

sults.<sup>[37,38,106,119,123]</sup> A phase II study was conducted by BRI in patients with advanced, hormone-refractory (most patients had undergone total androgen blockade) adenocarcinoma of the prostate.<sup>[12]</sup> Treatment involved orally administered AS2-1 120 mg/kg/day and diethylstilbestrol 0.015 mg/kg/day. Complete or partial response was documented in 38% of patients.

#### 2.4 Treatment of Breast Cancer

Tissue culture and animal studies have demonstrated the antitumour activity of antineoplastons in breast cancer.<sup>[6,13,79,80,82,83,87,89,93,95,98,103,104]</sup> 77 evaluable patients up to 80 years old received treatment with A10. The majority of these patients had stage 4 disease and had failed to respond to previous treatment, including chemotherapy and bone marrow transplantation. Approximately one third of the patients received A10 as a single agent, one third A10 combined with low dose oral methotrexate, and one third A10 plus additional anticancer agents. Complete and partial responses were documented in 38% of patients. Currently, phase II trials with A10 are in progress in stage 4 breast cancer.

#### 2.5 Treatment of Non-Hodgkin's Lymphoma

In a study conducted at BRI, A10-1 and AS2-1 were administered to 55 evaluable patients with non-Hodgkin's lymphoma; most had stage 4, low and intermediate grade disease. All patients had failed to respond to chemotherapy and 12% had relapsed from bone marrow transplantation. During the trial, some patients received chemotherapy or interferon- $\alpha$  in addition to A10-1 and AS2-1. Objective responses of up to 11 years duration were obtained by 53% of the patients.

#### 2.6 Treatment of Bladder Cancer

19 patients diagnosed with bladder cancer, without metastases, were treated in separate phase I trials with antineoplaston A2, A3, A5, A10 and AS2-1 and followed for more than 10 years.<sup>[77]</sup> Overall, 68% of the patients achieve complete re-

sponse. Intravenous A2 gave the best results; 83% of patients obtained an objective response.

#### 2.7 Treatment of Autoimmune Diseases

Aging is usually associated with the decline of the immune defence and an increased tendency to develop autoimmune disorders.<sup>[137-144]</sup> Errors in the differentiation of T cells may result in autoimmune reaction.<sup>[145-148]</sup>

Clinical trials in rheumatoid arthritis and systemic lupus erythematosus are now in progress with AS2-1 capsules (100 mg/kg/day). 23 patients have received the treatment with improvement documented in 52%.<sup>[148]</sup>

#### 2.8 Treatment of Neurological Disorders

Research on growth factors and gene expression has changed the understanding of the pathogenesis of cancer and neurological disorders.<sup>[31,32,56,149,150]</sup>

Neurotrophic factors promote the survival of dopamine-secreting neurones, indicating possible use in the treatment of Parkinson's disease (PD).<sup>[151,152]</sup> Astrocytes producing neurotrophins appear to protect and nourish the neurones.<sup>[151-154]</sup> When errors in differentiation occur, astrocytes do not supply neurotrophins and neurones degenerate. The process can be stopped by giving the patient neurotrophic factors, or inducing astrocytes to produce such factors. One proposed treatment for PD requires administration of glial cell line-derived neurotrophic factor or brain-derived neurotrophic factor directly to the brain.<sup>[155,156]</sup> Inducing astrocytes to produce neurotrophins offers an easier way to treat PD.<sup>[157,158]</sup> Marked improvement in PD has been observed after the treatment with A5, AS2-1, and A10-1.<sup>[157]</sup>

### 3. Future Prospects and Conclusion

Standard chemotherapy and radiation therapy offer little hope for the elderly and make them vulnerable to infections and autoimmune disorders.<sup>[139-142,159-161]</sup> Treatment with antineoplastons is simple, usually free from adverse effects, and does not cause tumour progression.<sup>[102]</sup> In addi-