UNIVERSITY OF
SOUTH DAKOTA
SANFORD SCHOOL OF MEDICINE

Annual Medical Student Research Forum 2020

Friday, July 24th
9:00 AM to 12:00 PM

Sanford School of Medicine
University of South Dakota
414 East Clark Street
Vermillion, SD

Program and Abstracts

Program Schedule

9:00-9:15 Opening Remarks by Dr. Kozmenko on the Summer Research Program, T-35 CHIRP Program, Scholarship Pathways, and Independent Research opportunities.

9:15-9:30 Thomas Blankespoor- Demographic Review of the COVID 19 Pandemic in South Dakota.
(Jewel Shepherd, Ph.D.)

9:30-09:45 Sydney Bormann-Retrospective study of long-term surgical outcomes in patients who had a vaginal hysterectomy in conjunction with pelvic organ prolapse surgery.
. (Matthew Barker, M.D.)

9:45-10:00 Kyler Hardie- SARS-CoV-2 vaccine development: progress, immunity and outlook.
(Victor Huber, PhD)

10:00-10:15 Troy Hollinsworth- Outcomes of distal femur fractures using nail/plate combination.
(David Potter)

10:15-10:30 Andrew Holmes- Identifying Determinants of Target Specificity in Two Related Bacterial Peptide Toxins.
(Keith Weaver, PhD)

10:30-10:45 Break

10:45-11:00 Anthony La Nasa- LASIK outperforms PRK in post-cataract enhancement patients.
(John Berdahl, M.D.)

11:00-11:15 Mitchell Van Kalsbeek- The adoption and adaption of Hippocratic medicine and oath.
(Henry Travers, M.D.)

11:15-11:30 Cassie Jackson, Scholarship Pathways- University-wide assessment of healthcare programs on readiness for team-based interprofessional education.
(Valeriy Kozmenko, MD)

11:30-11:45 Nathan Blaseg, Scholarship Pathways- Simulation-based interprofessional ICU bedside rounding course.
(Valeriy Kozmenko, MD)

11:45-12:00 Tony Restaino, CHIRP- Role of Notch3 in Human Osteosarcoma.
(Dr. Jianning Tao)

Abstracts

Demographic Review of the COVID 19 Pandemic in South Dakota

Thomas Blankespoor, Jewel Shepherd, Ph.D

Introduction: A novel strain of the coronavirus family, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was linked to several pneumonia cases in Wuhan, China in December 2019. This strain led to a surge in coronavirus disease (COVID 19) so large that the World Health Organization deemed it a global pandemic in early March. While outbreaks in larger urban areas have been heavily researched and publicized, states consisting of mostly rural communities have not received as much coverage or investigation. To determine the impact of COVID on South Dakota, public health data will be used to characterize the spread of the disease across the state and its most vulnerable populations.

Methods: Local public health data and national data was obtained from state departments and the Centers for Disease Control. Different models were used to illustrate the prevalence and movement of COVID in counties of South Dakota. Additionally, South Dakota public health trends were used to characterize vulnerable populations in the state.

Results: While COVID cases have been confirmed in every county of the state besides two, 49% of all cases have occurred in Minnehaha county. Compared with the rest of the United States, South Dakota is 10th lowest in case fatality rate with 1.4% and 28th in cases per capita with 882 per 100,000. Prevalent comorbidities which put individuals at high risk for severe COVID-19 complications were also analyzed. It is evident that certain counties in South Dakota are more heavily affected by these comorbidities and therefore make them vulnerable to worse outcomes.

Conclusions: Although South Dakota is mostly made of rural communities, special care should be taken to limit the spread of COVID in its urbanized areas and vulnerable populations. While a considerable amount of research is needed to answer questions about the entire COVID pandemic, focussed efforts on what comorbidities are leading to severe COVID disease in this specific population could help alleviate the disease's future mortalities.

