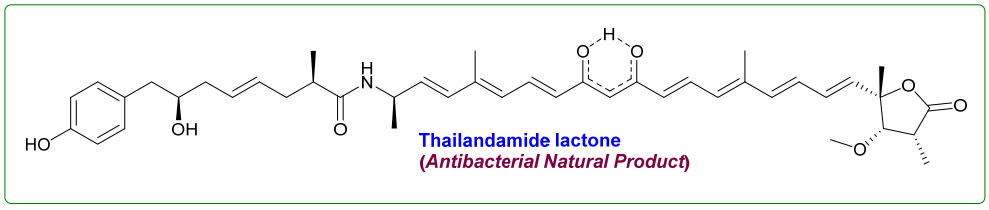
<u>In order of importance, list of ten best papers of the candidate, highlighting the important discoveries/contributions described in them briefly (not to exceed 3000 words):</u>

i). ***"Total Synthesis of Antibacterial Plyketide Natural Product Thailandamide Lactone"*** Himangshu Sharma, Joyanta Mondal, Ananyo K Ghosh, Ritesh Ranjan Pal and **Rajib Kumar Goswami*; Chem. Sci., 2022, *13*, 13403-13408**.

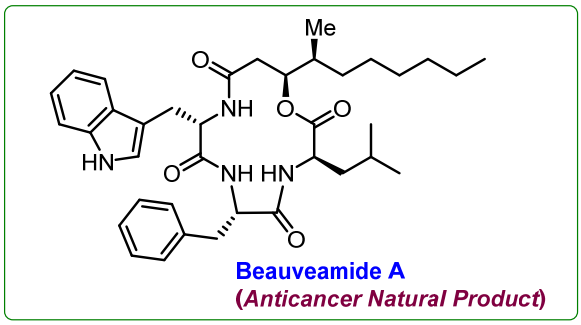
Researchers worldwide engage to look into the potential methods to discover new antibiotic(s). One of such promising method is exploring the biosynthetic potential of microorganisms. In order to understand the thailandamide biosynthesis, the silent *tha* PKS-NRPS gene cluster of *B. thailandensis*, a bacterium, was activated through manipulation of a quorum sensing (QS) regulatory system which alter dramatically the metabolic profile of the mutant. This resulted the isolation of structurally challenging new polyketide thailandamide lactone in 2010 which was not detectable in wild type broth initially. Highly challenging architectural features, natural scarcity, lack of synthetic route encouraged us to envisage the total synthesis of thailandamide lactone. Structurally thailandamide lactone is a linear highly challenging polyene polyketide where a tetraene conjugated with a γ-butyrolactone is fused with a conjugated triene through an enolized dione moiety. There are six asymmetric centers among which one is quaternary and a phenolic moiety embedded to another terminal of the molecule. Our first total synthesis includes several coupling operations including two intermolecular Heck reactions. Notably, Pd(I) based Heck coupling has been introduced first time in total synthesis of natural product. The possible site to couple efficiently the highly sensitive eastern and western polyene segments of thailandamide lactone has been deduced. The evaluation of antibacterial activity of thailandamide lactone revealed first time its role against both pathogenic and nonpathogenic Gram-positive and Gram-negative bacterial strains. Importantly, the developed modular strategy would be amenable to thailandamide A, another member of this family as well as the structurally simplified designed analogues for further exploration towards antibacterial research.



ii). ***"Late-Stage Functionalization: Total Synthesis of Beauveamide A and Its Congeners and Their Anticancer Activities"*** Sanu Saha, Sourya Shankar Auddy, Akash Chatterjee, Prosenjit Sen and **Rajib Kumar Goswami*; Org. Lett. 2022, *39*, 7113-7117. (*One of the most read/downloaded papers for the month September-October, 2022*).**

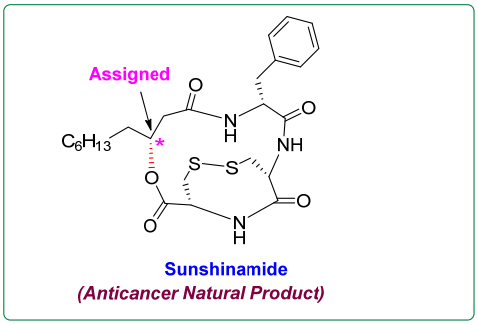
During the search of novel secondary metabolites from Endolichenic fungi, in 2021 a family of new cyclotetradepsipeptides beauveamides has been discovered using the cultures of endolichenic *Beauveria* sp. Structurally, beauveamides are 13-membered macrocycles bearing a common fatty acid moiety, 3-hydroxy-4-methyldecanoic acid (HMDA). There are three amino acids in the peptide segment which varies among the members. Some of the members exhibited protective effects on mouse auditory cell line (HEI-OC1) in micromolar concentration whereas

