CC/NUMBER30
JULY 27, 1992

This Week's Citation Classic®

Takatsy G. The use of spiral loops in serological and virological micro-methods. *Acta Microbiol. Acad. Sci. Hung.* 3:191, 1955. [State Institute of Public Health, Budapest, Hungary]

A new micromethod for serial dilutions is described. It is performed in wells of plastic plates, with calibrated "spiral loops" instead of pipettes. Diluents and reagents are dropped in from a simple calibrated instillator. Advantages of the micromethod in virological and serological titrations are detailed. [The *SCI*® indicates that this paper has been cited in more than 395 publications.]

Microtitrations in Serology and Virology

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In 1948, we made efforts to resume the influenza virus research that had been suspended in our institute during World War II. The World Influenza Centre (London) was ready to support us until our Communist government left the WHO. Then, we worked without useful cooperation, in poorly-equipped laboratories, where virus and serum titrations were seriously hindered by want of pipettes and test tubes.

It would have been reasonable to give up our efforts if Gy. Takatsy had not invented his "spiral loop." The original device looked like a platinum loop known from bacteriology, but the end of the wire formed windings with narrow gaps between them. Capillary action drew a constant volume of fluid to fill up the loop. Calibrated loops and droppers enabled us to perform dilution series in the wells of trays.

Takatsy prepared his loop on a tray whose geometric features determined the loop's capacity. Loops were calibrated by weighing them on an analytic balance—once when dry and again when full of water. When 0.025-ml loops were calibrated, error did not exceed ± 2 percent. Use of loops in making serial dilutions saved time, labor, reagent, laboratory room, and equipment, compared to conventional methods.

These advantages were growing parallel with consecutive modifications. Takatsy developed a set (Microtitrator) containing, in addition to the loops, plastic plates with wells and calibrated droppers delivering drops of constant volume. Initially, all requisites were made by Takatsy, manually.

To save more time, Takatsy exchanged the original handles for thinner knitting needles. Thus, it required no special skill to work with six-to-eight loops in one hand, simultaneously. For this reason, there were 96 wells arranged 8 x 12 in each plate of the set. If loops were blotted, rinsed, and flamed after each series of dilutions, they needed neither intense washing nor additional sterilization. Modified plastic plates, being resistant to detergents and intense cleaning, saved still more time and labor.

Our authorities failed to appreciate the Microtitrator's significance; they were even unwilling to patent it. Therefore, there was no reason to keep the method unpublished. The first paper on this subject, published in Hungarian,[1] gained no international interest. Neither was the paper under commentary (the first paper on the spiral loop in a world language) attractive for readers because of the low publicity and poor English of our *Acta.* The method gained wide popularity after 1956, when firms abroad were informed of the Microtitrator from Hungarian refugees.[2,3] The high number of citations reflects this popularity.

The spiral loop had a disadvantage: It was sensitive to physical effect, whereby its life span was short, especially in unskilled hands. Therefore, manufacturers made efforts to develop more resistant devices, some of them with success; e.g., Takatsy's "metal cup," which has all advantages of the loop, but is less sensitive.[4]

Although recently other microsystems of serial dilutions have gained increasing popularity, Microtitrator-type sets are still good enough to be widely used, not only in virology and serology, but also elsewhere in microbiology and clinical laboratories. Some of Takatsy's ideas published in this *Classic* paper can be recognized in recent micropipette sets as well. No doubt, the use of the Microtitrator system has led—directly or indirectly—to many valuable discoveries in the above-mentioned fields of research.

1. Takatsy G. Uj modszer sorozatos higitasok gyors es pontos elvegzesere (A rapid and accurate method for serial dilutions). *Kiserl. Orvostud.* 5:393-7, 1950.(Cited 50 times.)
2. **Csizmas L.** Preparation of formalinized erythrocytes. *Proc. Soc. Exp. Biol. Med.* 103:157-60, 1950. (Cited 170 times.)
3. **Sever J L.** Application of a microtechnique to viral serologic investigations. *J. Immunol.* 88:320-9, 1962. (Cited 2,205 times.)
4. Takatsy G. Use and fields of application of a modified microtitration apparatus. *HS1. Hung. Sci Instrum.* 10:10-8, 1967.
Received March 22.1991