Enzmann, M.O.; Erickson, M. P.; Grindland, C. J.' Lopez, S. M. C.; Hoover, S. E.; Leedahl, D. D. (2020). Treatment and preliminary outcomes of 150 acute care patients with COVID-19 in a rural health system in the Dakotas. *Epidemiology and Infection, 148*

Clark, A.; Jit, M.; Warren-Gash, C.; Guthrie, B.; Wang, H. X.; Mercer, S. W.; Sanderson, C.; McKee, M.; Troeger, C.; Ong, K. L.; Checchi, F.; Perel, P.; Joseph, S.; Gibbs, H. P.; Banerjee, A.; Eggo, R. M. (2020). Global, regional, and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020: a modeling study. *Lancet Global Health*

Lauer, S. A.; Grantz, K.H.; Bi, Q.; Jones, F. K.; Zheng, Q.; Meredith, H. R.; Azman, A. S.; Reich, N. G.; Lessler J. (2020). The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Annals of Internal Medicine, 172(9),* 577-582

COVID 19; South Dakota; Demographics

Retrospective study of long-term surgical outcomes in patients who had a vaginal hysterectomy in conjunction with pelvic organ prolapse surgery

Sydney Bormann, Matthew Barker, M.D.

Introduction: Pelvic organ prolapse (POP) is the descent of one or more female pelvic organs through the vagina. Patients with POP often present with vaginal bulging and urinary, bowel, or sexual dysfunction (Barber, 2016). This condition is estimated to affect up to 50% of women, and prolapse is the most common cause of hysterectomy in post-menopausal women (Barber, 2016). Patients who have severe symptoms and have failed conservative treatment may undergo surgery.

Evaluating POP repair outcomes is difficult due to variability in the definitions of surgical success and the lack of long-term data (Pelvic Organ Prolapse, 2019). Due to the difficulty in reaching surgical success based on anatomic criteria, it has been proposed that success should be determined by subjective criteria (Stanford, et al. 2011). Our primary aim was to evaluate the long-term retreatment rate of women who have undergone POP surgery. Our secondary aim was to evaluate improvement in pelvic floor symptoms and patient quality-of-life 7-10 years post-surgery.

Methods: This is a retrospective cohort study of patients who underwent primary POP repair surgery that included a hysterectomy and native tissue repair at a tertiary pelvic floor center from 2009 to 2013. Following IRB approval, the surgical records of 231 subjects who fit the study inclusion criteria were obtained from a surgical database. A survey consisting of two validated pelvic organ symptom questionnaires, the Pelvic Floor Distress Inventory (PFDI-20) and the Pelvic Floor Impact Questionnaire (PFIQ-7) were distributed to subjects by phone or mail. Subjects were also asked if they had required retreatment with a pessary device or surgery. Survey results were compared to the PFDI-20 survey subjects completed prior to surgery.

Results: At this time, the analysis included 44 subjects. All subjects identified as white/Caucasian and had a mean age of 66, BMI of 29.6, and vaginal parity of 2.9. One respondent reported requiring retreatment with a pessary device. Of the 20 subjects who fully completed both the pre- and post-operation surveys, 16 reported improved PFDI-20 scores.

Conclusions: Surveys assessing long-term POP symptoms show a low rate of retreatment and an improvement in patient quality-of-life after surgery. A strength of this study is the long-term survey follow-up. Study limitations include low survey response rate and limited generalizability.

Barber M.D. (2016). Pelvic organ prolapse. *BMJ,* 354, i3853.

Pelvic Organ Prolapse. (2019). *Female Pelvic Med. Re, 25*(6), 397-408.

Stanford, E. J., Cassidenti, A., & Moen, M. D. (2011). Traditional native tissue versus mesh-augmented pelvic organ prolapse repairs: Providing an accurate interpretation of current literature. *Int. Urogynecol. J. 23*(1), 19-28.

