

polymerized to polymannuronic acid. During this, epimerization of manuronic acid units with guluronic acid units occurs. The variation in epimerization, i.e., the concentration of M and G blocks, alters the structure of alginates. After epimerization, the alginate is transported to the outer membrane. During this process, several phosphate molecules are involved, which is maintained by the alginate synthesis genes.

14.3.1 Alginate Biosynthesis Gene

The production of alginate in bacteria has been studied extensively, and the genes involved in its synthesis have been mapped by various techniques. These genetic studies revealed that alginate biosynthesis in bacteria has been controlled by *alg* genes. The *alg* genes have been found to be predominantly present in members of *Pseudomonas*, *Azotobacter*, and also *azomonas* [48]. To date, 25 *alg* genes have been identified to be involved in the production of alginates [49, 50].

The genes involved in production of alginates have been categorized into three types, namely, structural or biosynthetic genes, regulatory genes, and genome switching genes. The structural or biosynthetic category includes 13 genes, which are named as *algD*, *algA*, *alg8*, *alg44*, *algK*, *algE*, *algG*, *algX*, *algI*, *algJ*, *algL*, *algF*, and *algC*. The genes *algE* and *algX* were formerly called as *alg76* and *alg60*, respectively. Genetic mapping studies showed that the genes *algA* through *algF* were found in a row of 34 minutes whereas the gene *algC* alone was found to be present 10 minutes far from these genes (Figure 14.2a) [51, 52].

The regulatory genes include *algZ*, *algR*, *algQ*, *algB*, and *algP* of which *algZ* to *algP* is present continuously for 9 minutes. *algP* is interrupted from

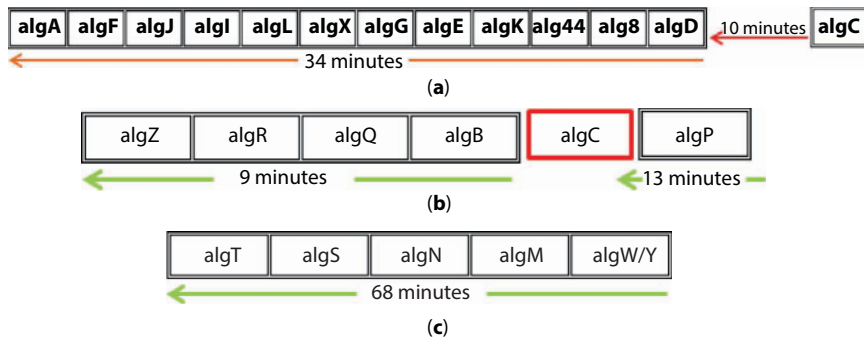


Figure 14.2 Gene order of alginate synthesis genes—(a) biosynthesis genes, (b) regulatory genes, and (c) genotypic switching genes.