

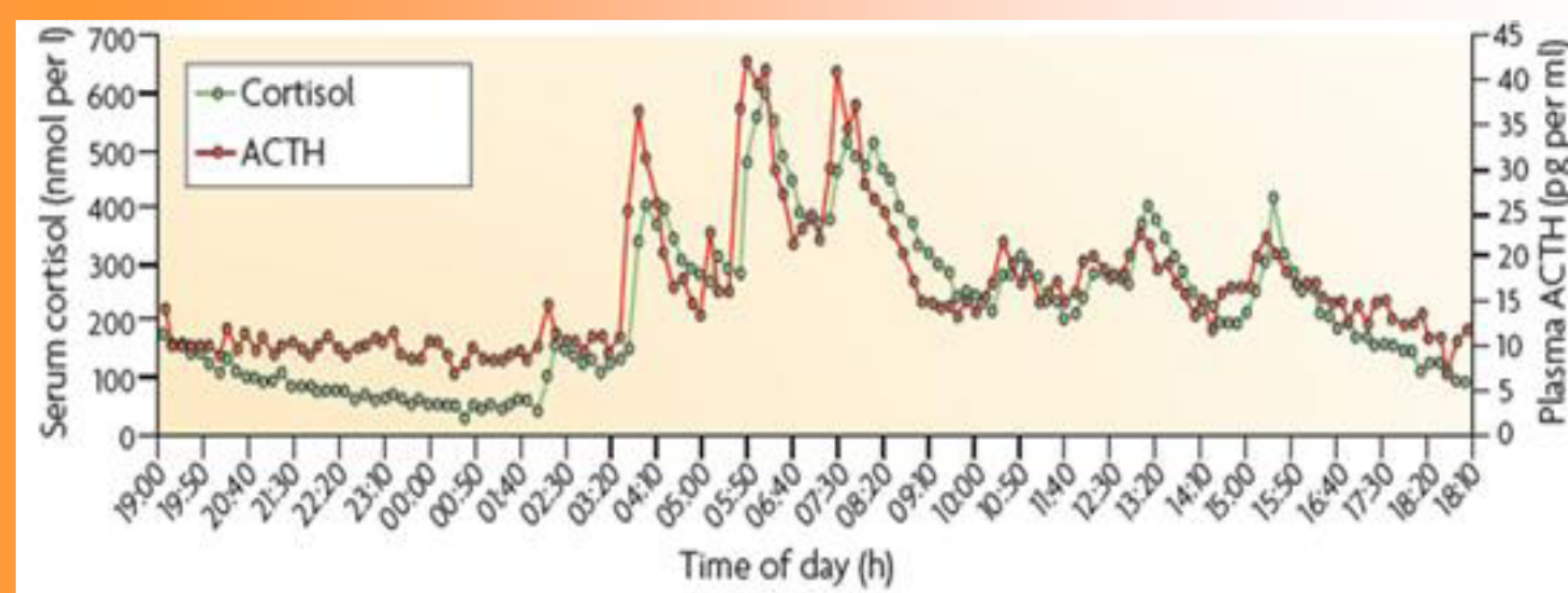
# Continuous subcutaneous hydrocortisone infusion (CSHI) in adrenal insufficiency-How to start

Katerina Simunkova<sup>1</sup>, Marianne Øksnes<sup>2</sup>, Nevena Jovanovic<sup>2</sup>, Kristian Løvås<sup>1,2</sup> and Eystein S Husebye<sup>1,2</sup>

Department of 1Clinical Science, University of Bergen, 4021 BERGEN, Norway; 2Department of Medicine, Haukeland University Hospital, 5021 BERGEN, Norway.