pelvic organ prolapse; pelvic organ prolapse retreatment; native tissue repair

SARS-CoV-2 vaccine development: progress, immunity and outlook

Kyler Hardie, Victor Huber, PhD

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the virus responsible for COVID-19 and the current worldwide pandemic that first emerged in China at the end of 2019. So far, the SARS-CoV-2 virus has infected over 13.5 million people and has caused more than 585,000 global deaths. With SARS-CoV-2 continuing to spread without an effective means of prevention, the prospect for a successful and safe vaccine remains our best method for controlling the COVID-19 outbreak. The development of vaccines for similar coronaviruses over the past two decades including the original (SARS-CoV-1) and Middle East respiratory syndrome coronavirus (MERS-CoV) offers valuable knowledge toward current SARS-CoV-2 vaccine efforts. The race for producing a vaccine against SARS-CoV-2 has garnered several countries, companies, and institutions to rapidly advance vaccine development encompassing both traditional and modern platform technologies. Over 150 vaccine candidates are currently in pre-clinical and clinical evaluation, with more than 20 candidates in clinical trials. Here, we review SARS-CoV-2 vaccine development efforts and prospects, integrating the clinical relevance of past SARS-CoV-1 and MERS-CoV studies. In addition, the potential for inducing sterilizing immunity, and the future outlook of long-term protection are considered to achieve a better understanding of the immunological factors and timeline surrounding the implementation of an efficacious SARS-CoV-2 vaccine.

Zhang, J., Zeng, H., Gu, J., Li, H., Zheng, L., & Zou, Q. (2020). Progress and prospects on vaccine development against SARS-CoV-2. *Vaccines*, *8*(2), 153.

Prompetchara, E., Ketloy, C., & Palaga, T. (2020). Immune responses in COVID-19 and potential vaccines: Lessons learned from SARS and MERS epidemic. *Asian Pac J Allergy Immunol*, *38*(1), 1-9.

Amanat, F., & Krammer, F. (2020). SARS-CoV-2 vaccines: status report. *Immunity*.

SARS-CoV-2; coronavirus; vaccine

Outcomes of distal femur fractures using nail/plate combination

Hollinsworth TD, Van Demark III RE, Potter GD

Introduction: Distal femur fractures account for 1% of all orthopedic fractures. In the geriatric population, this is associated with a 13.4% mortality rate. Recent surgical technique changes have created the possibility of earlier mobilization compared to the traditional fixation technique. Surgical fixation options include traditional lateral plating, intramedullary fixation and the novel nail-plate fixation. The purpose of this study is to demonstrate that the nail-plate fixation technique has a shorter hospital stay, shorter skilled nursing facility (SNF) stay, quicker return to weight-bearing and no significant increase in mortality or morbidity compared to conventional plating.

Methods: A retrospective chart review was performed identifying patients with a distal femur fracture that underwent fixation by one of the two surgeon authors. Patients were included if they received one of three treatments; nail only, intramedullary fixation or the combination nail-plate fixation and had 90 days of follow up. Statistical analysis included One-way ANOVA of the three fixation techniques, Bonferroni Post-Hoc Test due to the multiple comparisons and a Linear Regression for the variable analysis. Mortality assessment was performed using Fisher's Exact Test/Binomial test.

Results: Forty-seven subjects were identified by electronic record review. Thirty-seven patients remained after excluding under age, incarcerated or non-ambulatory patients. The average age was 72 years (21-105), 7 males and 30 females. There were 11 plate-only, 10 nail-only, and 16 nail-plate fixations. When comparing nail-plate fixation to nail and/or plate only, there was no significant increase in mortality at 30/60/90days, return trips to the OR, hardware failure, or surgical site infections. The nail-plate fixation demonstrated significantly ($p<0.001$) shorter time until start of weightbearing and full weightbearing ($p<0.001$). On average, SNF stay was 9 days shorter and radiographic union was quicker with nail-plate fixation.

Conclusions: The nail-plate fixation technique does not increase mortality or morbidity when compared with the traditional plate-only fixation. The nail-plate technique allowed for the patient to have a shorter SNF stay, shorter time to radiographic union and significantly shorter period of time before weightbearing. Further investigation with a larger patient cohort and longer follow up is warranted to make these findings more generalizable to the broad patient population.

Myers, P.; Laboe, P.; Johnson, K. J.; Fredericks, P. D.; Crichlow, R. J.; Maar, D. C.; Weber, T. G. (2018). Patient Mortality in Geriatric Distal Femur Fractures. *J. Orthop. Trauma,* 32, 111-115.

Liporace, F. A.; Yoon, R. S. (2019). Nail Plate Combination Technique for Native Periprosthetic Distal Femur Fractures. *J. Orthop. Trauma,* 33, e64-e68.

