

הרצאה סמינריונית

חברי הסגל, סטודנטים והציבור הרחב מוזמנים בזה לסמינר שיינתן ע"י:

**שקד אליהו**

התוכנית הרב תחומית לננו מדעים וננו טכנולוגיה

עבודת דוקטור בנושא:

" Nanometric Mucoadhesive Carriers for Macromolecule Delivery"

שתתקיים ביום רביעי, 16.12.20, בשעה 13:30

בזום בקישור:

<https://technion.zoom.us/j/97591164072>



ב ב ר כ ה,

פרופ' ח. ג'וזואה שניטמן

בהנחיית: פרופ' חבצלת ביאנקו פלד

" Nanometric Mucoadhesive Carriers for Macromolecule Delivery""

Shaked Eliyahu

Supervisor: Prof. Havazelet Bianco-Peled

The ability to adhere to mucosal surfaces, termed mucoadhesion, has attracted much attention in the last few decades. This adhesive property is considered valuable for pharmaceutical purposes, as mucosal drug delivery has great potential to provide improved drug absorption and bioavailability. Drug residence time on mucosal surfaces can be prolonged using polymers designed to attach to mucosal membranes. Such mucoadhesive dosage forms are a useful tool for mucosal drug delivery. Polymeric nanoparticulate mucoadhesive carriers have even greater potential. Not only can they adhere to mucosal tissues, but they also offer increased surface area and enhanced bioavailability by protecting the drug from degradation.

The aim of this research thesis was to investigate the effect of acrylate modification on the mucoadhesion of chitosan at the nanoscale. A second goal was to investigate the effect of cryoprotection and freeze-drying on the physical and chemical properties of the nanoparticles and explore the potential of these carriers to deliver drugs. Nanoparticles were fabricated from acrylated chitosan (ACS) via ionic gelation with tripolyphosphate and were characterized in terms of size, zeta potential, stability, and nanoparticle yield. Chitosan (CS) nanoparticles, serving as a control, were fabricated using the same procedure. The mucoadhesion of the nanoparticles was evaluated using the flow-through method after different incubation periods.

The retention percentages of ACS nanoparticles were found to be significantly higher than those of CS nanoparticles, for all studied time intervals. Cryoprotection of both type of nanoparticles was achieved using sucrose and revealed that ACS nanoparticles are less sensitive to freeze-drying in terms of size. The incorporation of a hydrophilic macromolecular drug, dextran sulfate, increased the nanoparticle size and decreased the zeta potential for both fresh and freeze-dried nanoparticle formulations. In addition, the freeze-dried nanoparticles presented penetration across a mucus gel layer and the flow through technique revealed that short term mucoadhesive properties were not impaired. ACS nanoparticles were able to deliver a model drug across a mucin gel layer but could not improve drug penetration through the triple co-culture cell model that was used in order to mimic the small intestine epithelium.

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|  |  | הטכניון - מכון טכנולוגי לישראל  TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY |
| הפקולטה להנדסה כימית  ע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Wednesday, December 16th, 2020 at 13:30**

**Online seminar via Zoom**

<https://technion.zoom.us/j/97591164072>

**Fatty liver disease prediction and prevention using a wearable sensor**

**Shay Sherbo**

**Mid-PhD Seminar**

Advisor: Prof. Hossam Haick

Metabolic syndrome (MetS) is a term coined to describe a cluster of conditions such as insulin resistance, dyslipidemia, obesity and hypertension. It affects 25-30% of the western population. There are currently above 400 million people suffering from diabetes globally. However, the number of prediabetes subjects is significantly higher and they are most often miss diagnosed. Obesity coupled with insulin resistance results in leakage of fatty acids from adipose tissue that are later stored in the liver, causing liver fat accumulation (NAFLD). Therefore, and due to lack of education, financial resources or lack of health services NAFLD and prediabetes are often diagnosed late through random screening or not diagnosed at all.

In this work, we provide a proof of concept through in vivo trial regarding the eligibility of Volatile Organic Compounds (VOCs) to be used as a diagnostic tool for early detection of metabolic disease. We fed rats with western type diet for 8 months to induce metabolic stress and followed their metabolic and VOC profile. We show that, rats become prediabetes and develop NAFLD disease that cannot be diagnosed through means of simple blood test. We attempt to find VOCs collected throughout the experiment that are relevant to disease manifestation and progression. In addition, we present obstacles of current VOC chemiresistors and present simple fabrication steps aimed at overcoming them. We also show how the skin VOC profile is affected through diet and health status of an individual.