



Working for a State Government Laboratory

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Dr. Crosswhite's Background

EDUCATION

- 2009-2012** **Ph.D. Analytical Chemistry**, The Florida State University, Tallahassee, FL.
- 2005-2009** **M.S. Analytical Chemistry**, The Florida State University, Tallahassee, FL.
- 2001-2005** **B.S. Chemistry**, University of North Carolina, Greensboro, NC.

PROFESSIONAL EXPERIENCE

- 2012-present** **Environmental Scientist Specialist III**, Florida Department of Agriculture and Consumer Services (FDACS), Tallahassee, Florida, USA.



Dr. Aldeek's Background

EDUCATION

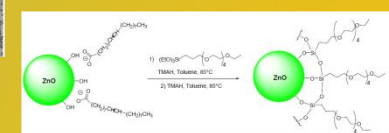
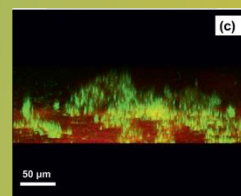
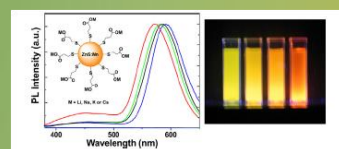
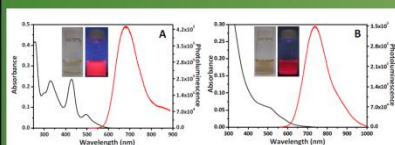
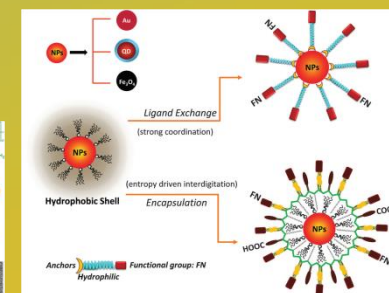
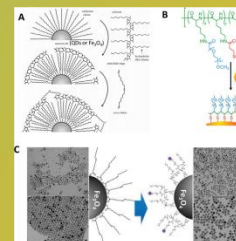
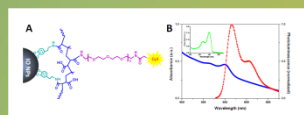
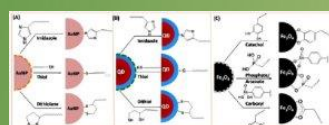
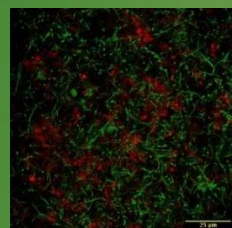
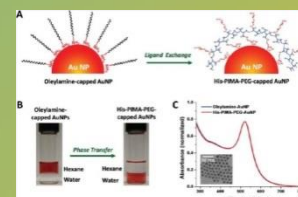
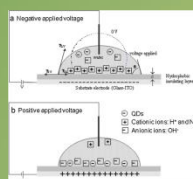
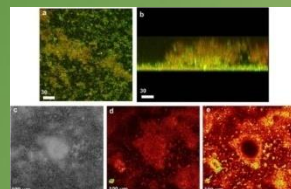
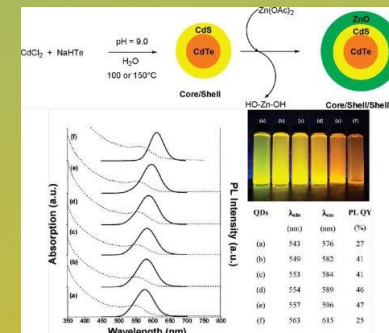
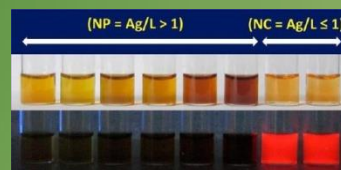
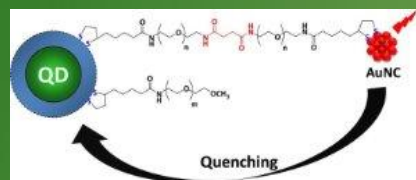
- 2007-2010** **Ph.D. Materials Science**, Henri Poincaré University, Nancy, France.
Title: Synthesis and functionalization of fluorescent nanocrystals (Quantum Dots) for imaging and characterization of hydrophobic/hydrophilic properties of bacterial biofilms.
Advisors: Prof. Raphael Schneider and Prof. Jean-Claude Block.
- 2005-2007** **M.S. Molecular and Supramolecular Chemistry**, Louis Pasteur University, Strasbourg, France. Title: Formation of molecular networks by self-assembly of tectons.
Advisor: Dr. Abdelaziz Jouaiti.
- 2001-2005** **B.S. Chemistry**, Louis Pasteur University, Strasbourg, France.

