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IDENTIFICATION AND SYNTHESIS AS TOOLS IN CHEMICAL ECOLOGY TO DECIPHER CHEMICAL MEDIATED INTERACTIONS BETWEEN ORGANISMS.

Stefan Schulz.

Institut für Organische Chemie, Technische Universität Braunschweig, Braunschweig, Germany.

ABSTRACT: The identification of compounds used for communication between individuals of one or different species is fundamental to investigate chemoecological interactions. This is not only true for more traditional methods aiming to characterize a small set of active compounds of a particular interaction, but also mandatory for modern metabolomics approaches dealing with hundreds of compounds. In this contribution the approach followed by my group to identify these compounds will be presented, following two general concepts. A certain interaction can be clarified by isolating, synthesizing and testing target compounds, which is common practice. Besides this approach we also perform reverse Chemical Ecology, starting from Chemistry trying to identify many compounds and evaluate their activity. The latter procedure is exemplified by our work on springtails (Collembola), a sister group of the insects. Although their radiation is much smaller compared to insects, they are important members of many ecosystems. Our group is interested in the chemical ecology of Collembola. The insect epicuticular lipid layer is dominated by complex hydrocarbon mixtures the fatty acid biosynthetic pathway. These specific mixtures often transmit information, e. g. on species identity, sex, physiological state etc. Collembola also use hydrocarbons as epicuticular lipids, but surprisingly these are often terpenes. Instead of complex mixtures, few compounds with unique structures are used. Often irregular terpenes with up to nine isoprene units dominate. Many Collembola also use chemical defense to protect themselves against predators. Such defensive compounds include highly chlorinated or aromatic components. Another project focusses on volatile compounds of bacteria, the function of which are currently intensively investigated in many groups. We are interested in marine an actinomycete, *Salinispora*, that produces a wide range of volatiles. A combination of various GC/MS and highly sensitive GC/IR techniques with DFT-calculations of IR spectra allowed the proposal of structures of unknown compounds that were verified by synthesis. Other examples of our work will cover *Heliconius* and ithomiine butterflies from Middle and South America.