

# 50 Years Ago in CORR

## The Parathyroid Hormone and Bone

Franklin C. McLean, MD CORR 1957;9:46–60

The effects of hormones on bone have been long known. Guyer in 1922 commented, “And if there is a serum-borne agent in the case of compensatory hypertrophy, may there not also be one in that of the ordinary physiological hypertrophy of the exercised muscle or stressed bone!” [4] (Exclamation mark from Guyer.) In the article we highlight this month, Dr. Franklin McLean (1888–1968), an eminent physiologist in the Department of Physiology at the University of Chicago, cited two earlier reports from 1929 [1] and 1932 [5] postulating distinct mechanisms by which parathyroid hormone might influence bone. In the first by Albright and Ellsworth, the observation of an increased serum calcium and increase in urinary phosphate excretion with the administration of parathyroid extract would indirectly lead to changes in bone metabolism [1]. In the second, Thomson and Pugsley suggested parathyroid hormone directly acted on bone by influencing osteoclast activity [5]. (The use of the term “parathormone” appears to have been first used in 1926 by Davies, reporting on the properties of the parathyroid hormone, which at the time had not been completely isolated and characterized [3]; even at the time of McLean’s article in 1957 the hormone had “not been prepared in pure form.”) McLean reviewed a considerable amount of

evidence including his own to support the notion that parathyroid hormone indeed had direct actions on bone leading to resorption and in fact it was the mobilization of bone mineral that led to the increase in serum calcium which in fact provided a feedback mechanism to the parathyroid glands. (Feedback loops as they applied to biological organisms were established in the 1920’s and 30’s by a number of individuals but primarily by Gustav Embden and Oscar Myerhof in establishing the glycolytic pathway we know by their names.)

McLean came to the following conclusions: (1) From experiments showing intracerebrally cocultured fragments of bone and parathyroid tissue caused bone resorption and other experiments he concluded parathyroid hormone has a direct effect on bone resorption; (2) There was clear evidence of an exchange of calcium and phosphate between bone and blood; (3) Homeostatic feedback mechanisms tightly controlled serum calcium levels. While the parathyroid hormone exerts an only a direct resorptive effect on bone, the resorption increases serum calcium which then reduces parathyroid hormone output.

McLean’s ability to synthesize a variety of diverse information reflected his superior ability as a creative scientist. He was a wonderful mentor to Dr. Marshall Urist [6], the discoverer of

bone morphogenetic protein (BMP) and to whom this issue is dedicated [2].

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### References

1. Albright F, Ellsworth R. Studies on the physiology of the parathyroid glands: I. Calcium and phosphorus studies on a case of idiopathic hypoparathyroidism. *J Clin Invest.* 1929;7:183–201.
2. Brand RA, Marshall R. Urist, 1914–2001. *Clin Orthop Relat Res.* 2009;467. doi:10.1007/s11999-009-1067-4.
3. Davies DT, Dickens F, Dodds EC. Observations on the preparation, properties and source of the parathyroid hormone. Part I. *Biochem J.* 1926;20:695–702.
4. Guyer MF. Orthogenesis and serological phenomena. *Am Nat.* 1922;56:116–133.
5. Thomson DL, Pugsley LI. On the mechanism of parathyroid hormone action. *Am J Physiol.* 1932;102:350–354.
6. Urist MR. The McLean campaigns for full-time academic medicine. *Clin Orthop Relat Res.* 1960;17:15–33.

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