(for 50 % purity) and 1.54 US$/kg (for 88 % purity). Technical grade lactic acid with 88 % purity has been priced as much as 1.59 US$/kg (*11,95*). Lactic acid consumption in chemical applications, which include PLA polymer and new »green« solvents, such as ethyl lactate, is expected to expand 19 % per year (*96*).

There are several major manufacturers of fermentative lactic acid, including Purac (Netherlands), Galactic (Belgium), Cargill (USA), and several Chinese companies (*91,92*). In late 1997, Cargill joined forces with Dow Chemical and established a Cargill-Dow PLA polymer venture, NatureWorks LLC, which exists today as a stand-alone company. In early 2002, NatureWorks LLC completed the construction of a PLA plant that has the capacity of producing 140 000 (metric) tonnes of PLA per year. Moreover, NatureWorks LLC has recently constructed a major lactic acid facility in Blair, Nebraska, USA, which has the capacity of producing 180 000 (metric) tonnes of lactic acid per year, and it began operating in late 2002 (*96,97*). NatureWorks LLC has stated publicly its belief that the PLA market will reach 500 000 (metric) tonnes per year worldwide by 2010, and the construction of two additional PLA plants are being considered presently (*12,97,98*).

On an industrial scale, the manufacturing cost of lactic acid monomer will be targeted to less than 0.8 US$/kg, because the selling price of PLA should decrease roughly by half from its present price of 2.2 US$/kg. According to the cost analysis by Datta *et al.* (*4*), although their analysis was sensitive to various factors such as plant size, raw material cost, and capital investment, the base manufacturing cost of lactic acid was estimated to be 0.55 US$/kg. However, there are still several issues that need to be addressed in order to produce lactic acid biotechnologically within the targeted cost, such as the development of high-performance lactic acid-producing microorganisms and the lowering of the costs of raw materials and fermentation processes. The biotechnological processes for the production of lactic acid from cheap raw materials should be improved further to make them competitive with the chemically-derived one.

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