the most commonly used treatment for patients with estrogen receptor positive breast cancer. Although many benefits from tamoxifen in the adjuvant and metastatic settings, resistance to this endocrine therapy is an important clinical problem. The primary goal of the present study was to investigate the mechanisms of anti-estrogen drug resistance and to design new therapeutic strategies for overcoming this resistance. The results show that MGMT expression is increased in TAM-resistant breast cancers and inhibition of MGMT by BG significantly improves TAM-sensitivity.

Results

Prolonged Treatment of Tamoxifen Increases MGMT Expression: We developed a tamoxifen resistant MCF-7 cell line by using prolonged treatment of tamoxifen on the parental ER-positive breast cancer cell line. MCF-7-Tamoxifen-resistant MCF-7 cells proliferate at rates similar to the parental MCF-7. Prolonged treatment of tamoxifen onto MCF-7 cells increased MGMT expression compared to parental MCF-7 cells by 2 fold (Fig.1A).

Knocking Down ER-α Enhances MGMT Expression in Tamoxifen Resistant Breast Cancer Cells: It is not known whether ER-α and MGMT transcriptionally regulate each other in tamoxifen resistant breast cancer cells. We therefore investigated whether down regulation of ER-α has any effect on endogenous MGMT expression in these cells. As expected, downregulation of ER-α using specific siRNA significantly reduced ER protein levels in these cells. Western blot analysis was performed and the results in the left panel (Fig. 2A) show that silencing of ER-α increased MGMT expression in these cells, and interestingly, the results in the right panel (Fig. 2B) show increased MGMT mRNA levels were increased as assessed by qRT-PCR. These data suggest that ER-α mediated signaling functions to repress MGMT gene expression in breast cancer cells.

Transcriptional Regulation Between MGMT and p53: Previously, it was reported that p53 negatively regulates MGMT in breast cancer cells. Therefore, we addressed whether or not silencing the p53 reduces endogenous MGMT transcription. Tamoxifen resistant MCF-7 cells were transfected with either p53 siRNA (p53-KD) (Fig. 2C) or MGMT siRNA (MGMT-KD) (Fig. 2D) alone (NS). MGMT expression in MCF-7 breast cancer cells was consistently increased in p53 knock down cells, with different experiments showing a 4-fold augmentation (Fig. 2A) and as expected, knocking down MGMT decreased MGMT transcription where p53 mRNA levels were unaffected in MGMT knockdown cells (Fig. 2D). These results confirm that p53 can regulate MGMT at the transcriptional level.

O⁶-Benzylguanine Plays a Dual Role in Tamoxifen Resistant MCF-7 Cells: Contrasting with the experiments above, next, we studied whether or not knocking down MGMT has any effect on ER-α transcription. As expected, knocking down MGMT decreased MGMT expression. However, it was interesting to find that ER-α gene transcription was also reduced after MGMT silencing (Fig. 2E). These data demonstrate that BG has the ability to attenuate not only the MGMT, but also the ER-α transcription, indicating a possible dual role for MGMT blockers in these breast cancer cells.

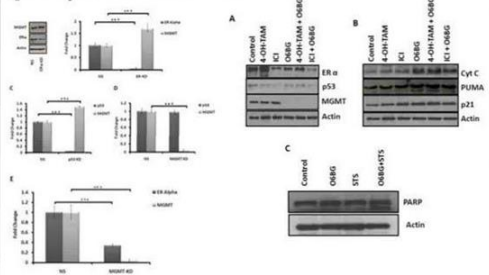


Figure 3. A) Tamoxifen resistant MCF-7 cells were transfected with ER-α siRNA (ER-KD) and ER-α siRNA (ER-KD), and cells were harvested 72 hr post transfection. Total protein was isolated and ER-α and MGMT expression was determined by Western blot analysis. ER-α and MGMT expression was significantly decreased by Western blot analysis. B) MGMT protein was significantly decreased by Western blot analysis. C) Total RNA was isolated and ER-α and MGMT transcription was determined by qRT-PCR. MGMT transcription was significantly increased in ER-α knock down cells. D) Total RNA was isolated from non-specific siRNA (NS) and ER-α siRNA (ER-KD) knock down cells. ER-α and MGMT transcription was determined by qRT-PCR. ER-α knock down cells showed increased MGMT transcription. E) Total RNA was isolated from non-specific siRNA (NS) and MGMT siRNA (MGMT-KD) knock down cells. MGMT and p53 transcription was determined by qRT-PCR. There is an inverse correlation between MGMT and p53 expression in tamoxifen resistant breast cancer cells (ER-α).

