

Comparison of process capacity, productivity, instrument efficiency and reagent handling of four immunoassay systems for allergy testing; ImmunoCAP® 1000, ImmunoCAP® 250, ADVIA Centaur® and Immulite® 2000

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Introduction

We have evaluated four immunoassay systems for *in vitro* allergy testing; ImmunoCAP® 250, ImmunoCAP® 1000, ADVIA Centaur® and Immulite® 2000. ImmunoCAP® 1000 and ImmunoCAP® 250 are two fully automated random access immunoassay systems from Pharmacia Diagnostics AB (Uppsala, Sweden). Immulite® 2000 and ADVIA Centaur® are random access immunoassay instruments from DPC (Los Angeles, USA) and Bayer Healthcare (Tarrytown, NY, USA), respectively. The study was performed by user trained operators at four different clinical laboratories in Europe. The handling of instruments, reagents and samples was done according to the instructions from the suppliers.

Aim of the study

To evaluate ImmunoCAP® 250, ImmunoCAP® 1000, ADVIA Centaur® and Immulite® 2000 regarding process capacity, productivity, instrument efficiency and reagent handling.

Conclusions

- The results from our study indicates that, from a productivity and instrument efficiency point of view, the ImmunoCAP® 1000 and ImmunoCAP® 250 from Pharmacia Diagnostics AB are better compared to Immulite 2000 and ADVIA Centaur, as systems for *in vitro* allergy testing
- The easy reagent handling, high grade of automation and low hands-on time makes the two ImmunoCAP® instruments well suited for both medium and large-sized laboratories
- Immulite 2000 and ADVIA Centaur are reporting the first result 30 minutes before ImmunoCAP® 1000. However, after 90 reported results Immulite 2000 and ADVIA Centaur are caught up by ImmunoCAP® 1000
- For *in vitro* allergy testing Immulite 2000 and ADVIA Centaur analyzers demands high hands-on time which makes the RPI values low compared to ImmunoCAP® instruments
- The consequence of an immunoassay system with high hands-on time is low productivity in the laboratory and high cost for labour

Results

Throughput

Figure 1 shows the result of throughput. Figure 2 shows the rate of processing, expressed as reported results per minute. The result shows that ImmunoCAP® 250 has the same rate of processing as Immulite 2000 and ADVIA Centaur. The results also shows that ImmunoCAP® 1000, which is delivering a result every 15 second, at the processing time of five hours has delivered nearly twice as many results as Immulite 2000 and ADVIA Centaur. In table 1 the number of reported results after five hours processing time, the time required for processing 300 results and the slope of the different curves in figure 2 are shown.

