

Presentation Abstracts

CHEM 23202 – 05

Spring 2008

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27 March 2008

12:30 – 12:42 Greg Antell

Cortisol

It is essential to understand the synthesis, characterization, and function of cortisol, a corticosteroid hormone, which has been identified as playing a role in multiple physiological functions. Insufficient production of cortisol in the body can lead to Addison's disease, a rare endocrine disorder in which potentially lethal symptoms may lead to an Addisonian crisis if left untreated. Cortisol is naturally synthesized by the body in the adrenal cortex by a known enzymatic pathway and is involved in a variety of homeostatic and metabolic functions. Additionally, cortisol is pharmaceutically produced as hydrocortisone for therapeutic use as an anti-inflammatory agent. Cortisol is readily identified through UV-Vis, ^1H and ^{13}C NMR, and MS spectra.

12:43 – 12:55 Rachel Staran

Norethisterone: A Drug of Many Uses

Norethisterone is a synthetic form of the hormone progesterone and is commonly used as an oral contraceptive, but its functions are useful in many other health-related issues. Mechanisms for synthesis along with physical and spectral characterizations of norethisterone are important in determining how and why it is used in different situations. Current literature discusses the use of norethisterone in various ways besides as a contraceptive. Research has shown that norethisterone can treat medical problems caused by low estrogen levels and can affect oxygen uptake during exercise. It is also used in hormone therapies for treating breast cancer and cardiovascular problems in diabetic women. This extensive range of medical uses indicates that norethisterone may be an important compound for researchers to continue to study.

12:56 – 1:08 Eirene Alexandrou

Cholesterol, a lipid found in the bloodstream and body cells, is an important part of healthy bodily functions. It is used to form cell membranes, insulate nerves, and produce hormones. However, high cholesterol levels known as hypercholesterolemia can pose major health problems such as coronary heart disease. Thus, the structure of cholesterol will be analyzed in order to better understand its subsequent function. The synthesis of cholesterol in the body will also be stressed to better understand ways of maintaining healthy cholesterol levels in terms of both HDL and LDL levels.

3 April 2008

12:30 – 12:42 James Masters The History, Biology, and Chemistry of Taxol

Taxol is a naturally-occurring anti-cancer agent. Investigation into its synthesis and its biological mechanism of action may suggest new synthetic techniques and/or new cancer treatments. By consulting the primary literature, it was possible to discover syntheses of Taxol, characterize the compound from spectral data, and determine its biological effect. Taxol was originally isolated from the Pacific Yew conifer; however, as this resource is in short supply, other techniques that utilize more plentiful natural compounds have been devised. Taxol inhibits cell growth by over-stabilizing cell microtubules, preventing cell mitosis. This unique mechanism of action suggests that other compounds with similar biological effects may have anti-cancer applications. Finally, a synthetic analysis of Taxol poses the question of whether more efficient synthetic routes are possible.

12:43 – 12:55 Douglas Hummon Camptothecin – A Natural Cancer Chemotherapy Drug

Cancer is one of the most feared diseases in the world killing over seven million people throughout the world in 2007. Camptothecin and its derivatives show remarkable anticancer behaviors that may be utilized to help cure patients with different forms of cancer. This report will discuss many of the major syntheses and characteristics of Camptothecin and the derivatives of the drug. Problems with the drug include adverse drug effects and being insoluble in water, affecting its function in the body. Research in many journals and recent articles has shown that Camptothecin inhibits the DNA enzyme topoisomerase I, which is critical in the unwinding and replication of DNA. Future research may provide a Camptothecin analogue that will have similar anticancer behavior without the side effects.

