

**THE ISABS FUTURE
SCIENTIST AWARD
PRESENTATIONS**

Presentation number: FSA 01

THE EFFECT OF PSYLLIUM AND VITAMIN C ON DECOMPOSITION AND PREVENTION OF CREATION OF THE GALLSTONE

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Nowadays, only a few natural cures for the prevention of gallstones are available, of which none had yet proven fully effective. Consequently, in this research the problem is approached in a different way, by studying the influence of natural substances directly on the gallstone. The aim of the study is to confirm whether vitamin C and psyllium can be used for the prevention of gallstone formation, for its breakdown and easier treatment of illnesses through diet therapy. The research was conducted by an experimental procedure. Using appropriate apparatus and chemicals, two isolated systems were constructed in which conditions like those in the gallbladder with stones of the human digestive system were simulated. The substances were added for 4 days, trying to achieve the effect of their assumed effect in a month, that is, every day a weekly dose was added. Results of the experiment indicate that psyllium and vitamin C affected the reduction of gallstone mass, which also caused changes in the structure of gallstones particles. This research confirmed that vitamin C and psyllium can be used in the prevention of gallstones, for the purpose of its degradation and easier treatment of illnesses through diet therapy. However, it is necessary to conduct new studies with the aim of forming new manners of action and giving final recommendations on their consumption, which is of great importance for the development of higher quality treatment and general advancement of medicine.

Presentation number: FSA 02

USE OF CRISPR-CAS9 AS A MODERN CLINICAL TREATMENT FOR HIV

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HIV is a dangerous retro virus which infects CD4 T cells, resulting in the weakening of the immune system. Currently there is no cure for the disease but there is effective antiviral therapy referred to as HAART (highly active antiviral therapy). HAART suppresses the viral gene expression but does not cure patients infected with HIV. Because of this HIV is currently an incurable and chronic disease. The promising discovery of a CRISPR-Cas9 coupled system, derived from the adaptive immune system of bacteria, provides a possible cure for HIV. This effector complex can edit precisely target and modify genes. It is changing the course of medical treatments aiming to cure this, currently, incurable disease.

Presentation number: FSA 03

TOXICITY TESTING OF SLAG FROM DUGI RAT USING *ALLIUM CEPA* TEST

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The aim of the research was to determine the toxicity of the slag deposited around Dugi Rat using the *Allium cepa* test. The experiment was conducted to investigate the effect of different concentrations of slag on the growth and morphology of onion rhizomes. Five bulbs were transferred to each of the 6 solutions with slag, 5 bulbs into cups with spring water (negative control) and 5 bulbs into cups with hydrogen peroxide (positive control). Four rhizomes per bulb were cut after 24h, fixed and colored with aceto carmine. Chromosomal aberrations and interphase vacuoles in onion cells were observed under a microscope, and the mitotic index was calculated. After 72 hours, all rhizomes were cut, and the length of rhizomes was measured. The results showed that all rhizomes treated with slag solutions were longer than rhizomes treated with negative and positive control. Treatments with pulverized slag and 40 g/L of coarse slag had significantly higher mitotic index compared to control solutions and treatments with 10 g/L and 20 g/L of coarse slag. Solutions with pulverized slag caused the most chromosomal aberrations. The treatment with 20 g/L of pulverized slag shows the strongest negative effect. Slag accelerates the growth of onion roots and therefore has a genotoxic and cytotoxic effect on the meristem cells of onion roots. In future research, it would be desirable to collect more slag samples from different parts of the landfill and investigate the influence of the solution with higher slag contents.