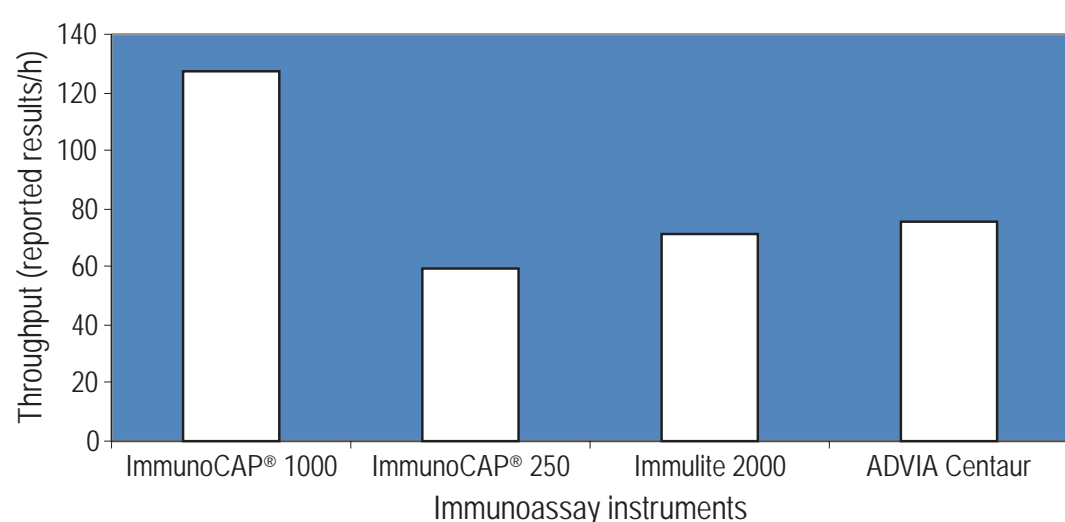


Figure 1. Throughput, reported results per hour

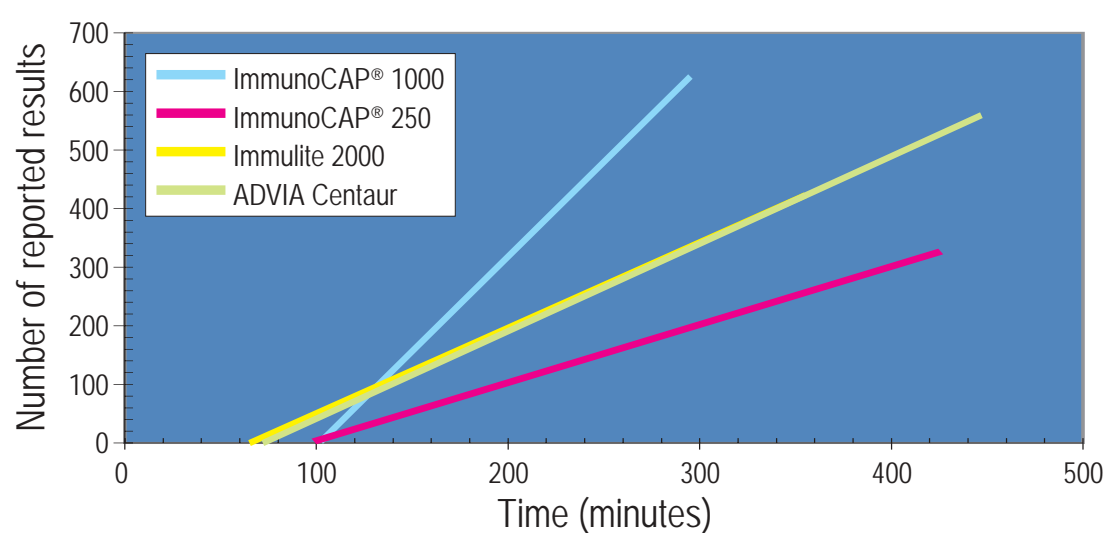


Figure 2. Rate of processing, expressed as reported results per minute

Table 1. Results, rate of processing

	Number of reported result at 5 hour processing time	Time required for processing of 300 tests (minutes)	Slope
ImmunoCAP® 1000	626	190	3.24
ImmunoCAP® 250	201	390	0.99
Immulite 2000	325	275	1.46
ADVIA Centaur	325	275	1.49

Materials and methods, immunoassay system

The ImmunoCAP® 1000 from Pharmacia Diagnostics AB is a floor model of a fully automated random access immunoassay system. The ImmunoCAP® 1000 is based on the well known ImmunoCAP® technology. The allergens are covalently coupled to a high capacity flexible hydrophilic cellulose-derivate, incased in a capsule. The enzyme labelled tracer gives a fluorescence eluate and the responses are measured with the in build fluorometer.

ImmunoCAP® 250 from Pharmacia Diagnostics AB is a bench model of a fully automated random access immunoassay system. ImmunoCAP® 250 uses the same technology as ImmunoCAP® 1000.

ADVIA Centaur from Bayer Healthcare is a floor model system. The ADVIA Centaur Specific IgE system is an IgE capture sandwich immunoassay, using streptavidin coated Para-Magnetic Particles as solid phase, liquid biotin labeled allergens and chemoluminescence detection.

Immulite 2000 from Diagnostic Product Corporation is a floor model system. The Immulite 2000 system is a two step chemiluminescence immunoassay with allergens in a liquid phase. The allergens are biotinlabelled and coupled to ligand-coated beads.

Relative Productivity Index

The result of the relative productivity index (RPI) is shown in figure 3. RPI is the number of reported results divided by total hands-on time.

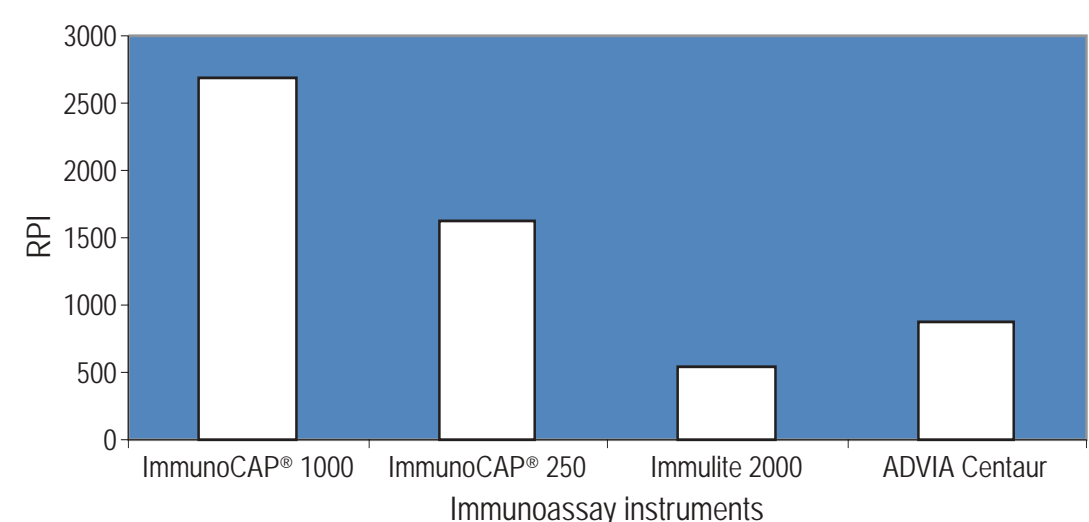


Figure 3. Relative Productivity Index (RPI)

Hands-on time

The total hands-on time is shown in figure 4. The major contribution to the high hands-on time for Immulite 2000 and ADVIA Centaur is the time that is required for reagent handling. The distribution of hands-on time is shown in figure 5.