12:56 – 1:08 Courtney Hamilton The Potential of Colchicine, an Antimitotic Agent, as a Cancer Treatment

In 2007, 7.6 million people died from cancer and uncontrolled cell growth occurred in each case. One goal of cancer research has been to find drugs, such as colchicine, that can stop cell proliferation. Colchicine is able to halt mitotic spindle formation and induce apoptosis, effectively killing the cells. Colchicine occurs naturally in meadow saffron and has been used historically to treat gout. More recently, the S-conformation of colchicine has been investigated as a possible cancer drug. Using secondary literature, information on characterization and synthesis of colchicine was researched and the overall effectiveness of colchicine as an anti-cancer drug was explored. From this information it was found that further manipulations of colchicine are needed before it will be a safe option for cancer patients.

1:09 – 1:21 Angela Niemi Effects of Topotecan in Tumor Cell Reduction

Cancer is only second to heart disease in the number of disease related deaths, but these numbers have decreased recently because of earlier prevention and better treatments. While topotecan, which is synthesized from Camptothecin, is used primarily in the secondary treatment of ovarian and small-cell lung cancer as shown by its characterization in tumor cells, clinical studies show that its ability to freely penetrate the blood brain barrier suggests that it could be used to treat brain metastases. After researching recent studies and literature about the treatment effects of topotecan, it has been found that there are promising results for its use in the primary treatment of some cancers and being able to reduce brain metastases by 80%, which shows that new uses are still being found involving topotecan.

10 April 2008

12:30 – 12:42 Cory Hakanen Tangeritin: A Citrus Treatment of Cancer

Tangeritin is a citrus flavinoid that strengthens and protects cell walls, mainly found in citrus peels. Tangeritin has been found to be a multi-purpose anti-cancer agent. Tangeritin will be discussed in terms of the cells it acts upon, the mechanism for these actions, and its favorable and adverse effects. Tangeritin can be better understood through its synthesis and spectral characterization. Interestingly enough, Tangeritin is able to combat various adaptations of cancer cells, such as mutagenic, invasive, and replication properties. Tangeritin's anti-cancer properties were researched through electronic resources such as CrossFire and SciFinder Scholar. Tangeritin has been clinically shown to prevent and treat cancer, with few negative effects. Tangeritin should be heavily researched in the future in order to improve conditions for cancer patients.

12:43 – 12:55 Matt Cossack

The claims of Rutin which is often marketed as an important dietary supplement for its supposed "anti-oxidant, anti-inflammatory, anti-allergenic, anti-viral and anti-carcinogenic properties" should be viewed with suspicion in the midst of the rising popularity of anti-oxidants. Therefore, this study examined the anti-oxidant claims of Rutin supplement providers by investigating the literature to find the anti-oxidizing properties of bioflavonoids and Rutin in particular. Studies have shown that Rutin does in fact serve well as an anti-oxidant. However, its effects are mediated by Vitamin C intake. Therefore, a balanced diet with the proper amount of rutin and Vitamin C is the best method to prevent oxidative stress.

12:56 – 1:08 Eric Guardino Hesperidin and its Medicinal Uses

Hesperidin is a flavonoid found in the skins of citrus fruits. It has a few known and suspected medicinal purposes. In order to find out the medicinal uses of hesperidin the literature was searched. One known medicinal use of hesperidin is that it reduces bone density loss. The most common disease associated with bone density loss is osteoporosis, which affects about 44 million people in the United States. Hesperidin would not cure osteoporosis, but it could reduce the rate of its onset and possibly lower the total number of people afflicted by the disease. Hesperidin can be produced through extraction from fruit peels. If more research is done on hesperidin more medicinal uses may be found or the ones known could become more widespread.

1:09 – 1:21 Joseph McCrary Quercetin Synthesis, Characterization, and Medicinal Applications

Naturally occurring in a variety of fruits and vegetables, quercetin, a bioflavonoid, has shown promise in a wide array of medical applications. Synthesis, physical and spectral characterization, and current research into the possible medicinal uses of quercetin will be covered in this review of the scientific literature. Possible medicinal applications currently being investigated include the role of quercetin in the prevention of cataracts, the leading worldwide cause of blindness, as well as the use of quercetin, in conjunction with ultrasound, as a chemotherapy drug.