few stimulated the glucose uptake in cultured rat L6 myoblasts. The first total synthesis of beauveamide A following a late-stage functionalization approach has been achieved. A common intermediate has been designed that could enable to provide diverse set of analogues having modification in the HMDA unit. The anticancer activities of beauveamide A and two of its variants have been evaluated against Human metastatic breast adenocarcinoma (MDA-MB-231) and cervical cancer (HeLa) cell lines where one of analogues was found much more effective compare to the parent natural product.



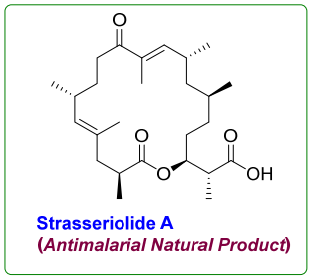
iii). ***"Total Synthesis and Stereochemical Assignment of Sunshinamide and Its Anticancer Activity."*** Joyanta Mondal, Ruma Sarkar, Prosenjit Sen* and **Rajib Kumar Goswami***; **Org. Lett. 2020**, *22*, 1188-1192.

Bicyclic natural products containing a disulfide linkage make up an important class of molecules that exhibit a broad range of biological activities and pharmacological properties. Many of these natural products showed striking anticancer and immunosuppressant activities. One such natural product is sunshinamide, a disulfide-containing cyclodepsipeptide isolated in 2018 which exhibits potent cytotoxicity against human cancer cell lines in nano-molar range. We have developed a convergent chemical route for the first total synthesis of this potent natural product. This synthetic study enabled the unambiguous determination of the stereochemistry of the unassigned stereocenter of the isolated sunshinamide. The cytotoxicity of sunshinamide and its analogues was evaluated against different cancerous and noncancerous human cell lines, which revealed their attractive and selective activities toward different cancer cells at very low concentrations.



iv). ***"Total Synthesis of Strasseriolide A"*** Moinul Haque Sahana, Dhiman Saha and **Rajib Kumar Goswami***; **J. Org. Chem, 2022, *17,* 11805–11815. (*One of the most read/downloaded papers for the month August-September, 2022*).**

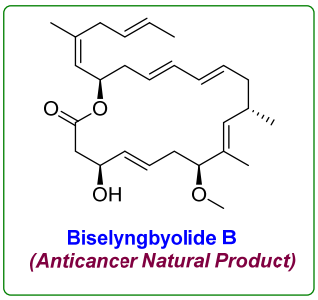
The development of resistance to existing chemotherapeutics in microorganisms is quite alarming which is true for *Plasmodium* parasites. Therefore, the search for new antiplasmodial pharmacophore(s) and their associated studies is quite important for our sustainability. Novel structurally intriguing macrolides strasseriolides discovered in 2020 showed promising effects against both drug-sensitive (3D7) and drug-resistant (Dd2) *Plasmodium falciparum* strains. A convergent route for the stereoselective total synthesis of strasseriolide A has been accomplished for its accessibility. The salient features of this synthesis include less explored $Co(BH_4)_2$-mediated selective reduction of conjugated olefin, Crimmins propionate aldol, Evans alkylation, intermolecular Horner−Wadsworth−Emmons olefination, Yamaguchi macrolactonization, and selective saponification of ester moiety in the presence of a lactone functionality. The developed route is modular which could be used easily for diversification to different analogues useful for antimalarial research.



Strasseriolide A
(Antimalarial Natural Product)

v). ***"Stereoselective Total Synthesis of Bioactive Marine Natural Product Biselyngbyolide B."*** Sayantan Das, Debobrata Paul and **Rajib Kumar Goswami*; Org. Lett., 2016**, *18*, 1908–1911.

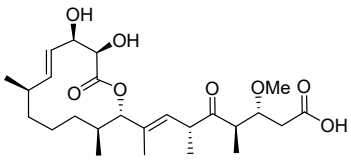
Biselyngbyolide B is a marine 18-membered marine macrolide bearing conjugated and highly sensitive skipped olefin isolated in 2012 which showed potential anticancer activity against number of human cancer cell lines in micro to nanomolar concentration and also instigates the apoptosis of osteoclasts. Thus, development of efficient chemical synthetic route of this family of natural products is quite important to understand their in-depth mode of action. During this synthetic study, we discovered a new modification of the Jamison protocol of trans-hydroalumination/ allylation, a crucial step in the synthesis of skipped olefin. Importantly, the less explored Heck macrocyclization has been incorporated for effective formation of the sensitive natural products. The developed approach made others courageous to adopt Heck macrocyclization in synthesis of different bioactive macrolides.



