

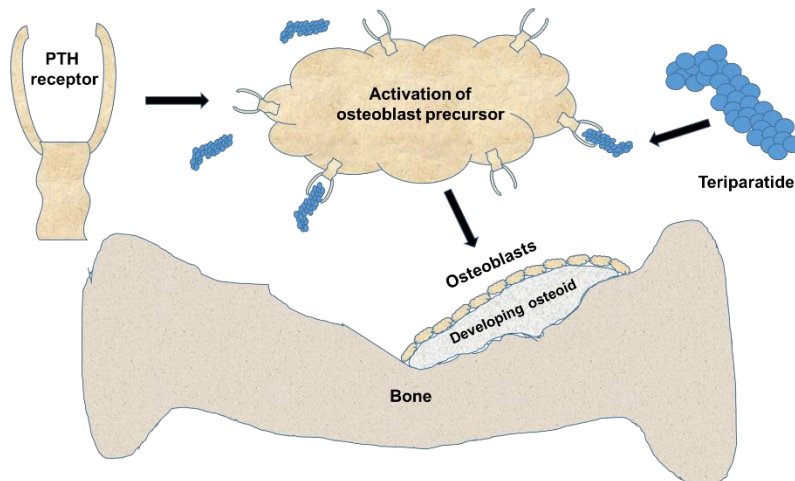
## PTH / Teriparatide – Fact Sheet

### Molecule

Parathyroid hormone (PTH, Natpara®, Preos™, Preatact®) is a polypeptide containing 84 amino acids (9.4 kDa). Only the 34 N-terminal amino acids are required for the bioactive conformation. Teriparatide (Forteo®) consisting of these 34 amino acids has the same efficacy as PTH.

### Mode of Action

PTH secreted by chief cells of the parathyroid glands is the primary regulator of calcium and phosphate metabolism in bone and kidney. It is acting upon the PTH-1 receptor in bone and kidney, and the PTH-2 receptor in the central nervous system, pancreas, testis, and placenta. PTH increases serum calcium levels. Thus, chronically elevated PTH will deplete bone stores. However, intermittent use activates osteoblasts more than osteoclasts, which leads to an overall increase in bone formation and increased bone mineral density.



### Indication

Teriparatide is indicated for treatment of osteoporosis in postmenopausal women and men at high risk for fracture and for glucocorticoid-induced osteoporosis in men and postmenopausal women. PTH is indicated as an adjunct to calcium and vitamin D to control hypocalcemia in patients with hypoparathyroidism.

### Patent Situation

The patents of Forteo® expire in US and Europe in August 2019. Ely Lilly accused Teva on infringing patents for preparing the market entry of its teriparatide biosimilar, which will be applied with a pen injector.

### Market and Competitive Field

Full length PTH is marketed by Shire as Natpara®. The originator product of teriparatide, Eli Lilly's Forteo®, was approved by FDA in 2002 and by EMA in 2003. In 2017, Forteo® had worldwide sales of 1.47 billion € and Natpara® of 123 million €. In contrast to PTH, biosimilars of teriparatide are already marketed, approved for market or in development.

|   |                                    |
|---|------------------------------------|
|   | PTH / Teriparatide                 |
|   | Natpara® / Forteo®                 |
|   | e.g. Tymlos™, Movymia®<br>Terrosa® |
| <b>Clone selection/ comparability</b>               |                                    |
| Affinity to recombinant target – kinetics (Biacore) | PTH-R                              |
| Cell-based bioassay                                 | cAMP                               |
| <b>(Pre)clinical application</b>                    |                                    |
| Pharmacokinetics (ECL or ELISA)                     |                                    |
| Immunogenicity (Biacore/ ELISA/ bioassay)           |                                    |
| <b>Batch release EU</b>                             |                                    |

 Vela Portfolio