Mercodia

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How to convert µg/L to other units of insulin when using Mercodia Insulin ELISAs

Samples measured in the Mercodia Insulin ELISAs will be given insulin concentrations in the traditional unit mU/L. However, some research applications need to convert this unit to pmol/L (or µg/L), and this technical note describes how to perform these calculations.

Conversion from mU/L to pmol/L

In 2009 the ADA (American Diabetes Association) Workgroup agreed on two major points (Miller et al., 2009).

1. The standardization effort would primarily target insulin specific assays, i.e. assays demonstrated to measure insulin with negligible cross-reactivity with proinsulin and proinsulin cleaved intermediate products.
2. Insulin concentrations be reported in Systéme International (SI) units, pmol/L (pM), rather than the traditional units based on insulin biologic activity per mg of insulin standard preparation.

Highly purified, biosynthetic/semi-synthetic human insulin was used as the basis for accurate SI molar units of insulin. A multiplication factor of 6.0 was used to convert concentrations in mU/L to pmol/L (Vølund et al., 1991).

1 mU/L = 6 pmol/L for human insulin

To calculate the conversion factor based on the molecular weight of insulin is not correct. The international preparation 1st IRP 66/304 that Mercodia's human insulin assays are calibrated against contains some water and salts and, therefore, the correct method for determining the conversion factor is quantitative amino acid analysis (Vølund et al., 1991).

Mercodia AB, Sylveniusgatan 8A, SE-754 50 Uppsala, Sweden
+46 18 57 00 70 | info-global@mercodia.com | www.mercodia.com
Vat No SE-556157510001

Conversion from µg/L to mU/L

The Mercodia Human Insulin ELISA is calibrated against the 1st IRP 66/304 serving as an international reference preparation for human insulin for immunoassays. According to the definition of this preparation, one vial contains 3 International Units (IU) and a weight of 130 µg which gives:

$$\frac{3\ IU}{130\ \mu g} = 0.0231 \frac{IU}{\mu g} = 23.1\ mIU/mg$$

Hence,

1 µg/L = 23 mU/L for human insulin

Please observe that other preparations of insulin (e.g. insulin analogs) may be defined differently and the calculations above may not be applicable.

References

1. Miller WG, Thienpont LM, Van Uytfanghe K, Clark PM, Lindstedt P, Nilsson G and Steffes MW (2009) Toward Standardization of Insulin Immunoassays. *Clin Chem* 55(5): 1011–1018.
2. Vølund A, Brange J, Drejer K, Jensen I, Markussen J, Ribel U, Sørensen AR and Schlichtkrull J (1991) In vitro and in vivo potency of insulin analogues designed for clinical use. *Diabet Med* 8(9):839-847.
3. Knopp JL, Holder-Pearson L, Chase JG. (2019) Insulin units and conversion factors: a story of truth, boots, and faster half-truths. *J Diabetes Sci Technol.* 13(3):597–600.