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Improvement of the Sandell-Kolthoff reaction method (ammonium persulfate digestion) for the determination of iodine in urine samples

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Iodine is an essential element involved in vital biochemical reactions, namely in protein synthesis and enzyme activity. Being a component of thyroid hormones its deficiency may lead to hypothyroidism, and physical and mental retardation. There is an iodine deficiency in many parts of the world, including Portugal, constituting a serious public health issue. The main sources of iodine in human diet are marine fish, shellfish and marine algae, and sea salt. Other potential sources are processed foods like bread, margarine, water, milk, and vegetables. Universal salt iodisation, was approved worldwide as a way to fight iodine deficiency [1], making it quite important to access iodine content in the final products. On the other hand, monitoring iodine in urine is an expedite way to control iodine deficiency in humans. Among current methods used for iodine determination, several detection systems are available, namely spectrophotometric, potentiometric, and ICP-MS.

In this work, the colorimetric Sandell-Kolthoff reaction was used, due to the simplicity inherent to spectrophotometric methods. After the digestion of the urine sample, attained with ammonium persulfate, iodide catalyses the reduction of ceric(IV) to cerous form, and the colour disappearance is measured. Several parameters of the described method were revisited in order to decrease the number of steps and minimizing the amount of reagents needed, resulting in a more reproducible and robust procedure. The improved method was applied to urine samples from a inter laboratory study EQUIP Round 38 for CDC (Centers for Disease Control and Prevention, Atlanta, USA) and the results obtained proved its accuracy, shown in Table 1.

Table 1. Comparison of the results obtained for accuracy assessment.

Sample ID	this method, µg/L	CDC value, µg/L	RD _{CDC value}	Mean all labs, µg/L	RD _{Mean all labs}
CDC #1	10.5	9.33	13%	10.81	-3%
CDC #2	67.2	65.65	2%	65.34	3%
CDC #3	141.5	137.54	3%	137.41	3%

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REFERENCES

[1] World Health Organization, 2007, ISBN 978 92 4 159582 7.