Hadrontherapy is a novel technique of cancer radiation therapy which employs beams of charged hadrons, protons and carbon ions in particular. Due to their physical and radiobiological properties, they allow to obtain a more conformal treatment with respect to photons used in conventional radiation therapy, sparing better the healthy tissues and allowing a better control of the disease. Hadrontherapy is the direct application of research in particle physics making use of specially conceived particle accelerators and detectors. Protons can be considered today a very important tool in clinical practice due to the several hospital-based centres in operation and to the continuously increasing number of proposed centres worldwide. Very promising results have been obtained with carbon ion beams in Germany and Japan and two hospital-based centres are now under construction in Europe. The present status of hadrontherapy is reviewed together with some innovative ideas issued form particle physics.