

This Week's Citation Classic

Glenn E M & Nelson D H. Chemical method for the determination of 17-hydroxycorticosteroids and 17-ketosteroids in urine following hydrolysis with β -glucuronidase. *J. Clin. Endocrinol. Metab.* 13:911-21, 1953.
[Dept. Biological Chemistry, Univ. Utah Coll. Med., Salt Lake City, UT]

17-Hydroxycorticosteroids and 17-ketosteroids were determined and quantitatively separated in urine treated with β -glucuronidase. The procedure gave good separation and high reproducibility along with good recoveries of added steroids. The methods were more specific than other methods previously described. [The SC[®] indicates that this paper has been cited over 280 times since 1961.]

E. Myles Glenn
Hypersensitivity Diseases
The Upjohn Company
Kalamazoo, MI 49001

May 29, 1980

"During the late 1940s I had been investigating the isolation and determination of various steroids from the urines of experimental animals and man with Roy Hertz, Benton Westfall and, especially, Erich Heftmann, at the National Institutes of Health. At that time, the splitting of the steroid ester conjugates in urine was a tedious, unsatisfactory, and stinking affair requiring acid hydrolysis of urine at elevated temperatures. One knew the essential nature of the work when stray dogs mistook one's briefcase or trouser leg for a mobile fireplug and used them accordingly. The smelly laboratory procedures required differential solvent extractions to extricate the desired steroidal alcohols for final colorimetric analysis—procedures which, at best, were unpredictable because of the lack of air-conditioning and high humidity in Bethesda at the time.

"Max Sweat and Kathryn Knowlton, working in adjacent laboratories, made it possible for me to become associated with Leo Samuels and Don Nelson in the department of biochemistry at the University of Utah School of Medicine. They were investigating steroid levels in human blood, as well as their synthetic pathways in various isolated tissues of experimental animals. My contribution, consequently, occurred from being at the right place, at the appropriate time; in association with interesting

scientists; all working on similar biomedical problems.

"Nelson¹ had already devised successful methods for the extraction and separation of 17-hydroxycorticosteroids from human serum, using Florisil columns. My contribution consisted of β -glucuronidase hydrolysis of urine, followed by solvent extractions and separation of the two major steroid components on Florisil columns and their subsequent quantitation by well established colorimetric procedures. This procedure allowed future studies to be done easily concerning adrenocortical and probable testicular function in man.

"Along with Nelson, Kristen Eik-Nes also worked alongside me on another project involving steroid secretion rates from the adrenal cortex of dogs treated with endotoxin. Eik-Nes was a tall and gifted Norwegian. Working in his bare feet some of the time, he played the guitar and sang, especially while working at midnight and beyond. He was accompanied by Pete and Oley Johnson, two Mormon youngsters playing ukuleles and singing while washing our dirty glassware—young men who were later to become members of the medical fraternity. Then, there were the beautiful and talented Rosie and Carma, capably assisting all of us in the many diversified experiments.

"After the intense labor on the methodologies was completed, Avery Sandberg² and I applied them to a study of steroid metabolism and excretion in both healthy patients and those with various endocrine diseases. This voluminous clinical work gained the attention of the great endocrinologist and teacher, George Sayers, with whom I later became associated and from whom, subsequently, I received the PhD degree in physiology at Western Reserve University School of Medicine.

"The frequency of citation of this article—although I was unaware of it until now—resulted, probably, from the simplicity, reproducibility, and applicability of the methodology to the study of steroid excretion rates, steroid metabolism, and various endocrinologic diseases in man."

1. **Nelson D H & Samuels L T.** Method for the determination of 17-hydroxycorticosteroids in blood: 17-hydroxycorticosterone in the peripheral circulation. *J. Clin. Endocrinol. Metab.* 12:519-26, 1952.
2. **Sandberg A A, Nelson D H, Glenn E M, Tyler F & Samuels L T.** 17-Hydroxycorticosteroids and 17-ketosteroids in urine of human subjects: clinical application of a method employing β -glucuronidase hydrolysis. *J. Clin. Endocrinol. Metab.* 13:1445-64, 1953.