



BISC 599 Vitamins in Marine Biogeochemistry

Units: 2

Fall 2023 Wednesdays 9:00 – 11:00 AM

Location: TBD

Instructor: Sergio Sañudo-Wilhelmy

Office: AHF 206

Office Hours: By request

Contact Info: sanudo@usc.edu

Course Description

Enzymes, together with organic (coenzymes) and inorganic (some trace metals) cofactors, catalyze all the biotic transformations in the so-called global biogeochemical cycles. While the roles of metal cofactors have extensively been studied, the study of coenzymes in marine systems has been more limited. Most of the coenzymes involved in metabolism were identified during the first half of the 20th century, and since then, we have learned that a significant fraction of those is derived from vitamins.

Learning Objectives

In this class, students will learn an overview of the evolution, mechanisms, and control that those coenzymes exert on the biogeochemical transformations of bioactive molecules in marine environments.

Required Readings and Supplementary Materials

The readings will be primary peer-reviewed literature posted on course blackboard site.

Description and Assessment of Assignments

The class will combine a series of lectures and discussions of peer-reviewed literature covering topics ranging from synthesis pathways and metabolic requirements to the environmental impacts of different vitamins. These will be followed by several student-led discussions on the effects of different vitamins on specific biogeochemical cycles. Depending on the student's enrollment, these student presentations will be individual or in groups, and these will be based on student-selected literature. The student's final paper will also be based on those presentations.

Course Schedule

Tentative schedule of course topics. The class schedule is subject to change and any schedule changes will be discussed in the first class and posted on Blackboard.

Table 1 Course schedule

	Topic	Reading Assignment
Week 1	Class overview and administrative introduction	
Week 2	Coenzymes-catalyzed reactions in metabolic pathways (overview)	Helliwell et al., 2017; Joglar et al., 2020; Sanudo-Wilhelmy et al., 2014. Stockbridge et al., 2010.
Week 3	Cobalamin and other cobamides in marine systems	Heal et al., 2017; 2019; Shelton et al., 2019; Sokolovskaya et al., 2020; Wienhausen et al., 2022c; Yi et al., 2012.
Week 4	Biotin synthesis, distribution and its role in anaplerotic reactions	Suffridge et al., 2018; Wienhausen et al., 2022b.
Week 5	Thiamin moieties and microbial auxotrophy	Gutowska et al., 2017; Paerl et al., 2018; Suffridge et al., 2020.
Week 6	Flavins in extra-and-intracellular reactions	Hirano et al., 2003; Monteverde et al., 2018; Leys and Scrutton 2016; Susuzi et al., 2020.
Week 7	Niacin and its derivatives in marine systems	Cooper et al., 2019; Opitz and Heiland 2015; Rodionov et al., 2008;
Week 8	Pyridoxine and pantothenic acid in marine microbes	Mooney et al., 2009;
Week 9	Other non-coenzyme vitamins: vitamin A in photoheterotrophy of marine and extreme environments	Gomez-Consarnau et al., 2007; 2019; Sephus et al., 2022.
Week 10	Vitamins in the carbon cycle	Student's choice
Week 11	Vitamins in the nitrogen cycle	Student's choice
Week 12	Vitamins in the sulfur cycle	Student's choice
Week 13	Vitamins and redox-sensitive elements	Student's choice
Week 14	Thanksgiving holiday	
Week 15	Final discussion	
FINAL	Final Group paper due	

Course policies

Attendance and Participation: Students are encouraged to attend and participate in all discussions. It is required that all students read all the assigned peer-reviewed articles before class to be to participate in the paper discussions. Students who miss classes are responsible for finding out any announcements from the instructor.

Communication: The preferred mode of communication with the instructors will be by email. In-person meeting will be schedule by request.

Planned Absences: Absences to class due to religious holydays or any other reason should notify the instructor as soon as possible. If the absence is approved, accommodations will be made.

Statement on Academic Conduct and Grading Breakdown

Table 2 Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Weekly discussions	70	20
Lead Presentation Assignment	20	20
Final Group Presentation	30	30
Final Group Paper	30	30
TOTAL	150	100

Grading Scale

Course final grades will be determined using the following scale:

Table 3 Course Grading Scale

Letter grade	Corresponding numerical point range
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity’s website](#), and university policies on [Research and Scholarship Misconduct](#).

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university’s mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and

could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.