Mar 31st, 10:30 AM - 12:30 PM

PC-01 Synthesis of zinc glycoconjugated phthalocyanines as a potential phototherapeutic

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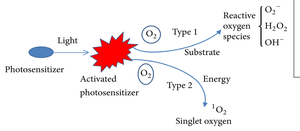
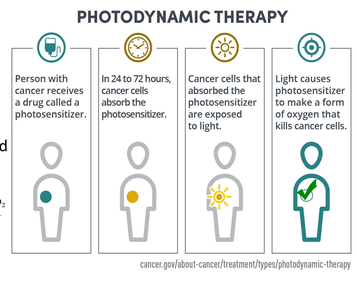
What is PhotoDynamic Therapy (PDT)?

Photodynamic Therapy (PDT) is a non-invasive type of phototherapy
- Utilizes a combination of a photosensitizer (phototherapeutic), light, and molecular oxygen
- A light-activated photosensitizer converts molecular oxygen to a reactive oxygen species (ROS)
  - ROS causes oxidative damage and may lead to cell destruction

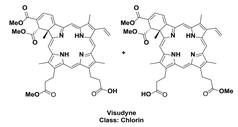




cancer.gov/about-cancer/treatment/types/photodynamic-therapy

Phototherapeutics

- Current Medical Applications
  - Skin conditions such as acne and eczema
  - Macular degeneration (Visudyne®)
  - Variety of solid cancers such as skin, liver, bladder, among others (Photofrin®, Foscan®)



Photodynamic Therapy with Selective Laser Treatment

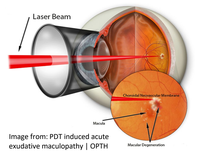


Image from: PDT induced acute exudative maculopathy | OPTH

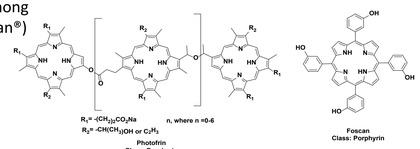
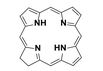
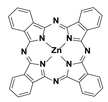


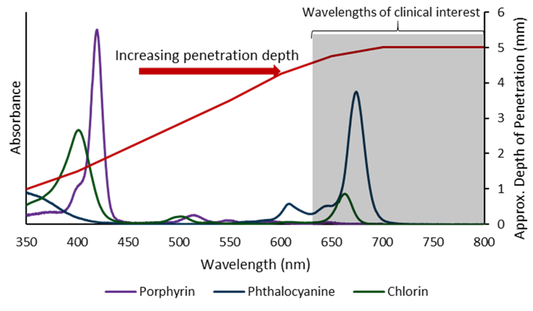
Image from: Visudyne® - Xediton Pharmaceuticals

Chem. Soc. Rev. 2011, 40, 340-362, Chem. Soc. Rev. 2016, 45, 6488-6519

Photosensitizers for PDT



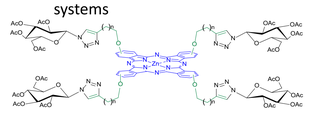


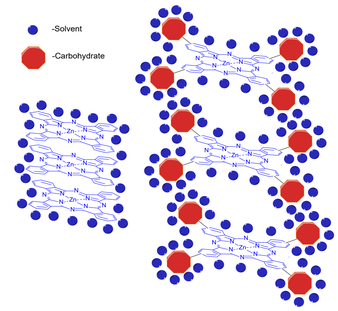


Development of Phthalocyanines as Phototherapeutics

Challenges (Bioavailability):
- Low solubility in aqueous systems
  - Large flat aromatic structure – leads to "stacking"
  - Highly non-polar

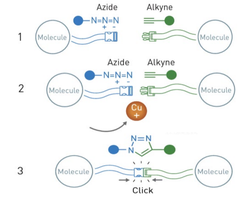
Potential solution:
- Glycoconjugation
  - Increase structural bulk and disrupts "stacking"
  - Increase solubility in aqueous systems



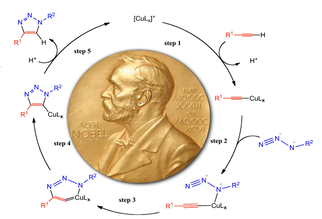


Glycoconjugation via a "Click Reaction"

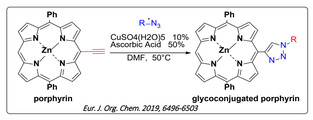
The Copper-Catalyzed Azide-Alkyne Cycloaddition (CuAAC)
- Often referred to as "click reaction"
- A reliable method used for the linking of carbohydrates
- Previously used in the examination of glycoconjugated porphyrinoids



https://www.kva.se/en/news/the-nobel-prize-in-chemistry-2022/



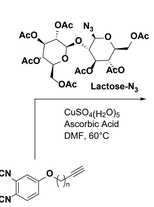
https://www.sciencedirect.com/science/article/pii/S0010854511001809#fig0035