PROFESSIONAL EXPERIENCE

- 2014-present** **Environmental Scientist Specialist III**, Florida Department of Agriculture and Consumer Services (FDACS), Tallahassee, Florida, USA.
- 2012-2014** **Postdoctoral Research Associate**, Florida State University, Department of Chemistry and Biochemistry, Tallahassee, Florida, USA.
- 2011-2012** **Postdoctoral research**, **Henri Poincaré University**, Laboratoire Réactions et Génie des Procédés (LRGP), Nancy, France.

Dr. Aldeek's Background

I was following an interdisciplinary research program that aims at developing the technology of chemically synthesized inorganic nanocrystals. This included challenges in making new compositions of nanocrystals and multifunctional ligands, with the ultimate goal of incorporating the nanocrystals into hybrid organic-inorganic devices and biological systems.



Design, Synthesis, Coordinating Ligands, Nanotechnology, Nanoparticles Growth, Surface Chemistry, Functionalization, Bio-Conjugation, Photophysics, Spectroscopy, Structural and Optical Characterizations, Bio-Sensing and -Imaging Applications.

Dr. Aïeek's Background

Synthesis, Characterization and Biological Applications of Water-Soluble ZnO Quantum Dots

Raphael Schneider¹, Lavinia Balas² and Fadi Aïeek³
¹Universit e de Caen et Normandie (UNICAEN)
²Nancy-Universit e, CNRS, Nancy
³Institut de Science des Mat eriaux et Mol ecules (ISM2), Metz, France

1. Introduction
Quantum dots (QDs) or semiconductor nanocrystals are of great interest to fundamental studies but also present applications in biological probes (Muller et al., 2005), fluorescent biosensors (Costa-Fernandez et al., 2006), light emitting diodes (LED) (Tan et al., 2007), and solar cells (Rohel et al., 2006). Owing to the effect of quantum confinement, QDs show exceptional physical and chemical properties such as sharp and symmetrical emission spectra, high quantum yields (QY), good photo- and chemical stability, and size-dependent emission-wavelength tunability (Drozd et al., 1998; Chan et al., 1999). For biological labeling, the most studied QDs are the nanocrystals of CdSe and CdTe (Aïeek et al., 2008) and the corresponding covalent structural QDs (such as CdSe/ZnS, CdTe/ZnS, CdTe/ZnO) (Zhu et al., 2006). Recent findings have highlighted the acute toxicity of ZnO nanocrystals (QDs) without an external layer of a non-toxic material on biological systems (Schoeker et al., 2006; Duan et al., 2011). This toxicity results mainly from the

The influence of capping thioalkyl acid on the growth and photoluminescence efficiency of CdTe and CdSe quantum dots

Fadi Aïeek^{1,3}, Lavinia Balas², Jacques Lantier¹ and Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
The influence of thioalkyl ligands on the growth and photoluminescence efficiency of CdTe and CdSe quantum dots (QDs) was investigated. The synthesis of QDs was carried out in the presence of different thioalkyl ligands: 2-mercaptoethanol (ME), 3-mercaptopropionic acid (MPA), and 4-mercaptobutyric acid (MBA). The results show that the use of thioalkyl ligands leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with MPA. The results also show that the use of thioalkyl ligands leads to a significant increase in the stability of the QDs. The QDs synthesized with MPA showed a higher stability than those synthesized with ME and MBA. The results show that the use of thioalkyl ligands is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Surface-engineering quantum dots for the labeling of hydrophobic microdomains in bacterial membranes
Fadi Aïeek^{1,3}, Christian Matus², Lavinia Balas², Tibahou Ropes-Carnes², Marie-Pierre Fontaine-Agagnif¹, Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
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Glycosylated Quantum Dots for the Selective Labeling of Kluveromyces fragilis and Saccharomyces cerevisiae Yeast Strains

