are available as liquids, pastes or solids and include polymers with various molecular weights and PEO/PPO ratios (Bromberg and Ron 1998). Pluronics show reversible phase transitions when the polymer concentration is above a critical value (Jeong et al. 2012). The gelation mechanism in poloxamers is highly investigated but the actual mechanism is still a point of debate. Most studies support dehydration of the PPO block as the main driving force behind the gelation process (Cabana et al. 1997; Jia et al. 2010; Matanović et al. 2014). Poloxamers are amphiphilic in nature and at low temperatures are soluble in water. They contain hydrophilic, EO block which favour solubilization in cold water. Hydrogen bonding between the EO and PO blocks with water molecules at colder temperatures keeps the poloxamer blocks separate and so it remains in solution. A previous study demonstrated that the micellization process of the triblock co-polymers in water is endothermic (Alexandridis and Hatton 1995). The polarity of EO and PO segments decrease with the increase in temperature. Thus, the poloxamers become less soluble in water causing the hydrogen bonds to destabilize and the hydrophobic PO blocks to assemble together and form a gel. The gelation process occurs through micellization and dehydration of the hydrophobic PO core. As the temperature increases and reaches the critical micelle temperature (CMT), the solubility of the PO block reduces, causing the poloxamer structures to aggregate and self-assemble into a spherical micelle. The size of the micelles grow until the PO

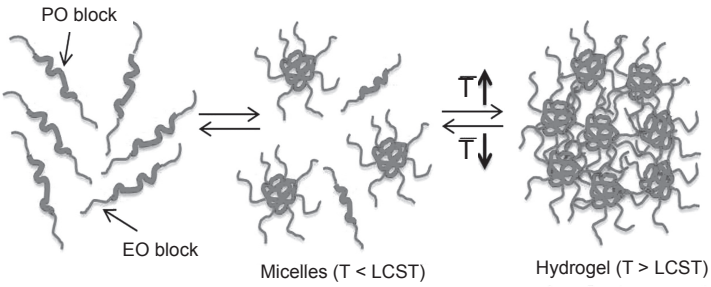

Fig. 6. Schematic representation of the micellization and gel formation of aqueous poloxamers solution (Adopted from (Matanović et al. 2014)).

core becomes dehydrated, then the outer EO chains swell and interacts with other EO chains to form a cubic 3D structure (the gel) (Fig. 6).

PEG/PLGA copolymers based systems

Thermosensitive hydrogels discussed in above sections are not all completely biodegradable and therefore can have toxicity concerns when used *in vivo*. Therefore, attempts were made to enhance the biodegradability of these thermoresponsive systems. Novel composite hydrogels were prepared by conjugating biodegradable polyesters, such as poly(L-lactic acid) (PLA) (Suk et al. 2004; Loh and Li 2007), poly(D,L-lactic acid-co-glycolic acid) (PLGA) (Alexander et al. 2013) to biocompatible poly(ethylene glycol) (PEG).

PEG/PLA di/tri-block copolymers exhibits sol-to-gel phase transition with increasing temperature (Danafar et al. 2014). The phase transition temperature could