

Translational Science, Policy, & Health Outcomes Science

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Development of an Antibiofilm Resorbable Membrane for Treating Peri-implantitis*

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OBJECTIVES/GOALS: Peri-implantitis is the inflammation of peri-implant mucosa and subsequent loss of supporting bone. Its treatment is only <40% successful mainly due to persistent bacterial infection. The goal of this project is to increase success rates by developing a robust antibiofilm multi-biomolecular membrane that can be placed around implant surfaces. **METHODS/STUDY POPULATION:** A collagen membrane was soaked in the antimicrobial peptide GL13K solution overnight to form an interpenetrating fibrillary network. The nanostructure of the membrane was imaged with scanning electron microscope (SEM). The hydrophobicity of the membrane was analyzed by water contact angle (WCA) measurements. The biodegradability was tested in a 0.01 mg/mL Type I collagenase solution for up to 5 weeks. The antimicrobial activity of the membrane was assessed with Gram-positive oral bacteria *Streptococcus gordonii*. The cytotoxicity was evaluated by culturing human gingival fibroblasts (HGF), and the osteogenesis was assessed using preosteoblasts MC3T3. Pure collagen membrane was used as the control. Statistical significance ($p < 0.05$) was determined by one-way ANOVA with Tukey's HSD test. **RESULTS/ANTICIPATED RESULTS:** The antimicrobial peptide GL13K self-assembled to short fibrils (< 1 μm long), which entangled with the larger collagen fibers (around 200 nm in diameter). The collagen fibers presented characteristic periodic banding structures, which provided biomimetic cues for cell behavior as extracellular matrix. The interpenetrated GL13K fibrils turned the highly hydrophilic collagen membrane to a hydrophobic membrane (WCA = 135°) and significantly reduced the rate of degradation by collagenases. The developed membrane was efficient in preventing the attachment of *S. gordonii*. A large portion of the attached bacteria was killed on the surface of the membrane. The incorporation of GL13K did not affect the cytocompatibility of the membrane for HGF. **DISCUSSION/SIGNIFICANCE OF IMPACT:** We developed an antibiofilm membrane with interpenetrating collagen and antimicrobial peptide fibrils. The strong antimicrobial activity and low cytotoxicity support its further translational evaluation as scaffolds for increasing success rate in treating peri-implantitis.

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A Computational Psychiatry Approach to Addiction Using Neuroeconomics Translated Across Species

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OBJECTIVES/GOALS: Decision-making impairments in addiction can arise from dysfunction in distinct neural circuits. Such processes

can be dissociated by measuring complex, computationally distinct behaviors within an economic framework. We aim to characterize computational changes conserved across models of addiction. **METHODS/STUDY POPULATION:** We used neuroeconomic tasks capable of dissociating neurally separable decision processes using behavioral analyses equally applicable to humans and rodents. We tested 12 human cocaine-users and 9 healthy controls on the Web-Surf task designed to match the rodent Restaurant Row task on which 27 mice were trained and then exposed to saline ($n = 10$), cocaine ($n = 7$), or morphine ($n = 10$). All subjects foraged for rewards (humans: entertaining videos; mice: food) of varying costs (1-30s delays) and subjective value (humans: genres; mice: flavors) by making serial accept or reject decisions while on a limited time budget, balancing the utility of wanting desirable rewards despite conflicting costs. **RESULTS/ANTICIPATED RESULTS:** When encountering unique offers for rewards with a delay above one's willingness to wait, cocaine-treated mice like cocaine-exposed humans were less likely to appropriately reject economically disadvantageous offers. Furthermore, these mice and humans did so despite spending more time deliberating between future options. In contrast, morphine-treated mice displayed distinct impairments when given the opportunity to correct past mistakes, a process we previously demonstrated was uniquely sensitive to alterations in strength of synaptic connectivity of the infralimbic-accumbens shell circuit in mice. We anticipate human opioid-users will mirror these latter, computationally distinct findings. **DISCUSSION/SIGNIFICANCE OF IMPACT:** These data elucidate facets of addiction shared across species yet fundamentally distinct between disease subtypes. Our translational approach can help shed light on conserved pathophysiological mechanisms in order to identify novel diagnostic parameters and computational targets for intervention.

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A look at motivation and income level for families in obesity treatment

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OBJECTIVES/GOALS: An evidence-based approach for childhood obesity is family-based treatment (FBT). Research supports that motivation and income level may impact treatment success; however, the relationship between the two is understudied. Therefore, the objective of this study was to examine whether motivation for beginning FBT is associated with income levels. **METHODS/STUDY POPULATION:** 459 parent and child dyads from the PLAN (Pediatric, Learning, Activity, Nutrition) with Families multi-site study were included in this study. PLAN consists of FBT through personalized health coaching over the course of two years, focusing on nutrition, physical activity, and parenting skills. Parent and child also attend height and weight assessments every 6 months in the study. Outcomes of the study include weight change and mastery of behavioral skills. Motivation and income level were provided by self-report at the beginning of the study. Motivation was based on a scale from 1-10 (1 = no motivation, 10 = high motivation). Income levels were grouped into one of three broader categories: low income (\$80,000/year). **RESULTS/ANTICIPATED RESULTS:** The mean level of motivation for the parent was 8.76 and for the child was 7.87. There was a significant difference in the mean level of motivation for the child and parent, $t = 7.73$, $p < .001$. Post-hoc

multiple comparisons using Tukey's HSD test indicated that children in the high-income group had lower levels of motivation ($M = 7.29$, $SD = 2.07$) compared to children in the middle ($M = 8.18$) and low ($M = 8.70$) income groups. Level of motivation did not differ for children in the middle and low-income groups. Finally, parent motivation level did not differ significantly by income group. While there were significant differences between parent and child motivation levels, the motivation remained high for both groups. **DISCUSSION/SIGNIFICANCE OF IMPACT:** The data suggests a significant difference in mean child motivation and income level. Child's high motivation may be from the idea of participating in something new, a rare opportunity for low-income children. To improve the implementation and efficacy of FBT, further study into the relationship between motivation and income level should be done.