Jael Catinas¹, Tina Thoenen¹, Fadi Aïeek¹, Lavinia Balas², Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France

Abstract
Glycosylated quantum dots (QDs) were prepared by the reaction of QDs with a glycosylating agent. The results show that the use of glycosylating agents leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with the glycosylating agent. The results also show that the use of glycosylating agents leads to a significant increase in the stability of the QDs. The QDs synthesized with the glycosylating agent showed a higher stability than those synthesized without it. The results show that the use of glycosylating agents is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Aqueous dispersions of core-shell CdSe/CdS quantum dots as nanofluors for electrochromic

Tibahou Ropes-Carnes¹, Fadi Aïeek^{1,3}, Lavinia Balas², Serge Corbel², Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
Aqueous dispersions of core-shell CdSe/CdS quantum dots (QDs) were prepared by the reaction of QDs with a shell material. The results show that the use of shell materials leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with the shell material. The results also show that the use of shell materials leads to a significant increase in the stability of the QDs. The QDs synthesized with the shell material showed a higher stability than those synthesized without it. The results show that the use of shell materials is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Quantum dots for color-tunable Mn-doped ZnS quantum dots

Hossein Labadi¹, Taher Ben Chahoun¹, David Parkowicz¹, Sebastian Mackowski¹, Jacques Lalere¹, Jafar Ghanbari¹, Fadi Aïeek¹, Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France

Abstract
Quantum dots (QDs) for color-tunable Mn-doped ZnS quantum dots were prepared by the reaction of ZnS with Mn²⁺ ions. The results show that the use of Mn²⁺ ions leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with Mn²⁺ ions. The results also show that the use of Mn²⁺ ions leads to a significant increase in the stability of the QDs. The QDs synthesized with Mn²⁺ ions showed a higher stability than those synthesized without it. The results show that the use of Mn²⁺ ions is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Faraday Discussions
One this DOI: 10.1039/C9FD00014A

PAPER [View Article Online](#)

A multifunctional amphiphilic polymer as a platform for surface-functionalizing metallic and other inorganic nanostructures

Wentao Wang, Fadi Aïeek, Xin Li, Biron Zeng and Heed Mattosoff¹

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POLYMERS FOR SURFACE-FUNCTIONALIZATION AND BIOPATIBILITY OF INORGANIC NANOSTRUCTURES

Introduction
Inorganic nanostructures such as those made of semiconductor quantum dots (QDs), metals, and metal oxides are greatly promising for numerous applications ranging from developing optical and electronic devices to sensing and cellular imaging (1–4). They exhibit an array of unique physical, optical and chemical properties. They also present a series of challenging fundamental problems to investigate and understand. Some of these unique features include: 1) size- and composition-tunable absorption and photoluminescence properties, high brightness combined with a remarkable photo- and chemical stability exhibited by QDs; 2) size- and shape-dependent surface plasmon resonance band for gold and silver nanoparticles (AuNPs and AgNPs) (5); and 3) strong size- and composition-dependent electrocatalytic activities and catalytic activity exhibited by metal nanoparticles (6). These features combined have presented a tremendous interest and activity in the past decade (11–13). One of the most explored applications is present toward the use of these materials as a platform for biological sensing and imaging, and as diagnostic tools.

Chem Soc Rev
REVIEW ARTICLE

Strategies for interfacing inorganic nanostructures with biological systems based on polymer-coating

Fadi Aïeek^{1,3}, Christian Matus², Lavinia Balas², Tibahou Ropes-Carnes², Marie-Pierre Fontaine-Agagnif¹, Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
The strategies for interfacing inorganic nanostructures with biological systems based on polymer-coating were investigated. The synthesis of QDs was carried out in the presence of different thioalkyl ligands: 2-mercaptoethanol (ME), 3-mercaptopropionic acid (MPA), and 4-mercaptobutyric acid (MBA). The results show that the use of thioalkyl ligands leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with MPA. The results also show that the use of thioalkyl ligands leads to a significant increase in the stability of the QDs. The QDs synthesized with MPA showed a higher stability than those synthesized with ME and MBA. The results show that the use of thioalkyl ligands is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

JACS
UV and Sunlight Driven Photolysis of Quantum Dots: Understanding the Photochemical Transformation of the Ligands

