CHAPTER 6

Conclusions

Tranexamic hydrogel patch was developed for the skin whitening purpose. The development approaches were the formulation, physicochemical examination, stability test and irritation test. These properties were evaluated between three formulae of hydrogel (M35, M38 and J33) that were prepared from the different hydrophilic polymers such as HPMC E4M, arcylax®, HPMC E50 and carbopol® 980 NF. The same amount of tranexamic acid, an active ingredient, was contained in these formulas. The method of spectrofluorimetric determination of tranexamic acid was also developed. The accuracy, precision, linearity and selectivity of the method were validated. Although the statistical data showed differences of drug content in standard solution and spiking preparations, the analytical reason was not clear to prove the gel interference. It was possibly due to the preparation and/or determination process error. In day1 evaluation, the hydrogel appearances were different due to the different polymers. Tranexamic acid content in the hydrogels of every formula was in an acceptable range of label amount (95.0-105.0%) and the content determined in long-term storage of formulae M38 and J33 at room temperature was decreased by 6.28% and 6.49%, respectively. The shelf life of these three formulae are approximately 2 years. Tranexamic acid released from hydrogel formula M35 investigated on day1 was highest among other two formulae due to the nonionic property of HPMC used as gelling agent.

The release study of long-term storage hydrogels (120 days) found that physical changes of the hydrogels also caused the alteration of release property. The swelling property of gel matrix as well as elongation ability of polymer in a matrix played an important role in the drug release behavior. Hydrogel formula J33 showed similar release profiles on reproducibility investigation and also similar release profiles in every storage condition reflecting its chemical stability although the drug content decreased at room temperature, long-term storage. Lactic acid did not provide higher drug release from hydrogel formula M35 due to the obstacle of the

amphoteric molecules of tranexamic acid. As for the release of the drug from NMP-added hydrogel, high drug released was promoted by the water attraction of NMP corresponding to easier swelling of hydrogel. Bigger amount of NMP in the hydrogel could retard the drug release when there was strong hydrogen bonding between the drug and NMP.

Formulas M35 and M38 were intolerant to a hot condition (45°C) in long-term storage, particularly formula M38 that consisted of acrylax® 1061. In low temperature (4°C) storage, these two hydrogel formulas also exuded, particularly formula M35. Formula J33 changed its colour from clear to yellow when it was stored at 45°C for 120 days but its texture and adhesive property including release property were similar to its one-day stored hydrogel.

Formula J33 exhibited stable thickness, skin adhesive time and friction coefficient whereas formulae M35 and M38 were not be able to test the adhesive property in long-term storage because of the limited property of their gelling agents. Laminated aluminum foil packaging of the hydrogel patches showed more protection to the air and temperature exposures than the zip-locked plastic bag.

No skin reaction from formula J33 was found in the irritation test. However, formulae P9, P10 and P11 affected the irritation to some volunteer. The skin reaction was itchiness while the patches were occluded and small erythema observed after the patch removal. The itchiness might be caused by NMP.

The hydrogel formula J33 was the best among the other two formulae in this study although it provided fewer released amounts than formula M35 on day1. But in long-term storage, stable chemical and physical properties of formula J33 was clear to confirm that its quality is better than formulae M35 and M38. Moreover, there was no skin irritation resulted by this formula.