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Adapting CAPABLE as CAPABLE-FAMILY for the caregiver-care recipient dyad with Alzheimer's dementia

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OBJECTIVES/GOALS: The purpose of this 4-phase exploratory study is to create a human-centered protocol for a new program, CAPABLE-FAMILY, to address older adults with physical disability and dementia and their caregivers. **METHODS/STUDY POPULATION:** The Szanton-Gill Resilience Model, Verbrugge & Jett Disablement, and Life Span Theory of Control are theoretical frameworks guiding this study. **Phase 1.** Using qualitative research ($n = 10$ dyads) methods (ex. Photovoice) we seek to understand the context for older adults with dementia regarding disability. **Phase 2.** Using synthesis/ideation ($n = 10$ dyads) tools (ex. Journey Maps) we will synthesize the qualitative research during group ideation sessions with stakeholders. **Phase 3.** Using prototype testing ($n = 3$ dyads) methods (ex. Semantic Differentials, Storyboards), we will build the most promising prototypes. **Phase 4.** Using an open-label pilot ($n = 3$ dyads), we will test the interventions. **RESULTS/ANTICIPATED RESULTS:** We will assess disability (ADL, IADL), environmental changes pain, depression, polypharmacy, provider communication needs, and caregiver burden. We will interview the dyads and multiple CAPABLE Registered Nurses (RN), Occupational Therapists (OT), and Handymen (HM) about their prior experiences and perceptions of the pilot. CFQ, MocA, pain (BPI), and ZBI will be measured pre/post RN, OT, HM visit. While there are evidence-based programs to separately address cognitive impairment and physical disability, we anticipate this is the first study to develop a community-based goal-directed, human-centered approach for the maintenance of physical function for persons with dementia in the home. **DISCUSSION/SIGNIFICANCE OF IMPACT:** Persons with more cognitive impairment did not improve as much as those with less cognitive impairment in the original CAPABLE study, an evidenced based program which reduced disability. This suggests the need to adapt CAPABLE to reduce the burden of disability in persons with Alzheimer's dementia. **CONFLICT OF INTEREST DESCRIPTION:** None

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An investigation into the use of curcumin, a topical herbal agent, for the treatment of cervical intraepithelial neoplasia

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OBJECTIVES/GOALS: Cervical cancer is the fourth most common cancer among women worldwide, with approximately 570,000 newly diagnosed cases and 311,000 related deaths among women in 2018. In the United States, approximately 13,000 new cases of cervical cancer are diagnosed annually with approximately 4,000 women dying each year from cervical cancer. Nearly all cervical cancer is caused by oncogenic strains of the human papillomavirus (HPV). Prevention strategies to reduce cervical cancer after HPV exposure entail treatment of cervical dysplasia at the premalignant state, specifically low-grade squamous intraepithelial lesions (LSIL) and high-grade squamous intraepithelial lesions (HSIL), along with the eventual clearance of HPV. The most common treatment for persistent LSIL or HSIL is the loop electrical excisional procedure (LEEP). This procedure is unfortunately not widely available in resource-limited countries and is associated with potential significant morbidities, including decreased fertility, preterm birth, premature rupture of membranes and cervical incompetence. Despite undergoing standard of care treatment, in certain high-risk populations, specifically HIV-infected women, there is a higher rate of premalignant HPV-related cervical disease persistence, progression and recurrence. There is a paramount need for novel non-surgical treatments to stabilize or treat precancerous lesions of the cervix and to decrease the persistence of HPV infection. Medical treatment with the natural herb curcumin may allow subjects to receive treatment of cervical lesions without undergoing a surgical procedure. Curcumin is a major active component extracted from turmeric with anti-inflammatory, anti-infectious, and anti-cancer properties. Topical intravaginal curcumin has the promise of delivering this drug directly to the site of disease, ensuring adequate concentrations at the site of disease while avoiding systemic side effects. This proposed study will determine if there are higher rates of HPV clearance after curcumin administration among women with and without HIV who have premalignant HPV-related cervical disease, specifically LSIL or recently treated (with a LEEP) HSIL. **METHODS/STUDY POPULATION:** We are proposing a prospective double-blind randomized control trial to investigate the utility of topical intra-vaginal curcumin in increasing rates of HPV clearance and mitigating the high rates of disease recurrence in women with and without HIV. A sample of approximately 200 women with and without HIV who have biopsy-proven LSIL or recently treated HSIL will be randomized to one of two arms: 2000 mg of curcumin powder in capsules or placebo inserted intravaginally at bedtime once weekly for 20 weeks (excluding the time of menses). Cervical cytology and HPV testing will be performed at baseline and 6 months post-randomization. If a participant has abnormal cytology or a positive high-risk HPV test 6 months post-randomization, they will be scheduled to undergo a colposcopy with biopsies of all suspicious cervical lesions. If biopsy results are HSIL or greater, subjects will be referred back to routine clinical treatment, which may include a LEEP. Clinicians performing the colposcopies and the study participants will be blinded since the placebo has the same appearance as the curcumin capsules. At the end