Fadi Aïeek^{1,3}, Yael Rabinovitch¹, Fadi Aïeek¹, Lavinia Balas², Tibahou Ropes-Carnes², Marie-Pierre Fontaine-Agagnif¹, Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
The photochemical transformation of the ligands of quantum dots (QDs) was investigated. The results show that the use of UV and sunlight leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with the ligands. The results also show that the use of UV and sunlight leads to a significant increase in the stability of the QDs. The QDs synthesized with the ligands showed a higher stability than those synthesized without it. The results show that the use of UV and sunlight is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Understanding the Self-Assembly of Proteins onto Gold Nanoparticles and Quantum Dots Driven by Metal-Histidine Coordination

Fadi Aïeek^{1,3}, Hanae Laili, Hanae Laili, Gustave Faure, and Heed Mattosoff¹
¹UNICAEN, UNICAEN, Normandie, France

Abstract
The self-assembly of proteins onto gold nanoparticles and quantum dots was investigated. The results show that the use of metal-histidine coordination leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with the proteins. The results also show that the use of metal-histidine coordination leads to a significant increase in the stability of the QDs. The QDs synthesized with the proteins showed a higher stability than those synthesized without it. The results show that the use of metal-histidine coordination is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Florida State University
1851

Postdoctoral Research: 2012-2014 Florida State University, Tallahassee, FL, USA

One phase growth of in-situ functionalized gold and silver nanoparticles and laminated nanocomposites

Fadi Aïeek, M. A. Huhner, Mahamoud, and Heed Mattosoff¹
¹Department of Chemistry and Biochemistry, Florida State University, 10 Chalkley Way, Tallahassee, Florida 32310, USA

Abstract
The synthesis and characterization of a new class of gold and silver nanoparticles (NPs) as well as laminated nanocomposites (NLCs) are presented. The synthesis of NPs was carried out in the presence of different thioalkyl ligands: 2-mercaptoethanol (ME), 3-mercaptopropionic acid (MPA), and 4-mercaptobutyric acid (MBA). The results show that the use of thioalkyl ligands leads to a significant increase in the photoluminescence quantum yield (QY) of the NPs. The QY values were measured to be 10% for CdTe and 15% for CdSe NPs synthesized with MPA. The results also show that the use of thioalkyl ligands leads to a significant increase in the stability of the NPs. The NPs synthesized with MPA showed a higher stability than those synthesized with ME and MBA. The results show that the use of thioalkyl ligands is a promising strategy to improve the photoluminescence efficiency and stability of NPs.

Quenching of Quantum Dot Emission by Fluorescent Gold Clusters: What It Does and Does Not Share with the Förster Formulation

Fadi Aïeek, Xue Ji, and Heed Mattosoff¹
¹Department of Chemistry and Biochemistry, Florida State University, 10 Chalkley Way, Tallahassee, Florida 32310, USA

Abstract
The quenching of quantum dot (QD) emission by fluorescent gold clusters was investigated. The results show that the use of fluorescent gold clusters leads to a significant increase in the photoluminescence quantum yield (QY) of the QDs. The QY values were measured to be 10% for CdTe and 15% for CdSe QDs synthesized with the fluorescent gold clusters. The results also show that the use of fluorescent gold clusters leads to a significant increase in the stability of the QDs. The QDs synthesized with the fluorescent gold clusters showed a higher stability than those synthesized without it. The results show that the use of fluorescent gold clusters is a promising strategy to improve the photoluminescence efficiency and stability of QDs.

Growth of In Situ Functionalized Luminescent Silver Nanoclusters by Direct Reduction and Size Focusing

Fadi Aïeek^{1,3}, Christian Matus², Lavinia Balas², Tibahou Ropes-Carnes², Marie-Pierre Fontaine-Agagnif¹, Raphael Schneider¹
¹UNICAEN, UNICAEN, Normandie, France
²Nancy-Universit e, CNRS, Nancy, France
³ISM2, Metz, France

Abstract
The growth of in situ functionalized luminescent silver nanoclusters was investigated. The results show that the use of direct reduction and size focusing leads to a significant increase in the photoluminescence quantum yield (QY) of the nanoclusters. The QY values were measured to be 10% for CdTe and 15% for CdSe nanoclusters synthesized with the direct reduction and size focusing. The results also show that the use of direct reduction and size focusing leads to a significant increase in the stability of the nanoclusters. The nanoclusters synthesized with the direct reduction and size focusing showed a higher stability than those synthesized without it. The results show that the use of direct reduction and size focusing is a promising strategy to improve the photoluminescence efficiency and stability of nanoclusters.

