CHAPTER V
CONCLUSION

In order to overcome the newly obtained carbon-based material for use as carriers in drug delivery system, the cluster of carbon nanoparticle (CCNs) was successfully synthesized. The morphology of CCNs showed spherical shape with average hydrated diameter and zeta potential of CCNs were 132.1 ± 4.74 nm and -47.56 ± 1.18 mV, respectively. The cytotoxicity of CCNs was non-toxic at concentration of 0-10 μg/mL after 48 h incubation with 3 cell lines, HEK293T, CaSki and RAW 264.7. The CCNs was used as nanocarriers for drug delivery system. The curcumin was used as a model drug and PNA was used as anti-gene model.

The curcumin-loaded CCNs (CCNs-C) showed encapsulation efficiency of 55.9 ± 5.4% (w/w of curcumin to initial curcumin) and curcumin loading of 21.8 ± 1.7 % (w/w of curcumin to curcumin-loaded CCNs). The anticancer activity of CCNs-C showed the lowest cell viability around 55% whereas free curcumin in DMEM and DMSO showed 91% and 76% cell viability, respectively. The monitoring of curcumin delivery by CCNs found that CCNs localized exclusively in cytoplasm whereas curcumin was found in nucleus. The result indicated that CCNs successfully delivered curcumin into cancer cell and enhanced curcumin penetration into nucleus compared with the free curcumin.

The NF-κB PNA designed to bind to *il-6* gene promoter were used as model anti-gene agent. The NF-κB-loaded CCNs (CCNs-NF-κB) showed active loading of 21.8 ± 1.7 % (w/w of active to active-loaded CCNs). The monitoring of PNA delivery by CCNs found that CCNs localized in exclusively in cytoplasm whereas PNA was found in the nucleus. The result indicated that CCNs successfully delivered PNA into the cancer cell and enhanced PNA penetration into the nucleus compared with free PNA. However, the IL-6 expression results showed non-repeatable patterns. It might be caused by designed PNA sequence is not suitable or stable to bind to DNA.

In conclusion, CCNs was successful synthesized as highly oxidized surface nanosphere. The particles are potent carriers for actives and anti-gene delivery system.