## Introduction:

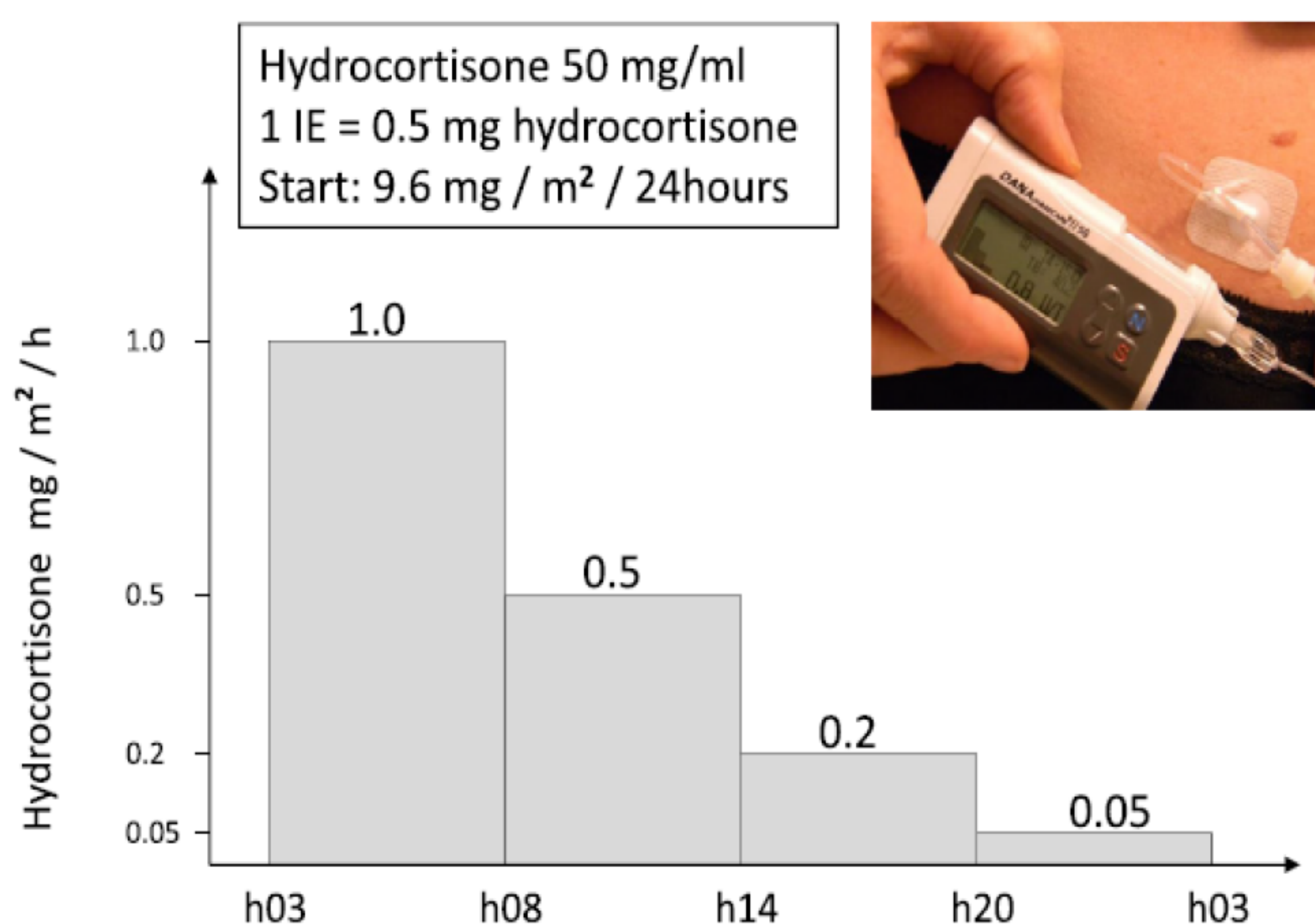
Conventional oral glucocorticoid treatment fails to reproduce the natural circadian cortisol rhythm. Non-physiological tissue exposure of cortisol could explain reduced quality of life and working ability and possible long term metabolic side effects.