Growth of Highly Fluorescent Polyethylene Glycol- and Zwitterion-Functionalized Gold Nanoclusters

Fadi Aïeek^{1,3}, M. A. Huhner, Mahamoud, and Heed Mattosoff¹
¹Department of Chemistry and Biochemistry, Florida State University, 10 Chalkley Way, Tallahassee, Florida 32310, USA

Abstract
The growth of highly fluorescent polyethylene glycol- and zwitterion-functionalized gold nanoclusters was investigated. The results show that the use of polyethylene glycol and zwitterion leads to a significant increase in the photoluminescence quantum yield (QY) of the nanoclusters. The QY values were measured to be 10% for CdTe and 15% for CdSe nanoclusters synthesized with polyethylene glycol and zwitterion. The results also show that the use of polyethylene glycol and zwitterion leads to a significant increase in the stability of the nanoclusters. The nanoclusters synthesized with polyethylene glycol and zwitterion showed a higher stability than those synthesized without it. The results show that the use of polyethylene glycol and zwitterion is a promising strategy to improve the photoluminescence efficiency and stability of nanoclusters.

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One phase growth of in-situ functionalized gold and silver nanoparticles and laminated nanocomposites

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What do I want to do now?

How can I be happy in both my professional and private life?

What can I do?

How will my professional career advance?



Will I continue to grow intellectually?

What should I offer to my family after all these years doing postgraduate studies?

What do I deserve?

Who can help me to get the dream job?

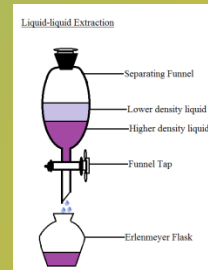
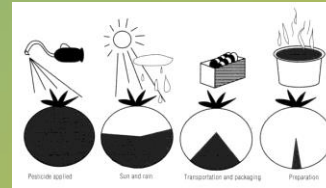
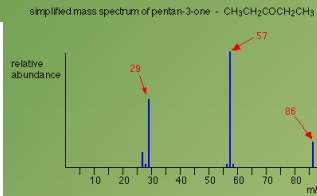
Am I mentally strong enough for academia

Can I be useful outside of my specialty?

Division of Food Safety

Chemical Residue Labs

Chemical Residue Laboratory, FDACS



Overview of the CR Laboratory

- Our lab started in early 1960 and is located in Tallahassee
- 33 lab employees: Chemists and Lab Technicians (prepare samples, analyze samples, document and report conclusions)
- 8 Field Inspectors, collect samples and ship to the laboratory for testing and analysis. Approx. 3000 samples are analyzed per year.

Our mission is to protect Florida's food supply

Where do the samples come from?

- **Within FDACS:**
 - Division of Food Safety
 - Agriculture Environmental Services
 - FDACS samplers

- **Within Florida:**
 - Department of Health
 - Law Enforcement

- **Federal Agencies:**
 - FERN: FDA and USDA
 - FDA: contract

Consumer Protection Testing

Authenticity Claims:

Fruits Juices

Honey

Vanilla Species (Fish and Meat)

Nutritional Claims:

No, Low, Reduced, High, Total fat, Trans Fat,

Sugars, Protein, Calories, Sodium, Calcium, Iron, Vitamins A & C,

Label Review

Food Safety Testing

- Decomposition:** Indole, Histamine, biogenic Amines (putrescine, cadaverine, spermidine)
- Toxins:** Aflatoxin, Patulin, Solanine
- Metals:** Mercury, Lead, Cadmium, Tin
- Allergens:** Egg, Milk, Soy, Wheat, Peanuts, Tree Nuts
- Dietary Supplements:** Ephedrines, Caffeine
- Preservatives:** Sulfites, Nitrites, Sorbate

Food Safety Testing cont'd

Food Colors:

- Blue 1,2
- Red 3,40
- Yellow 5,6

Vanilla Flavoring:

