

Estimating the environmental impact of inappropriate laboratory testing

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In a recent letter commenting a previous article published in the *Journal of Laboratory and Precision Medicine* (1), Joseph Watine has outlined an intriguing and almost overlooked consequence of inappropriate laboratory testing, i.e., the potential impact of redundant or unnecessary tests on environmental protection (2). Notwithstanding this concept is theoretically straightforward, Watine failed to provide significant data in support of this statement, which hence remains hypothetical in essence.

To obtain a more reliable and touchable picture, we have made some speculative calculations for estimating the potential economic and environmental impact of wastage attributable to laboratory inappropriateness. According to the local facility (i.e., the laboratory of Clinical Chemistry and Hematology of the University Hospital of Verona,

Italy), the global consumption of and cost per test of water, energy and personnel resources for clinical chemistry and immunochemistry testing performed on the analyzer Roche Cobas 6000 testing (two c501 modules and one e601 module; Roche Diagnostics GmbH, Mannheim, Germany) (Figure 1) are shown in Table 1, as estimated by the current tender and manufacturer's declaration (3). Overall, each inappropriate test may hence impact by approximately 0.286€ on the hospital budget, 0.2% of which attributable to wastage of water, 3.2% to wastage of energy and 2.2% due to unnecessary personnel cost.

According to recent statistics, the current consumption of water, electric energy and the overall number of laboratory tests performed per year in Italy are approximately 5,348,272 million liters, 342,379 GWh and 668.8 million

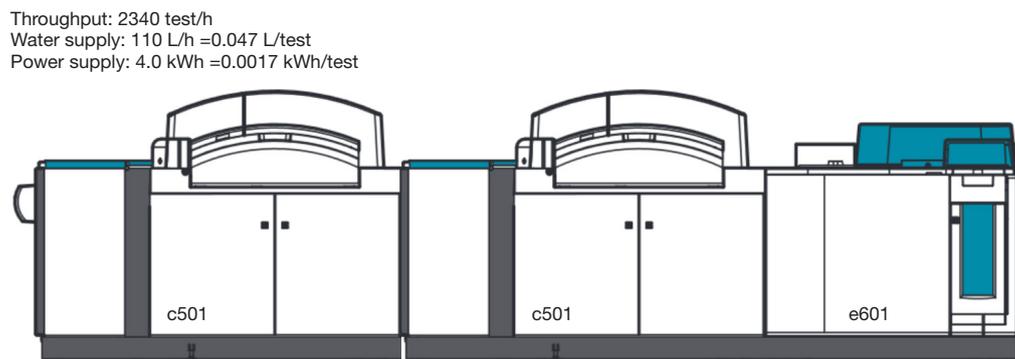


Figure 1 Manufacturer's specifications for the clinical chemistry and immunochemistry analyzer Roche Cobas 6000 (i.e., configuration c501-c501-e601).

Table 1 Consumption of and cost per test of water, energy and personnel for clinical chemistry and immunochemistry testing performed in the local laboratory, using the analyzer Roche Cobas 6000 (i.e., configuration c501-c501-e601) (Figure 1)

Parameter	c501	e601	C6000 (need for 1 test)	Cost for unit usage	Total cost for test (% total)
Test/hour	1000	340	2340	0.27€ (for test)	0.270€ (94.4%)
Maximal water consumption	40 L/h	30 L/h	110 L/h (0.047 L/h)	0.013€ (for L)	0.0006€ (0.2%)
Power consumption	1.44 kWh	1.12 kWh	4.0 kWh (0.0017 kWh)	5.52€ (for kWh)	0.009€ (3.2%)
Personnel cost		1 person		13€ (for 1 h work)	0.006€/L (2.2%)
Total cost	–	–	–	–	0.286€

tests, respectively. Even assuming the worst scenario in clinical chemistry and immunochemistry (i.e., 30% of unnecessary/redundant tests) (4), the overall impact of laboratory inappropriateness in clinical chemistry and immunochemistry (i.e., the largest diagnostic area) would hence expectedly account for less than 0.0002% of total water consumption and less than 0.0001% of total electric consumption in Italy.

Can these figures be considered really meaningful in terms of environmental protection? Although we do not have a definitive answer to this question, and with the awareness that water and energy consumption for inappropriate laboratory tests is a very tiny drop in the immense ocean of human wastage of resources (as for our speculative calculations), the comment of Joseph Watine should be cherished since it adds more, though substantially weak, evidence that additional efforts should be made to reduce the burden of laboratory inappropriateness. Yet, environmental protection inside and outside the laboratory probably would much more benefit from other types of interventions, such as repairing water leaks and leaky toilets, installing water aerators and systematically shutting-off ancillary services to reduce energy use and maintenance requirement, unplugging equipment and turning off lights when not in use, using available sunlight to illuminate work spaces or switching to compact fluorescent bulbs.

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