O⁶-Benzylguanine Modulates p53 Down-Stream Targeted Protein Expressions: Encouraged by the results reported, we investigated the effect of combination therapy on endogenous MGMT, p53, and ER-α protein expression. As expected, BG decreased MGMT expression, while combination therapy (4-OH-TAM or ICI combined with BG) significantly decreased both MGMT and ER-α expression and decreased the p53 expression. The same treatment with tamoxifen alone and ICI alone decreased and decreased the p53 expression (Fig. 3A). p53 expression was slightly altered after ICI treatment. The reduction in p53 expression by ICI alone was reversed when BG was combined (Fig. 3A). We investigated the effect of BG on proteins which are involved in cell cycle regulation, apoptosis in tamoxifen resistant breast cancer cells. All the cancer treatments significantly increased the p53 protein expression (Fig. 3B). PUMA expression was also increased with these treatments. Hence, PUMA may have transduced to the cytochrome C release (Fig. 3B), and apoptosis was triggered in these cells in presence of combination therapy. PARP cleavage is seen in BG treated cells in presence of etoposide as an indicator of apoptosis (Fig. 3C). Therefore, this data suggest that BG promotes cell cycle arrest and can induce apoptosis by modulating p53 function.

O⁶-Benzylguanine Modulated Transcriptional Targets

Tamoxifen Resistant Breast Cancer Cells: The effect of combination therapy on endogenous MGMT mRNA levels was also studied. Quantitative real-time PCR (qRT-PCR) revealed that anti-estrogens (TAM/ICI) increased the MGMT expression while the combination therapy decreased it compared to control levels. ER-α transcription was decreased compared to controls with all these treatments (Fig. 4A). Surprisingly, p53 and PUMA mRNA was significantly increased in the presence of combination therapy (Fig. 4A & C). These results suggest that p53 mediated target gene transcription was affected by the drug combinations in breast cancer cells (Fig. 4 & 4A).

O⁶-Benzylguanine Enhances p21 Transcriptional Activity in Tamoxifen Resistant Breast Cancer Cells:

In order to investigate the effect of BG on p53 function, we performed luciferase reporter assay. Tamoxifen resistant MCF-7 breast cancer cells were transfected with p21 luciferase reporter construct in presence of absence of BG (data not shown). These results clearly demonstrate that BG significantly enhanced p21 transcriptional activity by 4-5 fold in these cells (Fig. 4D).

Figure 3. A) p53-KD and p53-KD cells were transfected with ER-α siRNA (ER-KD) and ER-α siRNA (ER-KD), and cells were harvested 72 hr post transfection. Total protein was isolated and ER-α and MGMT expression was determined by Western blot analysis. ER-α and MGMT expression was significantly decreased by Western blot analysis. B) MGMT protein was significantly decreased by Western blot analysis. C) Total RNA was isolated and ER-α and MGMT transcription was determined by qRT-PCR. MGMT transcription was significantly increased in ER-α knock down cells. D) Total RNA was isolated from non-specific siRNA (NS) and ER-α siRNA (ER-KD) knock down cells. ER-α and MGMT transcription was determined by qRT-PCR. ER-α knock down cells showed increased MGMT transcription. E) Total RNA was isolated from non-specific siRNA (NS) and MGMT siRNA (MGMT-KD) knock down cells. MGMT and p53 transcription was determined by qRT-PCR. There is an inverse correlation between MGMT and p53 expression in tamoxifen resistant breast cancer cells (ER-α).

Figure 4. A) Tamoxifen resistant MCF-7 breast cancer cells were treated in presence or absence of BG (20 μg/ml) and 4-OH-TAM (10 μg/ml) or ICI (10 μg/ml) for 72 hr. Total RNA was isolated and ER-α, MGMT, p53, and PUMA mRNA levels were determined by qRT-PCR. ER-α, MGMT, p53, and PUMA mRNA levels were significantly decreased by Western blot analysis. B) MGMT protein was significantly decreased by Western blot analysis. C) Total RNA was isolated and ER-α and MGMT transcription was determined by qRT-PCR. MGMT transcription was significantly increased in ER-α knock down cells. D) Total RNA was isolated from non-specific siRNA (NS) and ER-α siRNA (ER-KD) knock down cells. ER-α and MGMT transcription was determined by qRT-PCR. ER-α knock down cells showed increased MGMT transcription. E) Total RNA was isolated from non-specific siRNA (NS) and MGMT siRNA (MGMT-KD) knock down cells. MGMT and p53 transcription was determined by qRT-PCR. There is an inverse correlation between MGMT and p53 expression in tamoxifen resistant breast cancer cells (ER-α).