Lightman ST et al., Nat Rev Neurosci, 2010

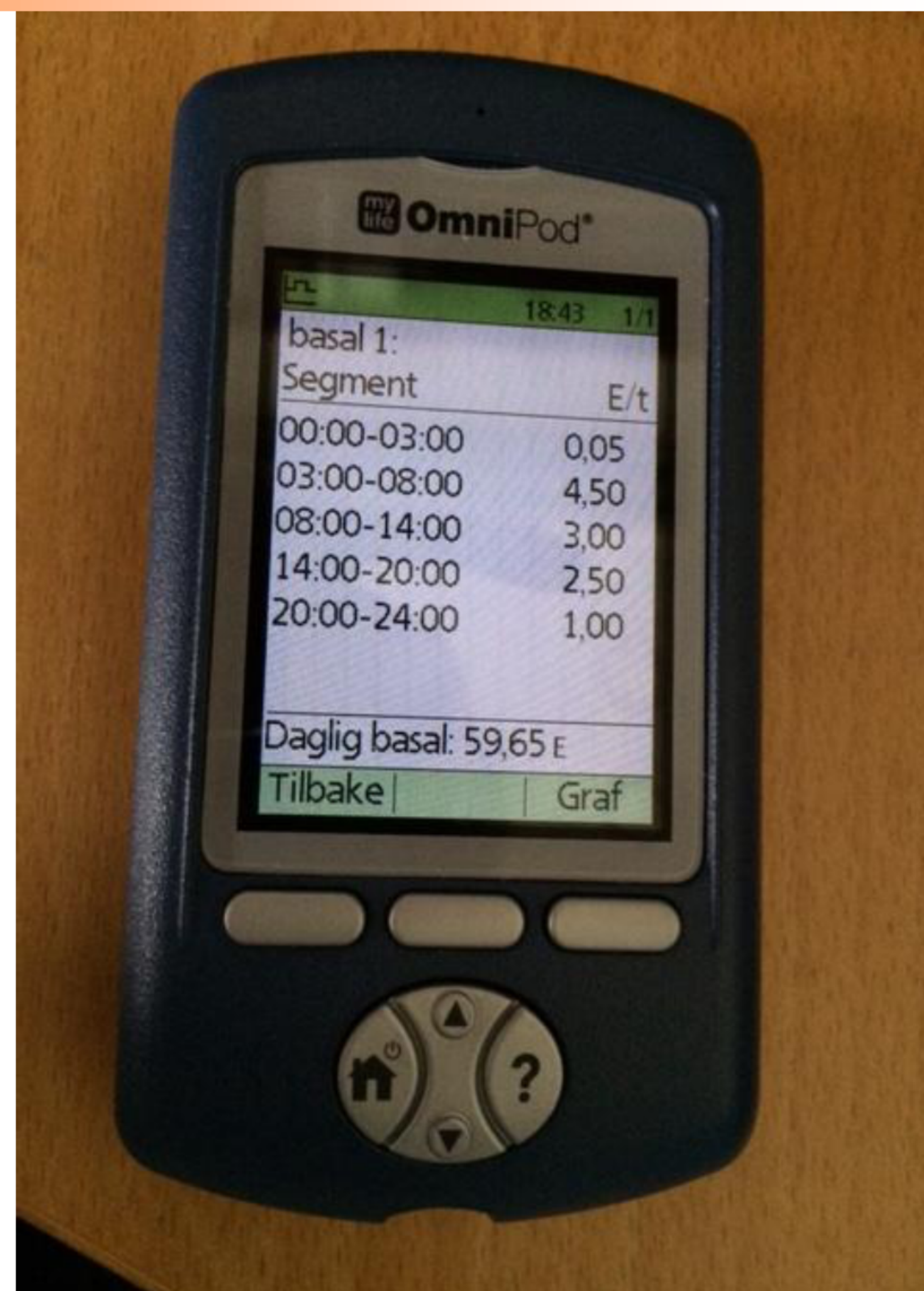
## Initial dose calculation

Normal production rates of cortisol is 5,7 - 9,9mg/m<sup>2</sup> per day, equivalent to a daily dose of 15-20 mg of hydrocortisone (HC). We started with a daily dose of 9.6 mg/m<sup>2</sup>/day, divided into 4 dosing intervals. Any type of insulin pump could be used, with the same infusion sets as for insulin treatment. The pump reservoir is filled with hydrocortisone (Solu-Cortef Act-o-vial©) 50 mg/ml; 1U corresponds to 0.5 mg HC. The injection site should be desinfected.



**Fig. 4.** Starting doses for continuous subcutaneous hydrocortisone infusion (CSHI). The insulin pump reservoir is filled with hydrocortisone 50 mg/ml (Solu-Cortef Act-o-Vial®, Pfizer Inc., NY, USA). The injection site should be cleaned with alcohol, otherwise the pump and infusion gear is used as for insulin pump treatment in diabetic patients. Doses are adjusted to body surface area (BSA; m<sup>2</sup>). The daily dose is divided in four dosing intervals, with the highest dose during the last part of the night, half that dose during the first part of the day, and further decreasing doses in the afternoon and early part of the night. For example; from hour 03:00 to hour 08:00 1 mg/m<sup>2</sup>/h, that is, 2 IE/m<sup>2</sup>/h. If the patient's BSA is 1,7 m<sup>2</sup> this means that the dose between h 03:00 and 08:00 should be 1.7 mg/h, that is, 3.4 IE/h. For monitoring CSHI, we recommend aiming for morning salivary cortisol in the middle reference area, and evening salivary cortisol within the reference area (<2.8 nmol/L) for optimal dosage. If the patient is not feeling well, measuring morning serum cortisol in the normal reference range can exclude under-dosage, and measuring a morning ACTH at the upper reference range can reassure that doses are not too high.

Øksnes M et al., Clin Endocrinol Metab, 2015



## Monitoring treatment

- Organize repetitive contacts (out-patient/by phone) with the patients when pump treatment is started.
- Observe for dressing allergy/rash, and for infection at the injection site.
- Ask for symptoms of fatigue and malaise suggesting a too low dose.
- The initial dose can be stepwise adjusted by approx. 10%, preferably in the 2 dose intervals with the highest doses (h03-08 and/or h08-14)
- Aim for morning and evening salivary cortisol within the reference range
- Aim for morning serum cortisol within the reference range to exclude under-dosage
- Aim for morning ACTH in the upper reference range to exclude over-dosage

## Patient education is mandatory

- The patient should be familiar with the pump and injection drug, and instructed to report any trouble.
- Patient education by a nurse trained in pump treatment is usually necessary.
- Provide the patients with emergency kit, steroid card and emergency phone number.
- In the event of emergency, severe illnesses, fever, or medical procedure, patients have to take extra doses of oral HC (as for conventionally treated patients).
- Provide the patient with a leaflet about pump treatment for travel abroad and for his general practitioner.

e-mail: katerina.simunkova@k2.uib.no