

# How to reverse low molecular weight heparin

Index: [Anticoagulation](#)

Original article by: [Michael Tam](#)

One of the benefits of using [unfractionated heparin](#) (UFH) by infusion over subcutaneous [low molecular weight heparin](#) (LMWH, e.g., [enoxaparin sodium](#)) is that reversal of UFH can be quickly done and is complete. Although LMWH can be mostly reversed by [protamine sulfate](#) it does have a small direct antithrombin effect that cannot be reversed. Furthermore, the subcutaneous administration is more difficult to reverse completely.

The use of protamine is non-trivial and best performed in experienced hands in a setting where monitoring is available.

## Step 1: Call for help

To repeat myself, call for some back up, preferably someone who has experience using protamine sulfate. In most major teaching hospitals, this would probably be the medical registrar. Assuming that the setting is reversal of anticoagulation in a patient with an acute bleed, critical care involvement may well be appropriate.

Does the patient need [fluid resuscitation](#)?

Remember that this is probably an emergency situation. At the end of the day, don't delay reversal waiting for help while the patient is bleeding to death.

A major bleed while on LMWH and its reversal is best performed under the supervision of a specialist haematologist or the haematology team. Contact them urgently.

## Step 2: Secure venous access

Protamine sulfate can potentially provoke anaphylactoid reactions with cardiovascular collapse, especially if infused too quickly. Monitoring must be available. Resuscitation equipment must be on hand.

Quality venous access must be secured with two large bore (18 gauge or larger) intravenous cannulae.

## Step 3: Calculate dose of protamine sulfate

Protamine can exert its own anticoagulant effect if used in doses larger than required for reversal (1). The dose required changes depending on when the patient last received their dose of LMWH. If the last dose was received within the past 8 hours (2):



**protamine sulfate 1 mg per 1 mg (100 units) of enoxaparin sodium**  
(if received within the past 8 hours)

- If the LMWH was given 8 hours or more prior, then use **half** the dose of protamine sulfate.

**The maximum dose of protamine sulfate is 50 mg** (single vial of the 50 mg/5mL)

#### Step 4: Start infusion

**Inject the calculated dose of protamine sulfate into a 100 mL bag of 0.9% NaCl (saline)**

**Run at 10 mL/min until completion of infusion**

The patient should be monitored for evidence of an hypersensitivity syndrome during and after the infusion.

#### Step 5: Check anti-factor Xa levels

Obtain blood 15 minutes after the completion of the infusion and check the anti-Xa level.

Rebound anticoagulation can occur so it would be prudent to monitor the anti-Xa level - probably at least twice in the next 24 hours. More than one infusion of protamine sulfate may be required for adequate reversal. I would recommend liaising with a haematologist for their recommendation.

#### Reference articles

(1) Protamine Sulfate Injection [prescribing information]. *MIMS 1 April 2006*. Last revised 1/05/1999. [download [PDF](#) :: 11 Kb]

(2) Low Molecular Weight Heparin (LMWH) Guidelines [electronic article]. *Royal Hospital for Women Clinical Practice Guidelines*. Last updated 17 January 2005.  
[http://www.rwh.org.au/rwhcpg/womenshealth.cfm?doc\\_id=3322](http://www.rwh.org.au/rwhcpg/womenshealth.cfm?doc_id=3322)

*[Please read the disclaimer](#)*