Attum, B.; Douleh, D.; Whiting, P. S.; White-Dzuro, G. A.; Dodd, A. C.; Shen, M. S.; Mir, H. R.; Obremskey, W. T.; Sethi, M. K. (2017). Outcomes of Distal Femur Nonunions Treated With a Combined Nail/Plate Construct and Autogenous Bone Grafting. *J. Orthop. Trauma,* 31, e301-e304.

Femur; fracture; fixation

Identifying Determinants of Target Specificity in Two Related Bacterial Peptide Toxins

Andrew Holmes, Keith Weaver, PhD

Toxin-antitoxin (TA) systems were originally identified as two-component systems ensuring the stable inheritance of plasmids in bacterial populations. Recently, they have been identified on bacterial chromosomes where their functions remain mostly undefined. The *par* locus of *E. faecalis* plasmid pAD1 (par_{pAD1}) was the first TA system defined in a Gram-positive bacterium and a homolog encoded on the *E. faecalis* chromosome (par_{EF0409}) was later described. Related loci numbering in the hundreds have been identified throughout Gram-positive bacteria based on homology to the toxin of the system, Fst, and similarities in genetic organization and regulation. Despite their similar sequences, over-expression of related toxins Fst_{pAD1} and Fst_{EF0409} have differing effects on the host transcriptome, suggesting that sequence differences between the toxins are fine-tuned for distinct functions. Using a combination of domain swaps, as well as single and double amino acid changes, we identified key amino acid residues between Fst_{EF0409} and Fst_{pAD1} critical for triggering the differing gene expression response. Specifically, the variant amino acids at positions 7 and 19 are critical in distinguishing the unique interactions both toxins have with specific membrane target proteins. Furthermore, the carboxyl-terminus tail region of both Fst_{pAD1} and Fst_{EF0409} is essential for generalized interaction with membrane proteins. These results help define the critical region of toxin specificity and will aid in determining the mechanism of action of this large family of peptide toxins.

LASIK outperforms PRK in post-cataract enhancement patients

Anthony La Nasa, Derek Rohlf, John Berdahl, M.D.

Introduction: LASIK and PRK are laser surgeries with the goal of correcting refractive errors in a patient's vision, and these surgeries can be used after cataract surgery to correct any errors induced by the extraction of the cataract (Solomon, et al. 2009; Shortt, et al. 2013). There is limited literature directly comparing the predictability of LASIK vs. PRK post cataract extraction; however, data regarding the efficacy of LASIK post extraction has been published (Gunvant, et al. 2011). The aim of this study is to directly compare post-enhancement visual outcomes in patients that underwent post-cataract LASIK vs. PRK.

Methods: Charts of 893 eyes that underwent post-cataract extraction enhancement surgery between January 1, 2016 and December 30, 2018 were reviewed. Excluded from the study were patients that received non-laser enhancement (lens-based, AK, etc.) or who had a target refraction outside of +/-0.5 D. Pre-enhancement and post-enhancement uncorrected distance visual acuity (UDVA) was recorded, converted to LogMAR, and compared for both groups. Post-enhancement UDVA was measured at a minimum of three months after the enhancement date.

Results: This study analyzed 827 eyes: 494 received LASIK, 333 received PRK. Mean Post-enhancement UDVA in LASIK group averaged 0.05 +/- 0.14. logMAR. Post-enhancement UDVA in PRK patients averaged 0.15 +/- 0.20 logMAR. 330 (67%) of LASIK patients achieved 20/20 or better post-enhancement vision, compared to 142 (43%) in patients that underwent PRK. Controlling for pre-enhancement uncorrected visual acuity, patients that received LASIK had better post-enhancement UDVA than patients that received PRK by 59.9% on average ($p<0.01$).

Conclusions: LASIK provides more predictable outcomes in decreasing refractive error than PRK in post-cataract enhancement procedures, even when pre-enhancement UDVA is controlled. Further research should delve beyond surface level analysis to find specific sources of the increased inaccuracy of PRK and thus help guide surgeons in their selection of the best-fit surgical procedure for their patients.

