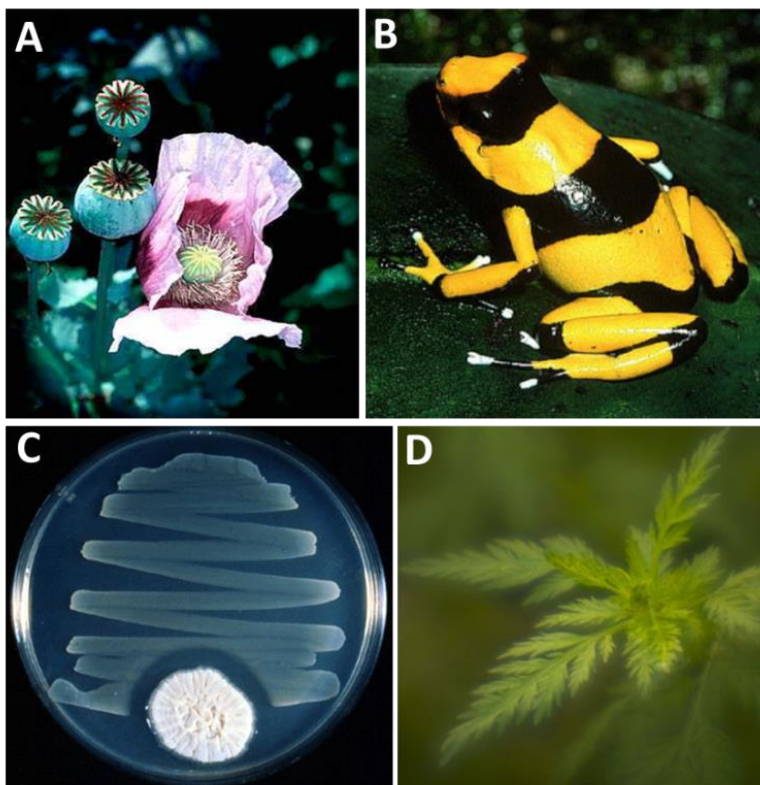


BIOC 4203, Secondary Metabolism and Natural Products Biochemistry

Offered Winter Term 2025

Course Description:

Chemodiversity is the spice of life! This course will cover specialized (secondary) metabolic pathways in plants, fungi, bacteria, and animals. Humans have long exploited the chemical products of these pathways, which are also important for the fitness of the host organism. These natural products are found in our medicines (e.g. antibiotics, chemotherapeutics, painkillers, herbal remedies), food flavourings (spices), fragrances, beauty products, and industrial materials. We will examine the structures and functions of these fascinating chemicals, but this course is not about memorization of complicated structures. We will focus on the metabolic pathways, emphasizing natural products that are found in medical and industrial applications (e.g. morphine, quinine, vinblastine, taxol, artemisinin, erythromycin, castor oil, natural rubber). We will also discuss biotechnological approaches to producing these products more effectively and cheaply using metabolic engineering and synthetic biology. If you are interested in natural chemical products and their biosynthesis, this course is for you! If you are interested in the human applications of these products from ancient times to the present day, this course is for you! Whether you plan a career in medicine, pharmaceuticals, agriculture, chemical ecology, food chemistry, toxicology, biotechnology, and more, this course is for you!



Examples of specialized metabolites and their natural sources: (A) Opium poppy produces the opiates codeine and morphine (heroin precursor) and is widely cultivated worldwide (mostly illegally) (B) The harlequin poison dart frog accumulates toxins (steroidal alkaloids) in its skin as a means of deterring predators. (C) The β -lactam antibiotics derived from *Penicillium* sp. have revolutionized medicine. (D) Artemisinin is a lactone isolated from sweet wormwood that has been found to be a highly effective anti-malarial. The artemisinin biosynthetic pathway has recently been engineered into yeast to produce this drug cheaply.

Prerequisites: BIOC 3101, General Biochemistry I and (BIOC 3102, General Biochemistry II or BIOL 3104, Molecular Genetics), or permission of the Institute

Text: No assigned textbook. Readings assigned from journal articles. General resource books may be found in the library.

Time: Tuesdays and Thursdays, 1:05-2:25 PM (in person)

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