Presentation number: FSA 04

FROM PLANT TO ANTISEPTIC: THE SEARCH FOR ANTIBACTERIAL COMPOUNDS IN PLANTS

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The aim of this study was to determine which of the collected plant samples contained antibacterial compounds, to compare the antibacterial activity of plants collected from wetland and coastal habitats, and to compare the effectiveness of different solvents for dissolving antibacterial compounds. The antibacterial effect of 60 plant samples was analyzed using the agar well diffusion method. Solid substrates made of nutrient agar were covered with a bacterial solution and drilled, creating 60 pores that were each filled with an aqueous solution of one plant sample. After 24 hours of incubation at 30 °C, the 21 samples that developed a zone of inhibition were used to further test the efficiency of three organic solvents: dichloromethane, diethyl ether and acetone, for dissolving antibacterial compounds. Student's t-test was used in statistical analysis. There was no statistically significant difference in the antibacterial effect of plants harvested from wetland and coastal habitats ($p = 0.861$). The largest average zone of inhibition was recorded for coastal plants using distilled water as a solvent (3.86 ± 2.12 mm), and the smallest for coastal plants using diethyl ether (1.67 ± 0.52). Statistically significant results when comparing the effectiveness of solvents were recorded between dichloromethane and diethyl ether ($p = 0.038$), and distilled water and diethyl ether ($p = 0.024$). No difference was recorded in the antibacterial activity of plants harvested in wetland and coastal habitats. The most effective solvent of herbal antibacterial compounds was distilled water, most effective organic solvent was dichloromethane, and the least effective was diethyl ether.

Presentation number: FSA 05

THE CONTRIBUTION OF HERVS TO PLACENTAL FUNCTION AND EVOLUTION IN HUMANS

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The aim of this research paper is to research the effect of the contribution of HERVs to placental function and evolution in humans. Scientific articles from Mayo Clinic and Encyclopedia Britannica along with Scientific papers on relevant topics were read, as found by search engines like Google Scholar, Science Direct, PubMed Central, MDPI and others. Human endogenous retroviruses (HERVs) are human genome sequences which were integrated into the genome through retrotranscription of ancient retroviruses. HERVs code for Syncytin-1 and Syncytin-2, proteins which facilitate cell-cell fusion in the placenta and are thus responsible for the creation and maintenance of the syncytiotrophoblast layer of the placenta. Syncytin-2, and to a lesser extent Syncytin-1, also seem to play a crucial role in the immunosuppression of the maternal part of the placenta. HERVs also participate in hormonal regulation of the placenta by acting as genetic enhancers in the form of long terminal repeats. HERVs likely endogenize in a sequence of "baton passes", replacing and refining each other's roles with each endogenization (as proposed by the BPT). This process also seems to have been crucial for selecting placental traits which gave apes, and thus humans, an evolutionary advantage against other primates. HERVs are crucial in forming the placenta and ensuring its proper functioning, as such they were instrumental for human evolution and success. More research needs to be done on the immunosuppressive role of Syncytins and the BPT for a complete picture of the functions and endogenization process of placenta specific HERVs.

Presentation number: FSA 06

NATURAL ANTIBIOTICS – AN EFFECTIVE WAY TO FIGHT INFECTIONS?

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The aim of this scientific research was to examine the difference in the effectiveness of natural and synthetic antibiotics on the growth of the bacteria *Escherichia coli* and the fungus *Candida albicans*. In this research, the cell culture method was used, and the data analysis was performed by measuring the diameter of the zone of inhibition of the growth of bacteria and fungi. The synthetic antibiotic used in the research was ampicillin, and the natural antibiotics used were: propolis, grapefruit seed extract and tea tree essential oil. The research results indicate that more accurate results were obtained by using "dry" discs due to the reduced possibility of antibiotic spillage when laying on the substrate. The natural antibiotic tea tree showed the highest effectiveness against the bacterium *Escherichia coli* with an effectiveness of 125.00% compared to ampicillin, and the lowest was propolis with an effectiveness of 0%. In the effect on the growth of the *Candida albicans* fungus, the natural antibiotic grapefruit seed extract was the most effective with an efficiency of 465.50%, and the least effective was propolis with 147.83%. Tea tree and grapefruit seed extract have similar effectiveness on *Escherichia coli* bacteria, while propolis has little or no effectiveness. In all cases, it is concluded that ampicillin has no effectiveness in preventing the reproduction of *Candida albicans* fungi. Also, it was concluded that all three natural antibiotics inhibited the reproduction of *Candida albicans* fungi with different efficiencies. The most important conclusion of this research indicates that taking natural antibiotics has a positive effect on bacteria and suppresses the reproduction of fungi, unlike synthetic ones, where the reproduction of fungi is not inhibited by the presence of a synthetic antibiotic.