Solomon, K. D.; Fernández de Castro, L. E.; Sandoval, H. P.; Biber, J. M.; Groat, B.; Neff, K. D.; Ying, M. S.; French, J. W.; Donnenfeld, E. D.; Lindstrom, R. L. (2009). LASIK World Literature Review: Quality of Life and Patient Satisfaction. *Opthalmology,* 116, 691-701.
Gunvant, P.; Ablamowicz, A.; Gollamudi, S. (2011). Predicting the necessity of LASIK enhancement after cataract surgery in patients with multifocal IOL implantation. *Clin. Opthalmol.* 5, 1281-1285.
Shortt, A. J.; Allan, B. D.; Evans, J. R. (2013). Laser-assisted in-situ keratomileusis (LASIK) versus photorefractive keratectomy (PRK) for myopia. *The Cochrane Library*, 1, 1-81.

Cataract; LASIK; PRK

The adoption and adaption of Hippocratic medicine and oath.

Mitchell Van Kalsbeek, MSI Henry Travers, M.D.

Introduction: Connections between medicine and religion extend into antiquity, as medicine emerged out of the prehistoric as a specific human activity. At least three thousand years thereafter, the rise of Greek civilization and the extension of Hellenistic culture resulted in “emancipation of medicine from religion, mysticism and superstition.” The emancipation from divine explanations for natural phenomena (disease) was neither abrupt nor talismanic for medicine’s future. While the historical record in Egypt, China and India also describes the changes in medicine occasioned by religions, this paper will concern itself primarily with Hippocratic medicine and the Judeo-Christian tradition as both intermingled and evolved in the period from approximately 1200 BCE through the end of the 4th century CE. To some extent, the rise of patristic-era Christianity in the first four centuries after the birth of Christ returned to ideas about healing through divine methods even though there was no specific ecclesiastical injunction against Hippocratic techniques or philosophy and, indeed, there were Hippocratic physicians numbered among the Christian converts. As they did during the transition marked by Christ’s birth, the values of medicine and religion have continued to challenge one another in a complex environment of morality, politics, philosophy and science. Our objective is to trace how Hippocratic medical traditions and values arose distinct from Christian traditions and values, and how the adoption and adaption of Hippocratic medicine into the Christian west occurred over time.

Methods: This investigation was carried out via studying a large volume of primary and secondary sources, commentaries and histories written in both ancient and modern times. This included sources which had been translated from the original Greek and Latin into English.

Results and Conclusion: Hippocratic medicine was adopted and adapted by various groups throughout history. Prior to the inception of Hippocratic medicine, the practice of medicine was characterized by cultic, magical, and spiritual healings. Then, in the fourth century BCE, an Oath and a new method of practicing medicine, emancipated from mysticism, arose. The Oath sought to bind students to a moral code and allegiance to a fraternity of physicians as well as to prescribe and proscribe certain behaviors in medical practice. We provide evidence of an incorporation of Pythagorean values into the Hippocratic Oath, and that Hippocratic medicine arose separate from early Christian values and principles. Moreover, we find that Christian physicians likely adopted the Hippocratic healing principles as well as the Oath and medicine, adapting it to better fit their doctrine and worldview.

Temkin, O. (1991). Hippocrates in a World of Pagans and Christians. Baltimore: Johns Hopkins University Press, 109-125

Ferngren, G. B. (2016). Medicine and health care in early christianity. Baltimore, MD: Johns Hopkins University Press, 88-100.

Edelstein, L., Temkin, O. Temkin, C. L. (1987). Ancient medicine. Baltimore, MD: The Johns Hopkins University Press, 16-320

Hippocratic medicine; Hippocratic oath; Christianity; Pythagoreanism

University-wide assessment of healthcare programs on readiness for team-based interprofessional education

Cassie Jackson, Valeriy Kozmenko, MD, CHSE-A

Scholarship Pathways, Sanford School of Medical, USD

INTRODUCTION: Modern healthcare occurs in a dynamic and complex environment that requires providers to work together, collaborate, and quickly adapt to the continuously changing work environment. To prepare providers to meet these demands, practical healthcare and academia established inter-professional education (IPE) opportunities for healthcare professions. According to constructivist theory of learning, readiness to accept or reject given concepts determines the learning outcome. The USD SSOM research group has performed an institution-wide assessment of readiness of healthcare students to participate in IPE activities, to assess for the optimal time to implement into a curriculum for the greatest outcomes.

