

# Carnitine transporter deficiency (group of mitochondrial fatty acid $\beta$ -oxidation deficiencies)

Label

## Priority patient: must not wait in A&E

In cases of poor intake or poor absorption of the treatment: **Risk of cardiac rhythm disorders, acute heart failure, hypoglycaemia, Reye's syndrome, rhabdomyolysis**

**Do not wait for signs of decompensation, in all cases initiate management as set out below**

### 1 EMERGENCY

**In cases of risky situations (poor intake or poor absorption of the treatment by L-carnitine=Levocarnil):**

- **ECG, troponin** + if clinical sign of myocardial dysfunction: cardiac ultrasound
- CPK, serum ammonia, blood electrolytes, blood glucose, blood ketones, lactate, liver work-up, PT, factor V, total plasma carnitine count (heparin tube, 0.5mL, centrifuge and freeze the plasma if taken at night or over the weekend)

### 2 ON ARRIVAL AT A&E

If vomiting / refusing to eat / diarrhoea / poor intake of levocarnil treatment: see next paragraph.

If consulting for another reason: ensure the levocarnil treatment is being taken correctly and continue in A&E following usual methods, **without** ever stopping this treatment. Provide treatment for the pathology that caused the patient to be admitted to A&E or hospital, as for all other patients, with no need for metabolic expertise.

### 3 IN CASES OF VOMITING / DIARRHOEA / POOR TREATMENT INTAKE: TREATMENT TO BE STARTED URGENTLY, without awaiting test results

- **LEVOCARNIL orally or IV depending on digestive tolerance: double the usual dose**, or 200mg/kg/d if dose unknown, in 4 to 6 intakes per day if oral intake, or continuous IV (max 12 to 16g/day for adults).
- Infusion if necessary depending on the patient's clinical status, adapted to the cardiac function if necessary.
- Specific treatment for potential intercurrent infection
- If **blood sugar < 3mmol/L**, raise blood sugar with 1ml/kg of 30% glucose orally (max. 30ml) or 2-3 ml/kg of 10% glucose by direct IV and start the glucose infusion below to ensure a **continuous glucose flow**: Infusion using **10% serum glucose** with standard electrolyte additions\* (not pure 10% glucose). IV lipids are contraindicated.

Age	0-3 months	3-24 months	2-4 years	4-14 years	>14 years - adult	MAX FLOW RATE
<b>Infusion flow rate</b>	7ml/kg/h (12mg/kg/min)	6ml/kg/h (10mg/kg/min)	5ml/kg/h (8mg/kg/min)	3.5ml/kg/h (6mg/kg/min)	2.5ml/kg/h (4mg/kg/min)	<b>120ml/h</b> <b>(3L/24h)</b>

*e.g.: Polyionic, Bionolyte, B45, Glucidion, etc. if no solutes available, 10% glucose + 4g/L of NaCl (70 meq/L) and 2g/L of KCl (27 meq/L)*

**If unable to infuse the patient =>** Nasogastric tube: prepare the IV fluids listed above and pass them through the tube at the same rate

### 4 SEVERITY SIGNS = Consult / transfer to Intermediate Care

- Cardiac rhythm disorders
- Heart failure
- Reye's syndrome: liver failure with severe hyperammonemia (Newborn >200  $\mu$ M – Child & Adult >150  $\mu$ M) or Severe liver failure (PT<50%, factor V<30%)

### 5 MONITORING

- Monitoring depending on clinical severity and initial biology.
- Electrocardioscope, ECG - Echocardiogram if signs indicative of cardiac failure or rhythm disorder
- In the absence of signs of severity: the patient may go home but only if it is feasible to ensure the oral levocarnil intake.



**PATHOPHYSIOLOGY**

Fatty acid oxidation (FAO) is a major route of energy production by the body, particularly when fasting and in inflammatory states, in the heart, muscles and liver.

One of the first stages involves the mitochondrial transfer of long chain fatty acids, due to the CARNITINE that allows this transfer via a specific transporter.

There are several different initial clinical pictures for the disease:

- Metabolic form (3 months - 2 years): episodes of decompensation with hypoglycaemia, hyperammonemia, hepatic cytolysis, hepatomegaly
- Cardiac form (1 - 7 years): dilated cardiomyopathy, hypotonia, myolysis.
- Adult form: dilated cardiomyopathy, rhythm disorders, fatigability, myopathy.

The clinical presentation is very variable and can be only mildly symptomatic in some cases. However, the decompensations can be fatal.

**Despite this, the prognosis is excellent so long as the patient takes the carnitine treatment.**

Usual treatment:

- **L-Carnitine (Levocarnil®)** orally 50 to 400mg/Kg/day in 3 to 6 intakes, **essential**,
- Preventive emergency measures for circumstances risking decompensation, particularly digestive troubles making Levocarnil® intake impossible.
- For some patients: treatment by vitamin B2 (Riboflavin) to reduce the body odour caused by carnitine. This treatment is in no way an emergency.

**ASSISTANCE WITH PRACTICAL ADMINISTRATION OF TREATMENTS:**

- LEVOCARNIL® IV (amp. 1g = 5ml), given neat or diluted in normal saline, using a Y infusion set.
- LEVOCARNIL® orally (amp. 1g = 10ml), separated into 3 to 6 oral doses/day

**CIRCUMSTANCES IN WHICH THERE IS A RISK OF DECOMPENSATION**

- All situations where the treatment has not been taken or absorbed (poor compliance, diarrhoea, vomiting)

**CLINICAL AND BIOLOGICAL SIGNS OF DECOMPENSATION: Do not wait for these signs!**

- Hypoglycaemia, liver failure, hyperammonemia
- Cardiac rhythm disorder, acute heart failure
- Rhabdomyolysis, muscular pain



**Prohibited:** acetyl salicylic acid (aspirin), valproic acid (depakin®, etc.)

- All vaccinations are recommended (particularly influenza).
- **In cases of hospitalisation** (or A&E consultation): whatever the situation, continue the Levocarnil treatment, orally or IV depending on the circumstances.

**SURGERY under General Anaesthesia:**

**WARNING never stop the Levocarnil treatment. Give the usual levocarnil dose by IV, and continue until oral treatment can be reinstated.**

- Check the latest cardiac ultrasound and ECG (monitored at least annually).
- No contraindication to specific anaesthetics.

**REFERENCE DOCTORS AND CONTACT DETAILS**

On-call telephone numbers for metabolic emergencies of:

At night, only the medical teams can call in emergency situations and only if the emergency certificate has not been understood or if the clinical state or test results are worrying. As far as possible make calls before night time.

Secretarial issues must be dealt with via the medical secretariat during the week or by email addressed to the patient's referring metabolic doctor.

Certificate issued on

Dr