Online Proceedings

Poster Session 2

Balcony, Easel 117

1:00 PM to 2:30 PM

Determining the Amount of Imidacloprd and a Soil Sample Using GC-MS

Aaron Lang, Sophomore, Chemical Engineering , Chemistry, Engineering , Bellevue College
Mentor: Grady Blacken, Chemistry, Bellevue College
Mentor: Sonya Remington-Doucette, Science Division, Bellevue College

Each year bee specialists report detection of larger numbers of bee colonies suffering from colony collapse disorder. One of the suggested causes is the increasing use of neonicotinoid pesticides in farming agriculture. To study the effects these pesticides have on the environment, it is necessary to establish a method to quantify the amount of imidacloprid in an environmental sample. Previously, we found that off-line C-18 cartridges were suitable for enriching imidacloprid from complex matrices and for preparing samples for analysis in GC-MS (gas chromatography-mass spectrometry). Our previous work primarily focused on achieving a reliable calibration curve by enhancing signal-to-noise in the GC-MS. To further evaluate our findings, a spiked environmental sample was subjected to C-18 extraction and analyzed. This method resulted in a limit of detection as low as 160 micromolar, which is similar to the 120 to 320 micromolar range for limits of detection achieved by other research groups using more complex extractions. This is important to the future study of imidacloprid because it allows us to progress towards the analysis of environmentally relevant concentrations of imidacloprid in soil, plant and honey samples.

Poster Session 3

Commons West, Easel 25

2:30 PM to 4:00 PM

Influence of pH and Temperature on Growth of Lactic Acid Bacteria

Bridget Wittke, Junior, Psychology, Bellevue College
Mentor: Sonya Remington-Doucette, Science Division, Bellevue College
Mentor: Grady Blacken, Chemistry, Bellevue College

Probiotics are living microorganisms that, when administered in adequate amounts, confer health benefits on the host. Many studies indicate that there are several ways in which probiotics, which include lactic acid bacteria (LAB), have health benefits. These bacteria survive in a wide range of temperatures and pHs, from storage to digestion. In this study, I investigated the effect of varying pH and temperature on LAB growth in a model stomach with MRS broth, one of the most common growth mediums used by microbiologists to grow LAB. I isolated LAB from Yogourmet®yogurt starter, which contains L. Bulgarius, S. Thermophilus, and L. Acidophilus, and grew the bacteria in MRS broth at temperatures of 4C, 22C, and 37C to imitate conditions under which various probiotic products are stored. I also grew LAB at pHs of 2, 4, 6.2, and 8 to replicate variations of pH that come with digestion. I measured bacterial growth at optical density (OD) 600 after 24 hours for all trials. I found that optimal LAB growth at the standard pH of the MRS broth (6.2 ± 0.2) and at the standard temperature of the human stomach (37C) was expected and confirmed through several trials. When conditions deviated from standard, there was always less LAB growth. I concluded that variations in pH and temperature from standard stomach conditions result in smaller amounts of probiotic growth. This finding is important because a smaller amount of bacterial growth in the stomach will result in reduced health benefits on the host.

Poster Session 3

Commons West, Easel 24

2:30 PM to 4:00 PM

Is Forward Osmosis a Viable Method for Desalination of Seawater?

Kateryna (Kate) Gomozova, Sophomore, Civil and Environmental Engineering, Bellevue College
Mentor: Sonya Remington-Doucette, Science Division, Bellevue College
Mentor: Michael Reese, RISE Learning Institute, Bellevue College

In many parts of the world, the lack of fresh water is the single largest factor limiting sustainable development. Water scarcity contributes to poverty and poor public health outcomes, and it can exacerbate ethnic and international conflicts in arid regions. This study aims to determine whether forward osmosis (FO) is a viable method for desalination of seawater.

FO is an emerging technology for desalination, in which osmotic pressure is used as a driving force for separation. By using a concentrated solution of high osmotic pressure, called the draw solution, water is induced to flow from saline water across the membrane, rejecting the salt. To obtain potable water, the diluted draw solution is recovered and then recycled. Two chemicals – ammonium bicarbonate (NH_4HCO_3) and magnesium chloride ($MgCl_2$) – were compared in order to determine which one results in a more effective FO process, in terms of flow and chemical composition of the produced water. The results showed that the FO process is viable in terms of water flow and salt rejection. The effectiveness of the FO process does not depend on the type of draw solution, but instead depends on concentration, volume ratio of feed and draw solutions, and type of mixing. More experiments are required in order to develop the optimal mathematical relationship between the concentration of draw solution, and volume ratio of feed solution to draw solution. Potable water that complies with EPA standards, was obtained only from recovery of $MgCl_2$ diluted draw solution. Methods of NH_4HCO_3 removal described in the FO scientific literature did not result in production of potable water. Further analysis is required to identify possible techniques for NH_4HCO_3 removal from draw solution.