8.9.3 [^{18}F]FET

Amino acid transport is another interesting imaging target used to measure functional activity responses. Usually, the amino acid transport is increased in tumor cells. [^{18}F]fluoro-ethyl-tyrosine (FET, see Figure 8.6) has been used to study brain tumors since FDG-PET diagnosis is unreliable in relatively benign brain tumors due to high normal FDG brain uptake. The response of tumors treated with bevacizumab, an angiogenesis inhibitor, could be assessed using FET and these PET experiments were predictive for treatment failure.

8.9.4 [^{11}C]PiB and [^{18}F]Florbetaben

Imaging with [^{11}C]PiB and [^{18}F]Florbetaben (see Figures 8.5 and 8.6) in Alzheimer's disease makes it possible to quantify the regional Aβ plaque load in the living brain. Aβ plaques are abundant in brains of Alzheimer's patients and the depositions begin a decade (or earlier) before clinical symptoms of Alzheimer's become apparent.

Bapineuzumab is a humanized monoclonal antibody, which has been reported to enhance the clearance of amyloid plaques in the brains of overexpressing transgenic mice and [^{11}C]PiB, was subsequently used to evaluate the effectiveness of Bapineuzumab in humans. Treatment of Alzheimer's patients for 78 weeks did indeed significantly reduce PiB-PET binding in cortical brain regions when compared to placebo, see Figure 8.12.

Despite these promising results, Pfizer and Johnson & Johnson later reported that bapineuzumab failed to give significant cognitive improvements in patients, suggesting that amyloid reduction cannot reverse the cognitive effects of Alzheimer's disease.

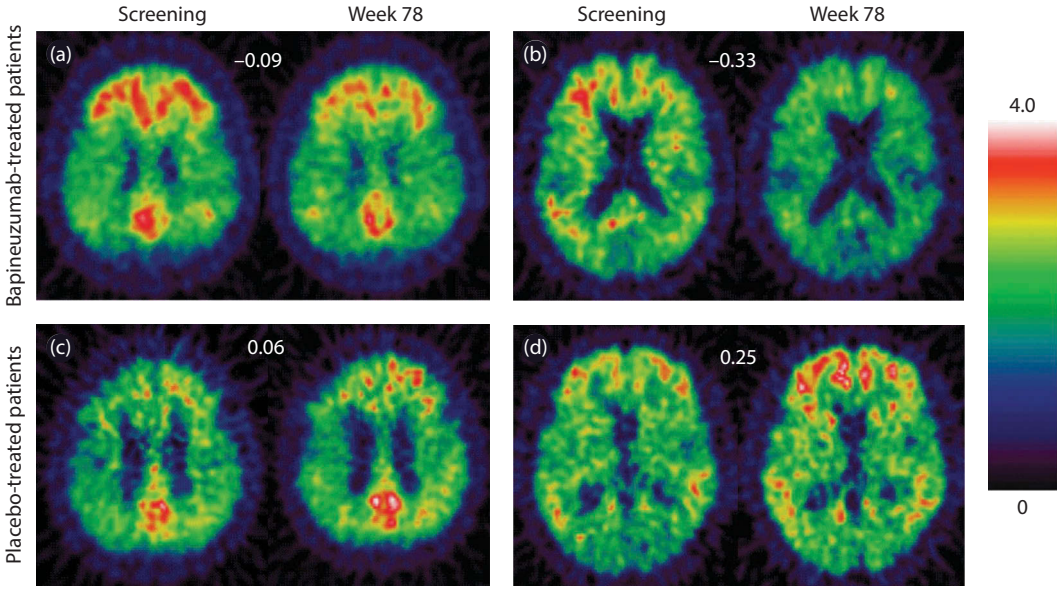

FIGURE 8.12 [^{11}C]PiB PET images from patients treated with bapineuzumab (a and b) and placebo (c and d). Mean [^{11}C]PiB PET changes are shown at the top of each picture for individual patients, indicating a significant change in the amount of amyloid plaques for both bapineuzumab (decrease) and placebo (increase). (Reprinted from *Lancet Neurol.*, Rinne, J. et al., ^{11}C-PiB PET assessment of change in fibrillar amyloid-β load in patients with Alzheimer's disease treated with bapineuzumab: A phase 2, double-blind, placebo-controlled, ascending-dose study, 9, 368. Copyright 2010, with permission from Elsevier.)