METHODS: A 29-item Academic Interprofessional Education Attitude Scale (AIPEAS) was developed to achieve the goals of assessing their attitude towards IPE, their readiness to learn and teach other specialties, the desired number of specialties participating within an IPE activity, the optimal time to implement IPE into their curricula and assessing professional identity. The survey was administered to the healthcare professional programs within the University of South Dakota. These program specialties include medical, nursing, and physical therapy/occupational therapy/physician assistant. Physical therapy, occupational therapy and the physician assistant program's data were grouped together due to the smaller number of these specialty programs at USD.

RESULTS: Students from all programs felt that their readiness to teach and to learn increases through the curriculum. Medical students' professional identity increased through the curriculum, rapidly inclined during clinical rotations. Nursing and PT/OT students' professional identity started high then rapidly declined early within the program's curriculum and increased toward graduation. Knowledge of the professional roles of the other professions was uniformly high across all the professions, then decreased within the middle of the programs' curricula and increased toward the end of the corresponding curricula. At the time of graduation, nursing students' knowledge of the professional roles of the other healthcare providers was lowest. Overall IPE attitude scores were high at the beginning of the curricula, declined toward the middle of the curricula, and increased toward the graduation time. At the time of graduation, nursing students had the highest interest toward IPE among tested specialties.

CONCLUSION: Obtained results were used in establishing the optimal time in the medical and health sciences school curricula to implement inter-professional education activities for greatest success.

Curran, V. R., et al., (2010) A longitudinal study of the effect of an interprofessional education curriculum on student satisfaction and attitudes towards interprofessional teamwork and education. *24*(1), 41-52.

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century.* Washington, DC: National Academies Press.

Kozmenko, V., et. al., (2017) The optimal time to institute interprofessional education in the medical school curriculum. *Medical Science Educator, 27*(2), 259-266.

Interprofessional education; healthcare; attitudes, medical school curriculum

Simulation-based interprofessional ICU bedside rounding course

Nathan Blaseg, Dr. Valeriy Kozmenko, MD

Scholarship Pathways, Sanford School of Medical, USD

Introduction: Medical schools are beginning to implement courses in Interprofessional Education (IPE) to prepare students for the interprofessional team-based patient care model which is becoming the standard of practice in many healthcare facilities. Students often have little exposure to multidisciplinary rounds prior to residency, and fast paced low-capacity healthcare environments such as operating rooms and intensive care units necessitate providers be competent and efficient in working within interprofessional teams.

Methods: The University of South Dakota Sanford School of Medicine (USD SSOM) has developed an innovative, simulation-based ICU bedside rounding course which uses a custom-designed simulated electronic health record system that is a hybrid desktop/web-based application. After they have had the opportunity to review the simulated patient's health records on their own, healthcare students of different backgrounds complete the simulated ICU rounding with a standardized patient at the Parry Simulation Center. This activity includes students from nursing, pharmacy, respiratory therapy, physical therapy, and occupational therapy alongside medical students. Students educate one another about their scope of practice, roles and responsibilities, strengths and limitations, as well as treatment goals and associated challenges. Students receive a formative assessment based on the clinical aspects of the curriculum. In addition, their IPE skills are assessed with the use of a 360-degree assessment instrument designed to measure core IPE competencies: (1) information sharing, (2) team support, (3) learning, (4) teaching, and (5) role clarity. The course consists of thirty-six two-hour sessions that include a simulation-based encounter followed by a post-activity debriefing.

Results: Average medical student IPE competency score varied significantly based upon grader, with standardized patients grading more harshly. Several common clinical pitfalls were also identified, including indwelling line status and code status. Satisfaction surveys from students showed high satisfaction and requests for including more specialties.

