

## The Effect of Carbidopa in Carbidopa-Levodopa Combination on Reducing Osteoporotic Symptoms in Parkinson's Disease Patients

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Bone Mineral Density (BMD) is low in Parkinson's Disease (PD) patients in comparison with age-matched healthy individuals. Bone loss in PD, have some reasons such as immobility, decreased muscle strength and low body weight which leads PD patients to experience osteoporotic symptoms. Levodopa may be one additional risk factor for BMD loss in PD patients [1].

Basically, carbidopa, which is used in PD to prevent conversion of the levodopa to dopamine, prevents 5-Hydroxytryptophan's (5-HTP) metabolism in the liver and causes decreased levels of serotonin in the blood [2]. In fact, 5-HTP is produced from tryptophan via the enzyme tryptophan hydroxylase. And then, 5-HTP is converted into serotonin via the enzyme L-amino acid decarboxylase [3,4]. Besides, serotonin circulation in the blood causes the regulation of osteoblasts' proliferation. In this case, low levels of serotonin cause high proliferation rates of osteoblasts and consequently, high bone formation rates occur [5]. On the other hand, it is known that due to decreasing bone formation, which is followed by low proliferation rates of osteoblasts, BMD decreases in osteoporotic patients [6].

In conclusion, based on above-mentioned points it seems that using the carbidopa decreases serotonin level in the blood by prevention of 5-HTP metabolism and in turn, increases the bone formation rate. Hence, we hypothesize that the carbidopa by increasing

bone formation rate and compensating BMD loss, which is the main aspect of osteoporosis, in PD patients may lead to reduce osteoporotic symptoms. So the carbidopa should be added to the levodopa to reduce the levodopa's side effect on BMD loss in PD patients. Surely experimental researches and clinical trials are needed to validate our hypothesis.

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