17 Apr 2008

12:30 – 12:42 Ashley Nashleanas Synthesis, characterization, and chemical applications of α -terpineol

Perfumes, cosmetics, household products, and soaps have one commonality associated with them. α -terpineol is the main ingredient! The synthesis, structural identification, and commercial uses of α -terpineol will be addressed in this presentation. Researching the chemical literature on synthesis, identification, and uses of α -terpineol will be the method taken to obtain further knowledge on the compound. After searching the literature, limonene reacts with trifluoroacetic acid (TFA) to first give an intermediate. Later on TFA is hydrolyzed to obtain a 76% yield of α -terpineol. If it is possible to understand how α -terpineol is synthesized, as well as the unique spectral components of the molecule, the motivations for its commercial use will seem more obvious.

12:43 – 12:55 Michael Blasco Thujone: Myth or Menace?

In 2007, the aromatic liquor absinthe was legalized in the United States; hitherto, the drink had been banned for its supposed psychotomimetic properties, attributed to the presence of the chemical alpha-thujone. The general public has misunderstood thujone's properties and effects for well over a century, and the goal of this study is to explicate the chemical nature of thujone so that fact may trump superstition. A thorough analysis of the chemical literature has been conducted to investigate the mysterious drug's biosynthesis and physical properties, as well as its pharmacological effects. The search has revealed the wide consensus that thujone, although it shows affinity to several interesting chemical receptors in the brain (including those that respond to cannabis-constituent THC), has a minimal pharmacological effect at the concentrations present in normal absinthe. Therefore, the chemical evidence validates the lifting of the absinthe ban; absinthe is, in reality, as safe as any other alcoholic drink.

12:56 – 1:08 Alex Deak The Sesquiterpene Nerolidol

Nerolidol is an important natural molecule because of its aroma and prevalence in natural oils. It is a common food additive and flavoring agent, and is one of the millions of smells that can be detected by the human olfactory system. Being a natural product, it should be synthesizable from other natural products and certainly isolatable from nature, and characterizable through multiple types of spectroscopy. As a natural product, nerolidol has possible uses in the medical field as well. After surveying the literature on nerolidol, I found that it has its aroma based on structure and isomeric forms, and is used medically as a skin penetration enhancer and antimicrobial agent. However, more research must be done to tap into the medical applications of this compound.

1:09 – 1:21 David Crisostomo Citronellol: The Fragrance of 1000 Faces

Fragrance manufacture is a fairly large business with some companies spending almost \$200 million each year to develop new products. Citronellol is a common component of both perfumes and insect repellent. However, the percentage of citronellol in these products is usually around 12%. The variety of uses for citronellol suggests that it is not a very potent substance or that its presence in those products is not necessary. By understanding the chemistry behind citronellol, including its synthesis and characterization, I should be able to determine how essential it is. After searching through encyclopedias, journals, literature, and patents, I found that citronellol has two different stereoisomers, each of which has differing properties. These two stereoisomers can be used in products to get different desired effects.

24 Apr 2008

12:30 – 12:42 Andrew Medvecz Common but harmful sodium lauryl sulfate: An analysis of the useful and detrimental roles of sodium lauryl sulfate based on its chemical properties

Sodium lauryl sulfate is a useful chemical found in common household products such as toothpastes, shaving cream, and shampoos. It is primarily used because it easily creates lather and for its amphiphilic character, a key component for detergents. However, debate has been raised over its safety as dermatitis and ulcer development have been attributed to it. The goal of this presentation is to examine the synthesis, characterization, properties, and safety issues of sodium lauryl sulfate. Upon synthesis outlined by literature, the characterization from physical and chemical properties confirmed the structure of the product. It can be inferred that dermatitis can be attributed to the amphiphilic character. The structure also indicates that it may disrupt normal biological processes (ulcer development) because of its distinct polar and nonpolar character.