Biselyngbyolide B
(Anticancer Natural Product)

vi). ***"Stereoselective Total Synthesis of Carolacton."*** Tapan Kumar Kuilya and **Rajib Kumar Goswami***; **Org. Lett.**, **2017**,*19*, 2366–2369.

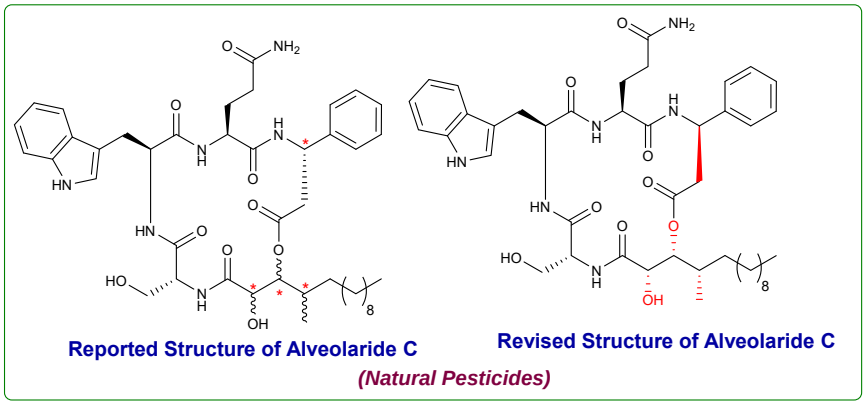
Carolacton is a potential antibacterial secondary metabolite isolated in 2010 which combats *Streptococcus mutans* and *Streptococcus pneumonia*, the major bacterial pathogens responsible for human dental caries and pneumococcal infections, respectively. It reduced the cell viability of bioflims in very low concentration (0.005 μg/mL) and found promising for dental medicine. The intriguing structure of this lactone made its efficient chemical synthesis quite challenging. We have developed best chemical synthetic route for this natural product in 13 linear steps with 18.8 % overall yield which is shortest and high yielding compare to the earlier reports. The developed route is quite flexible and suitable for synthesis of different analogues of this natural product which cloud have potential value in antibacterial research especially towards dental domain.



Carolacton
(Antibacterial Natural Product)

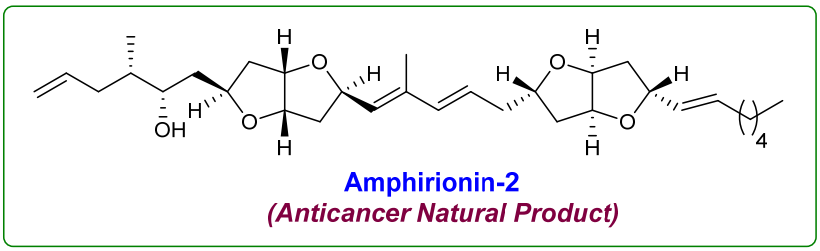
vii). ***"Cyclodepsipeptide Alveolaride C: Total Synthesis and Stereochemical Assignment"*** Sanu Saha, Debobrata Paul and **Rajib Kumar Goswami*; Chem. Sci.**, **2020**, *11*, 11259-11265. (*Highlighted in ChemistryViews.org and Published as literature coverage in Synform, 2021/03, A43–A45*).

Dow Agro Sciences, USA, in 2018, first identified and isolated a family environmentally benign pesticides cyclodepsipeptide alveolarides A–C. Invitro inhibition studies against different harmful plant pathogens *Pyricularia oryzae*, *Zymoseptoria tritici*, *Ustilago maydis*, *Puccinia triticina*, and *Phakopsora pachyrhizi* revealed that these cyclodepsipeptides exhibited excellent to moderate activities which necessities the development of synthetic route of this family of natural products. In this paper, we have demonstrated first stereoselective total synthesis of alveolaride C following a convergent approach. This synthetic study enabled us to establish unambiguously the stereochemistry of three unassigned chiral centers embedded in the nonpeptidic segment as well as revised the stereochemistry of the proposed β-phenylalanine counterpart of the molecule which is very important for further development of pharmaceutical value. This study put a foundation stone to understand the chemistry of other members of alveolarides and left an open space for further research towards natural pesticides.