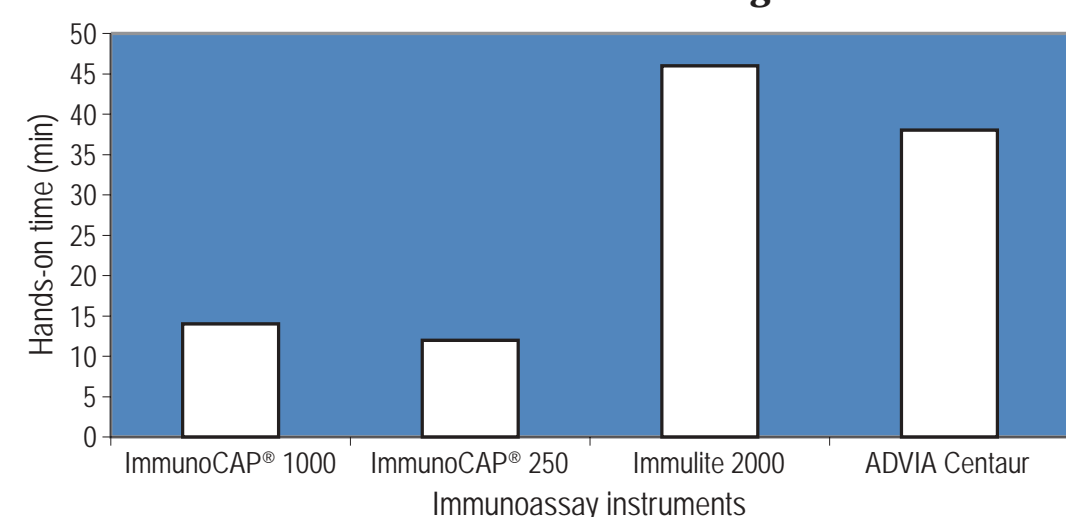


Figure 4. Total hands-on time

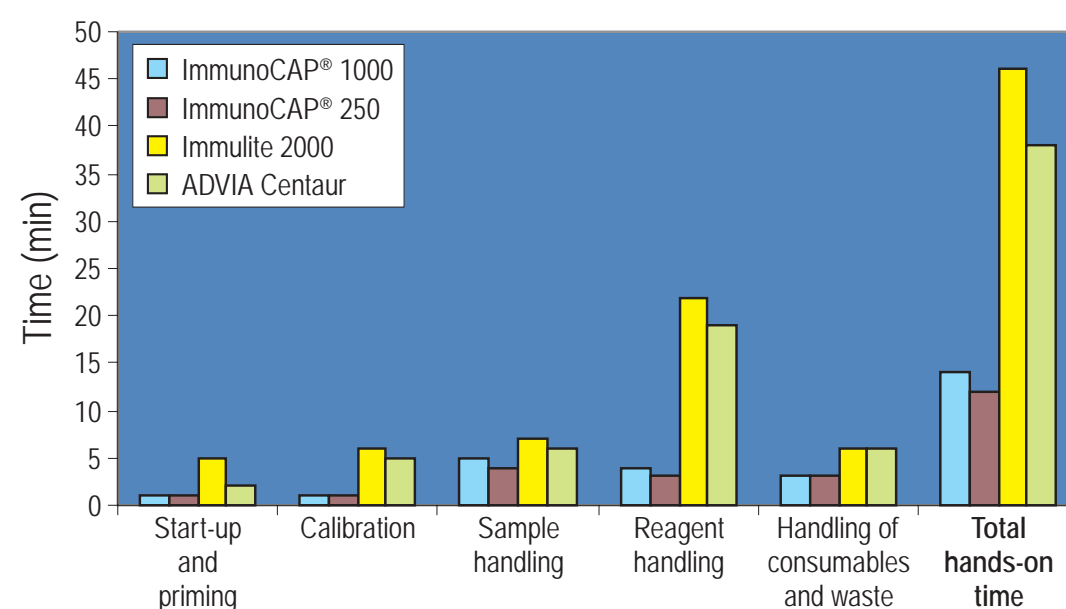


Figure 5. Distribution of hands-on time

Materials and methods, samples and reagents

626 determinations were used in the study. Specific IgE antibodies were measured in all serum samples. Controls were included in the protocol in the beginning and at the end of the workload. The handling of instrument, reagents, samples and consumables was done according to instructions.

Definitions of parameters

Definition of the different parameters used in the study.

- **Relative Productivity Index (RPI):** The number of reported results divided by the total hands-on time
- **Throughput:** The number of reported results divided by processing time. Throughput is reported in results/hour
- **Number of reported results:** The number of each reported result from each serum sample
- **Processing time:** The total time for processing all the total workload. Processing time is reported in minutes
- **Hands-on time:** The time that is required for an operator to work with the system. Hands-on time is reported in minutes