Synthesis of Naturally Occurring Nitrogen Heterocycles from Carbohydrates, by E. S. H. El Ashry and A. El Nemr; Blackwell: London, **2005**, hardcover, 464 pp, £ 119, ISBN 1-405-12934-4

Every chemist knows the famous coenzyme biotin and its strong binding affinity to avidin and streptavidin; however, how many know, how it can be synthesized and that it actually can be made from sugars? Did you know that biotin has been synthesized starting from D-glucose, or from glucosamine, from glucuronolactone, mannose, or even from arabinose? All these biotin syntheses from carbohydrates can be found in *Synthesis of Naturally Occurring Nitrogen Heterocycles from Carbohydrates*, a pleasing reference book.

The volume represents an enormous amount of synthetic work that is very carefully reviewed on more than 420 pages. This rich text, written by El Sayed El Ashry and his academic pupil Ahmed El Nemr, is dedicated to the synthesis of naturally occurring N-heterocycles with biological activity and medicinal potential. The authors have succeeded in presenting the vast variety of such nitrogen heterocyclic compounds in a clear and straightforward manner.

The refereed work has been arranged in six chapters, according to the sizes and nitrogen content of the heterocyclic rings. Consequently, the chapters deal with five-membered N-heterocycles, such as differently substituted pyrrolidines, five-membered heterocycles with two heteroatoms, six-membered nitrogen heterocycles, such as the piperidines, and two types of seven-membered heterocylces derived from carbohydrates, the bengamides and liposidomycins. Last but not least, chapters 5 and 6 receive half of the book's volume and are dedicated to fused and multi-fused heterocycles.

Carbohydrates are especially useful starting materials for the synthesis of such valuable compounds as they provide an almost unlimited combinatorial source of stereocentres and they allow facile introduction of nitrogen after activation–substitution of hydroxyl groups or via the anomeric carbonyl functionality of the sugar. The enormous work that has been reported in this field of chiral pool synthesis is extremely well reviewed and referenced, with plenty of both classical and up-to-date references after each section. Even the short introduction refers to 262 references on synthetic work, starting from that large renewable sugar biomass. The reader can further draw profit from the rich index on compound names, supplemented by an index on biological activities and another on natural sources.

Each section starts with a systematic introduction to the structures of the targeted compounds and a very brief comment on their biological activity, followed by an extensive and detailed overview of the published synthetic routes from different carbohydrate sources. The reader can learn carbohydrate chemistry, including the chemistry of alditols and glyconolactones, as well as protecting group chemistry, plenty of hydroxyl group modifications and conversions, peptide coupling, glycosidation methods, interesting rearrangements such as the Overman rearrangement of allylic trichloroacetimidates that allows for the preparation of α,α-disubstituted lactams from glucose, supplemented by enzymatic procedures including the use of fucose-1-phosphate aldolase to catalyse an aldol reaction with dihydroxy acetone phosphate, and phosphatase to cleave phosphate esters or glucose isomerase (SWEETZYMENT) for conversion of glucose into fructose.

The synthesis of famous glycosidase inhibitors consumes many pages, such as in the case of the six-membered nitrogen heterocycles nojirimycin and 1-deoxynojirimycin as well as the 5:6-fused heterocycles castanospermine and swainsonine, which are extensively discussed (with 266 references cited for just swainsonine).

The drawings of the book deserve the highest appreciation, as they are concise and consistent throughout the hundreds of pages, most of the pages containing at least one synthetic scheme. Very complex structures such as bleomycin and its relatives are equally accurate and all the synthetic schemes are very carefully set up.

The book's format has not allowed the authors to detail mechanistic considerations regarding the reviewed synthetic work, which is not always that obvious. Nevertheless, the admirable accumulation of synthetic chemistry will provide guidance and council to both students and academic teachers, and moreover, researchers will find stimulation and entertainment when rummaging and browsing this fine book.

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