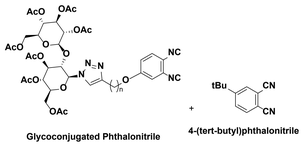


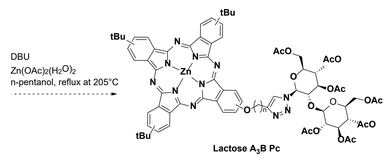
Eur. J. Org. Chem. 2019, 6496-6503

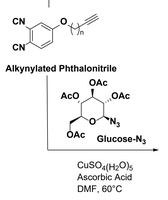
Development of a "Pre-Functionalization" Synthetic Route for Glycoconjugate Phthalocyanines

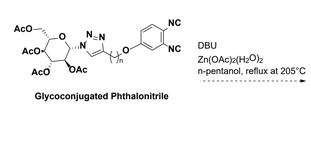
4-nitrophthalonitrile

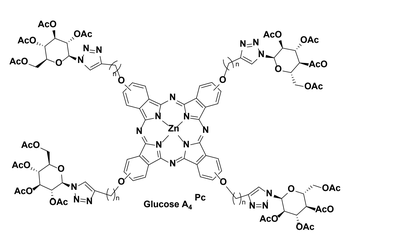




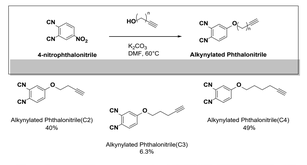


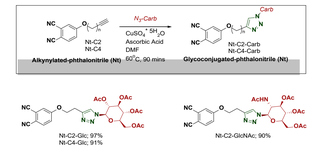


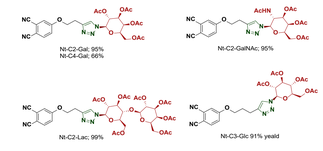




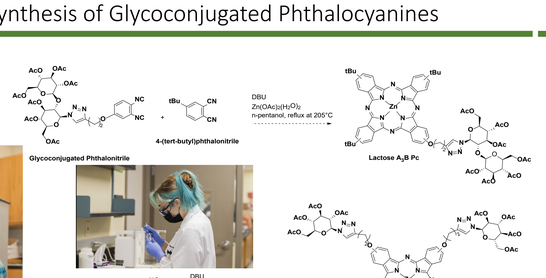
Synthesis of Glycoconjugated Phthalonitriles



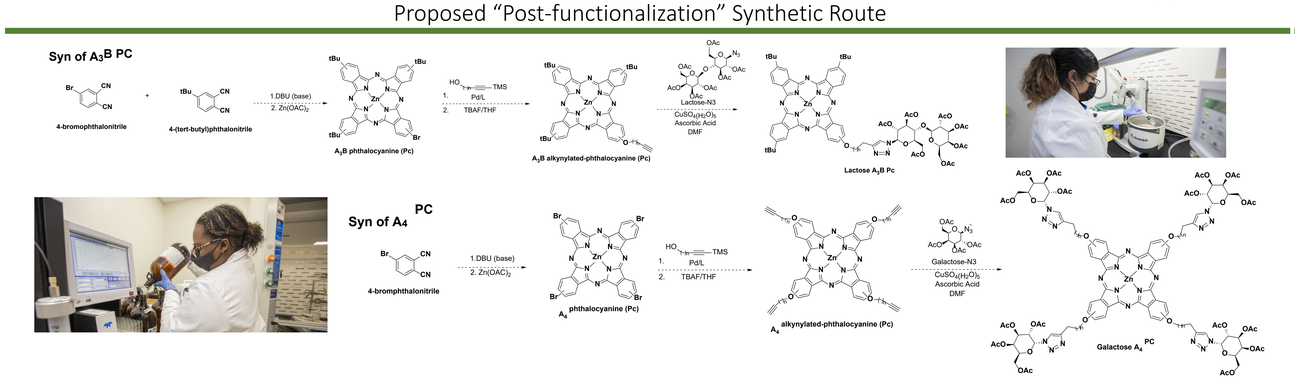




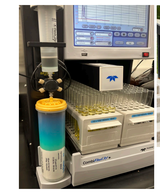
Synthesis of Glycoconjugated Phthalocyanines



Proposed "Post-functionalization" Synthetic Route



Ongoing Work and Acknowledgements



Solving challenges with purifying A_3B and A_4 for both "pre" and "post" functionalization routes

National Institutes of Health
SCINBRE South Carolina IDeA Networks of Biomedical Research Excellence

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