viii). ***"Asymmetric Total Synthesis of Amphirionin-2"*** Dhiman Saha, Gour Hari Mandal and **Rajib Kumar Goswami*; J. Org. Chem., 2021**, *86*, 10006–10022**.**

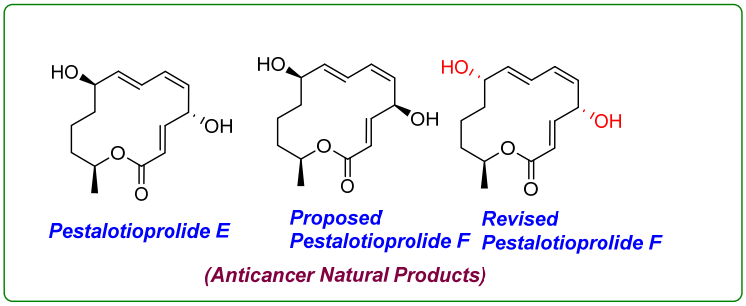
Amphirionin-2 was isolated in 2014 from the KCA09051strain of laboratory-cultured marine dinoflagellates *Amphidinium sp.* which showed promising *in vitro* anticancer activities against Caco-2 (human colon carcinoma) and A549 (human non-small cell lung adenocarcinoma) cell lines as well as in vivo antitumor efficacy against murine tumor P388 cells. Architecturally, it is a linear polyketide embedded with two unique hexahydrofuro[3,2-b] furan moieties, ten stereogenic centers, a conjugated olefin and two isolated olefins. A convergent route for the asymmetric total synthesis of potent anticancer polyketide natural product amphirionin-2 has been developed. Our initial synthetic trials revealed that the proposed structures of amphirionin-2 need to be revised. The key features of our synthesis comprised Sharpless asymmetric dihydroxylation, followed by cycloetherification, Wittig olefination, Julia−Kocienski olefination, and Crimmins propionate aldol reaction. Later, the actual structure of the natural product has been synthesized. The developed synthetic route is quite flexible, which creates an opportunity to explore the structure−activity relationship of this potent anticancer natural product.



ix). ***"Total Synthesis of Pestalotioprolide E and Structural Revision of Pestalotioprolide F."*** Debobrata Paul, Sanu Saha and **Rajib Kumar Goswami*; Org. Lett., 2018**, *20*, 4606–4609.

Natural products are the treasure trove to fight against broad human diseases including cancer. Pestalotioprolides E and F, the 14-member macrolides isolated tin 2016, exhibited promising cytotoxicities to murine lymphoma cell line (L5178Y) with IC50 values of 3.4, and 3.9 μM, respectively, while pestalotioprolide E showed potential activity against human ovarian cancer cell line (A2780) with an IC50 value of 1.2 μM. We have developed a short and convergent

strategy for the first asymmetric total synthesis of these natural products. The intramolecular HWE reaction in 14-membered ring formation has been utilized which is rare. Importantly, the proposed structure of pestalotioprolide F has been revised.



x). ***"Asymmetric Total Synthesis of Bioactive Natural Lipid Mycalol"*** Subhendu Das, Tapan Kumar Kuilya and **Rajib Kumar Goswami***; **J. Org. Chem.**, **2015**, *80*, 6467-6489.

Mycalol is a polyoxygenated monoalkyl glyceryl ether lipid isolated in 2013 which exhibits promising and selective cytotoxic activity against human anaplastic thyroid carcinoma (ATC), the most aggressive human thyroid gland malignancy (IC50 against different human ATC-derived cell lines: FRO-HMGA1as = 7.3 μM, ACT1 = 4.5 μM, 8505c = 3.8 μM). It also shows moderate cytotoxicity to human colon solid tumor cell lines (IC50 = 10.9 μM). A concise and convergent route for stereoselective total synthesis of promising anticancer natural lipid mycalol has been achieved using cheap and readily available -arabinose as a chiral pool. The notable features of our synthesis comprised regioselective Wacker oxidation, Sharpless asymmetric dihydroxylation, Julia−Kocienski olefination, Wittig olefination, Zipper reaction, and Sonogashira reaction. In our effort to resolve the differences in the NMR data of the isolated structure and the proposed synthesized structure, we have developed convenient synthetic strategies for several configurational and positional isomers of mycalol. Comparison of their data finally resulted the revised structure of the natural product. The developed route is flexible and left an open space for making diverse structural analogues.