

### 14.6.6 Nanoparticulate Systems

The application of alginates in medicinal field has also been experimented with nanoparticle formation. Katuwavila *et al.*, [160] showed that chitosan–alginate nanoparticles can efficiently deliver doxorubicin to MCF 7 cells, making them an efficient candidate when compared with chitosan–doxorubicin combinations. Similarly, chitosan–alginate nanoparticles were used for the controlled release of the drug nifedipin [161]. In addition to these, chitosan–alginate nanoparticle has also been studied for the delivery of nonviral DNA via oral route. Plasmid DNA expressing humanized secreted Gaussia Luciferase as a reporter gene encapsulated in chitosan–alginate nanoparticle was found to show effective transfection of human epithelial cell lines with distinct cell differentiation [162]. Alginate nanoparticles have been combined with several molecules such as polyvinyl alcohol, piperazine, cyclodextrin, chitosan, rhodamine 6G, etc., and are studied for their delivery of compounds such as vitamin C, molecules with superficial carboxylate groups such as epidermal growth factor, ketoprofen, insulin, and other drugs, respectively [163–165].

## 14.7 Conclusion

Being abundant in uronic acid obtained from ocean and also the flexibility of producing them in bacteria are the best attributes of alginate for its easy production. Despite its easy production, the properties of alginates discussed in this chapter prove that they are an efficient candidate to be used in various applications. Apart from food industry and medicinal industry, the use of alginates has to be explored in many other industries. Apart from this, the immunogenic response produced by alginates as mentioned in biocompatibility can be or may be reduced by further insights into them. To conclude, alginate is a best candidate for its application, which can be put forward to the betterment of life.

## References

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