Conclusions: A simulation-based IPE course implemented at an appropriate time in a healthcare curriculum, with applied principles in effective teamwork and communication, will better prepare health professional students to work within the dynamic interprofessional healthcare environment

Hendricks, S., LaMothe, V. J., Kara, A., & Miller, J. (2017). Facilitators and Barriers for Interprofessional Rounding: A Qualitative Study. *Clinical Nurse Specialist CNS*, 31(4), 219–228.

Interprofessional Education Collaborative. (2016). Core competencies for interprofessional collaborative practice: 2016 update. Washington, DC: Interprofessional Education Collaborative

Leonard, M., Graham, S., & Bonacum, D. (2004). The human factor: The critical importance of effective teamwork and communication in providing safe care*. Quality & Safety in Health Care*, 13 Suppl 1, i85-90.

Interprofessional education; simulation; medical teaching

Role of Notch3 in Human Osteosarcoma

Tony Restaino, Dr. Jianning Tao

CHIRP, Sanford School of Medical, USD

Osteosarcoma is an aggressively malignant tumor of mesenchymal cells exhibiting osteoblastic differentiation. Despite advances in treatment the 5-year survival rate and the survival rate following metastasis, around 70% and 30% respectively, has not improved despite advances in treatment, indicating a need to identify new and novel therapeutic targets. One such potential target is the Notch signaling pathway, a highly conserved signaling pathway which has been shown to regulate a variety of regulatory processes. Recent studies have identified NOTCH3 as being a potential target for study, due to its over-expression in various human osteosarcoma cell lines and its association with metastasis and poor prognosis in osteosarcoma patients. This study will focus on the expression and function of NOTCH3 in the pathogenesis and progression of osteosarcoma in the SJSA-1 cell line, a human osteosarcoma cell line that is characterized by an over-expression of NOTCH3 (4.1 copies). Here we show evidence of the production of NOTCH3 shRNA knockdown SJSA-1 stable cell lines. Additionally, we examined the effects of NOTCH3 knockdown on cell proliferation, invasion, and wound-healing, providing evidence that NOTCH3 is involved in the processes of cell invasion and wound-healing.

Research Programs and Opportunities for SSOM Students

The USD-SSOM Medical Student Research Program (MSRP) strives to create and support opportunities for medical students in the areas of research, service, and education. Three of our programs are described below. In addition, we can assist medical students who are not enrolled in these programs by helping find mentors and funding small projects and travel to conferences.
Contact Laura Rumohr, Program Assistant, Medical Student Research Committee (msrp@usd.edu).

The Medical Student Summer Research Program is an 8 week research experience for students newly accepted to the medical school. Students receive a $5,000 stipend and the hosting lab receives up to $2,000 for supplies. To apply, students choose a faculty member as a research mentor and submit an application to the Medical Student Research Committee.
For more information, please contact Laura Rumohr, Program Assistant, Medical Student Research Committee (msrp@usd.edu).

The Scholarship Pathways Program is an elective opportunity developed to enrich the medical school experience by promoting rigorous independent scholarship and scholarly excellence as well as produce leaders in medical education, research and service. The program spans all four years and develops critical thinking and independent learning skills.
For more information, please contact Benjamin Aaker, M.D. (Benjamin.Aaker@usd.edu), 605-357-1300, 1400 W. 22nd Street, Sioux Falls, SD 57105.

NIH T-35 Children's Health Innovative Research Program (CHIRP) at the Sanford School of Medicine and Sanford Research is focused on providing research training in clinical biomedical sciences to medical students. The ultimate goal of the CHIRP is to help meet the future needs of health-related research by contributing to the development of physicians who will be well-prepared to use evidence-based medicine in practice and contribute to translational research. This research program is self-paced, allowing participants to work closely with their mentors to complete 320 hours of research time during pillars 1 & 2 of their medical school curriculum. All participants receive a generous stipend. Additionally, participants are required to participate in a responsible conduct in research training program, meet routinely with their mentoring team and are encouraged to present their research at regional/national research conferences. For more information, please contact Dr. Pat Manzerra pat.manzerra@usd.edu . To apply, visit the Medical Student Research webpage.

All of these programs can be found at the Medical Student Research Website:
www.usd.edu/medicine/basic-biomedical-sciences/research/medical-student-research-program