



Fig. 3. Overview of the clotting cascade.

medical devices by the application of hydrogel coatings designed to inhibit adsorption of biomacromolecules, in particular proteins, is therefore a rationale strategy to prevent thrombus formation.

Poly(vinyl pyrrolidone) (PVP) has gained importance as a hydrophilic medical device coating material due to its biocompatibility (Leone et al. 2011), resistance to hydrolysis (Butruk-Raszeja et al. 2015), non-antigenicity and non-toxicity (Biazar et al. 2012). Of key importance to blood-contacting devices is the haemocompatibility of PVP, which was reportedly used as a human plasma substitute during World War II (Seldon 1954) and is now widely employed as a hydrogel coating to increase biocompatibility of devices such as intravascular catheters (Francois et al. 1996). Reductions in surface-adsorbed platelets (Butruk-Raszeja et al. 2015), albumin, fibrinogen (Butruk-Raszeja et al. 2015) and fibronectin (Francois et al. 1996) have all been demonstrated on PVP-coated surfaces.

A novel two-phase free radical-based grafting-crosslinking method has recently been reported for the formation of highly biocompatible, athrombogenic hydrogel coatings on polyurethane surfaces. In addition to the controllable density and equilibrium water content of the applied hydrogel layer, this two-phase application process, involving initial substrate immersion in an organic solution containing cumene hydroperoxide, the free radical generator species, and ethylene glycol dimethacrylate, the grafting and cross-linking agent, followed by immersion in an aqueous solution of PVP and iron (II) chloride (FeCl_2), ensures high grafting efficiency and leads to the formation of a durable, covalently-anchored coating. The presence of the hydrated PVP coating resulted in a 50% reduction in adhesion of fibrinogen after a one hr incubation period in platelet-poor plasma and significantly reduced the aggregation of platelets in whole human blood under dynamic conditions simulating arterial flow, with the percentage of remaining platelets in the blood samples approximating 35% and 80% after incubation of unmodified and PVP-coated polyurethane materials respectively (Butruk-Raszeja et al. 2015).