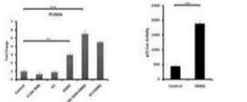
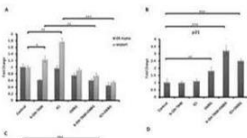
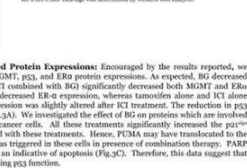


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O⁶-Benzylguanine Inhibits Tamoxifen Resistant Breast Cancer Cell Growth and Increases Resistant Breast Cancer Cell Sensitivity to Anti-Estrogen Therapy (TAM/ICI): Detailed results revealed that all the mice had tumors in the breast. The data summarized in Table 1 shows the daily BG alone or in combination with twice weekly tamoxifen/ICI significantly decreased median tumor volume and weight as compared with that seen in tamoxifen/ICI treated and control mice. The combination of BG with tamoxifen or ICI produced the greatest decrease in median tumor volume as compared with control mice (83.99 mm³, 9.33 mm³ (TAM-BG), respectively; p < 0.0001; (83.99 mm³, 31.66 mm³ (ICI-BG), respectively; p < 0.0001). Tumor weight was also significantly reduced in mice treated with combination therapy as compared with control mice (81.23 mg, 42.49 mg (TAM-BG), respectively; p < 0.0001; (81.23 mg, 51.57 mg (ICI-BG), respectively; p < 0.0001). (Table 1). Body weight was not changed among all treatment groups as compared with control mice. No visible liver lesions were present (examined with the aid of a dissecting microscope) in all treatment groups.

Histology and IHC Analysis: We next determined the *in vivo* effects of BG (alone or in combination) with tamoxifen/ICI. Tumors harvested from different treatment groups were processed for routine histological and IHC analysis. Tumors from mice treated with BG alone or in combination with tamoxifen/ICI alone or control group, p53 expression was not much altered in these treatment groups. In sharp contrast, the expression of p21 was significantly increased in tumors from mice treated with BG either alone or in combination with tamoxifen/ICI. The images were analyzed by ImageJ (NIH) and MGMT, ER-α, p53, p21 and Ki-67 expressions were quantified by the Immunohistochemistry (Fig. 5).

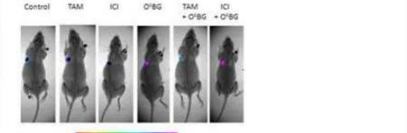
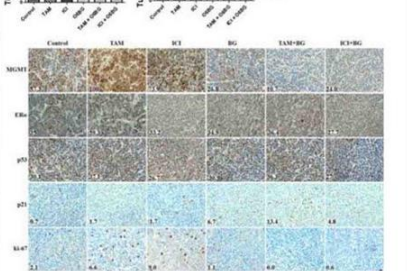


Figure 5. Tumors were harvested from control mice and mice treated with tamoxifen/ICI, BG, or with tamoxifen/ICI and BG. The sections were stained for p53, ER-α, p21, and Ki-67. Tumors from mice treated with BG alone or in combination with tamoxifen/ICI had a significant decrease in the expression of MGMT, ER-α and Ki-67. p21 expression was not much altered in these treatment groups. In sharp contrast, the expression of p21 was significantly increased in all these treatment groups compared with control mice. Representative example (40x) is shown.



Conclusions

- In the present study, we observed that prolonged treatment with anti-estrogens causes drug resistance by inducing the DNA repair protein O⁶-methylguanine DNA methyltransferase (MGMT).
- Decreasing the expression of MGMT by exposing breast cancer cells to BG sensitized these cells to anti-estrogen therapy (tamoxifen and ICI).
- We also observed that combination therapy of anti-estrogens and MGMT blockers not only overcome the MGMT derived drug resistance but also increased the efficacy of anti-estrogen therapy by decreasing estrogen receptor expression and restoration of the functionality of p53 in tamoxifen-resistant breast cancer cells.
- Combination therapy inhibited tamoxifen resistant breast tumor growth *in vivo*.

Acknowledgements

We would like to thank the Florida Department of Health, Breast Cancer Research Program (to Dr. Santhi Konduri) for their kind support.

Halva postri bingo.

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Gradient fills in coloured boxes	Big blocks of text	Photographic background	Unlabelled error bars on graphs	Pixelated pictures
More than five colours	Institutional logos bookending title	Free space	ALL CAPITALS	Text with shadows, outlines, or bevels
Abstract	<u>Underlined text</u>	Comic Sans	3-D graphs	Checking tablet or phone during presentation
Tables showing data that could be in a graph	Poster does not fit on poster board	Comic Sans (it's that annoying)	Objects almost touching or overlapping	<small>Try, unreadable type</small>

By Zen Faulkes, betterposters.blogspot.com

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- aeg katsetamiseks!

AGA!



Signe Ivask, Tartu Ülikool. 2020