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This Week's Citation Classic

Kay E R M, Simmons N S & Dounce A L. An improved preparation of sodium desoxyribonucleate. *J. Amer. Chem. Soc.* **74**:1724-6, 1952. [Depts. Biochem. and Pathol., Sch. Medicine and Dentistry, Univ. Rochester, Rochester, NY]

An improved method of preparing DNA from various sources is described, making use of the detergent sodium dodecyl sulfate to deproteinize the protein component of DNA-protein complexes. [The *SCI*® indicates that this paper has been cited over 895 times since 1961.]

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"Among my recollections of boyhood are the times when my father, who was a science teacher, would bring home a microscope for me to use. I was fascinated by the examination of cells, and intrigued by the nuclei of these cells. My ambition was to learn as much as I could about them, and when the situation presented itself years later I was grateful for the opportunity to study with Alexander Dounce in Rochester. I was his first graduate student.

"Dounce had pioneered in the field of nuclear isolation techniques and studies of the biochemistry of these cell organelles. When I joined his laboratory he was involved in the study of the nature of the binding of DNA in nuclei, and particularly interested in the phenomenon of nuclear gelation.[1] He had commenced some studies with Norman Simmons with the use of the detergent sodium dodecyl sulfate in attempts to isolate DNA from cell nuclei. At the suggestion of Dounce, I worked with Simmons for a while to develop a reproducible procedure using this detergent. Simmons left Rochester soon after we had carried out a few preliminary experiments. The task of developing a procedure for isolating DNA then became a part of my PhD thesis work. This led to developing a method which has been used apparently quite extensively.

"I was familiar with the available methods for isolating DNA and the detergent approach did seem to be a good direction to follow. The sodium dodecyl sulfate had been used earlier by Pirie[2] to solubilize tobacco mosaic virus. In the preliminary experiments, Simmons and I found that the detergent could solubilize DNA from calf thymus chromatin. These experiments had embodied a double salt technique which was rather cumbersome.

"It was decided to attack the problem using the solubility characteristics of DNA-protein complexes in solutions of NaCl alone. The basic procedure was built on earlier work of Mirsky,[3] who had used NaCl solutions to prepare chromosome threads and subsequently extract DNA from them. Using the isolated chromosomes as a starting material, I added detergent solutions and observed the changes in structure of the chromosome threads with the microscope. Experiments were then done using varying concentrations of detergent and suspensions of chromosome threads. These suspensions were centrifuged at high speed and the supernatants analysed for N and P to arrive at the proper detergent concentration for effective solubilization of the DNA. The repurification steps were followed using NaCl solutions and the required detergent concentration. The development of the procedure was a straightforward approach coupling microscopic observations and chemical analysis.

"The procedure appealed to me because of its simplicity, reproducibility, and yield of a pure product, when applied to a variety of tissues. It was at the time of its development a fascinating experience for me to isolate DNA and observe its nature. It is still a source of considerable pleasure for me to help students follow through with the procedure and observe their astonishment at the nature of the product obtained."

1. **Dounce A L.** Cytochemical foundations of enzyme chemistry. (Summer J B & Myrbäck K, eds.) *The enzymes*. New York: Academic Press, 1950. Vol. 1, Part 1. p. 187-266.
2. **Sreenivasaya M & Pirie N W.** The disintegration of tobacco mosaic virus preparations with sodium dodecyl sulfate. *Biochemical J.* **32**:1707-10, 1938.
3. **Mirsky A E & Pollister A W.** Nucleoproteins of cell nuclei. *Proc. Nat. Acad. Sci. US* **28**:344-52, 1942.