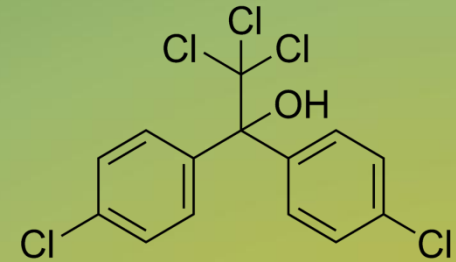
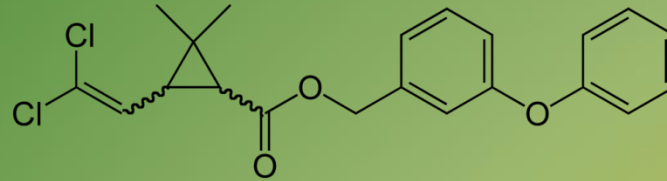
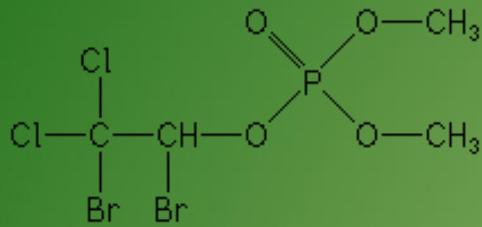
- Coumarin

Foreign Material:

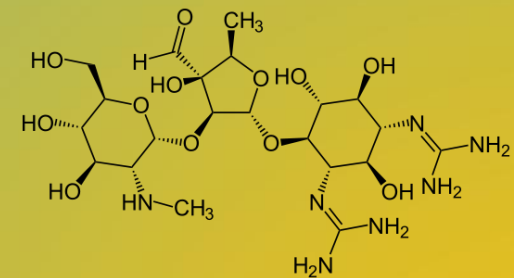
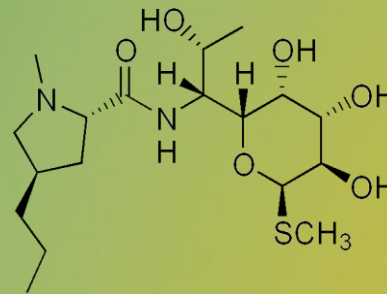
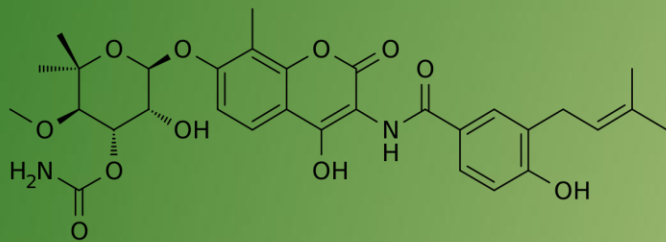
- Insects
- Feces
- Hair

Protecting Our Food Supply

- Pesticides



- Antibiotics



- Toxic chemicals

Counter Terrorism

- Food Emergency Response Network (FDA)

- In response to 911

- Testing for Toxic Chemicals in Food Supplies

- Cyanides
- Ricin
- Many other toxins



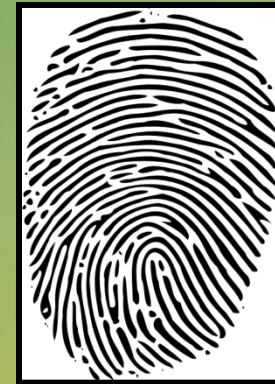
Analytes Extraction

- Homogenize
- Weighing sub-sample
- Extract Chemicals
- Dispersive Extraction – “Clean Sample”



The Instruments & Analysis

- **Gas Chromatography**
- **Liquid Chromatography**
- **High Resolution Mass Spectrometry**



New Skills developed at FDACS

- Developed new extraction methods to screen for antibiotic residues and various adulterants in a wide range of matrices
- Optimized instruments to enhance capabilities of extraction methods used in our laboratory
- Trained and supervised fellow chemists to ensure advanced extraction methods were accurately performed
- Collaborated with other agencies to work on projects of national interest
- Taught short courses on challenges and successes of chemical residue extraction in food matrices
- Presented findings on projects developed in our laboratory at conferences with international audiences

Achievement at FDACS

Journal of Agricultural and Food Chemistry

Finally, my first paper as a leader (Corresponding Author)

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LC-MS/MS Method for Determination and Quantification of Penicillin G and its Metabolites in Citrus Fruits Infected with Huanglongbing

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Division of Food Safety, Chemical Residues Lab at FDACS



Thank You

