



## Serum bone turnover markers CTX and P1NP are now routinely available

Assays for the serum bone markers CTX and P1NP are now routinely performed at Sullivan Nicolaides Pathology. CTX and P1NP are markers of bone resorption and bone formation respectively.

### What are CTX and P1NP?

During synthesis of collagen, the procollagen 1 N-terminal extension peptide (P1NP) is cleaved from procollagen. Serum levels of P1NP reflect bone formation.

In bone resorption, fragments of bone collagen are produced by osteoclast activity. Serum C-terminal cross-linking telopeptide of type I collagen (CTX) is one of the bone collagen degradation products and is a bone resorption marker.

### Clinical use of bone turnover markers

Current literature indicates that biochemical bone turnover markers are more sensitive to early changes in bone turnover from anti-resorptive therapy than direct measurement of bone mineral density (BMD).

### Why are serum bone turnover markers better than urine?

Urinary bone turnover markers are affected by glomerular filtration rate and are calculated relative to creatinine which can be affected by alterations in the muscle mass of the patient. This results in a greater intra-individual variability for urine bone markers of 15-25% compared to that of 10% for serum bone markers. Biological variation due to diet and circadian rhythm can be reduced for serum bone markers by collecting a fasting morning sample. The least significant change required for serum bone marker results is 30%, while for urine it is 40-70%. Serum CTX and P1NP assays are performed on an automated immunoassay platform which minimises analytical imprecision. Both CTX and P1NP are stable, eliminating problems from sample degradation which can be experienced with urine analytes and the highly unstable osteocalcin.

### SNP routine bone marker range of assays

Bone resorption: serum CTX; urine deoxypyridinoline  
Bone formation: serum P1NP; plasma osteocalcin;  
total alkaline phosphatase

### How to request

Fasting serum CTX and/or fasting serum P1NP.

### Patient preparation

Overnight fast and blood collected in the morning. It is recommended that the patient avoids exercise for at least 24 hours before blood sampling for bone turnover markers.

### Medicare

Medicare rebate available. Item numbers 66773 (for monitoring patients with proven low bone mineral density) and 66776 (for monitoring patients with metabolic bone disease or Paget's disease of bone).

### How often are bone turnover marker assays performed?

CTX and P1NP are assayed daily Monday-Friday.

### General summary of biochemical markers of bone turnover

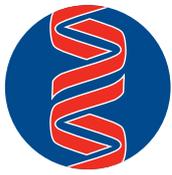
Biochemical markers of bone turnover (formation and resorption) are measured by either immunoassay or HPLC techniques in serum or urine. Bone formation markers include by-products of type 1 collagen synthesis, e.g. procollagen type 1 N propeptide (P1NP) and procollagen type 1 C propeptide (P1CP) (serum); products of osteoblasts, e.g. osteocalcin (serum and urine); and bone alkaline phosphatase (serum). Bone resorption is assessed by collagen breakdown products, e.g. C-terminal cross-linking telopeptide of type 1 collagen (CTX) (serum and urine), N-terminal cross-linking telopeptide of type 1 collagen (NTX) (serum and urine), deoxypyridinoline (DPD) (serum and urine) or osteoclastic activity, e.g. tartrate resistant acid phosphatase (TRAP5b) (serum).

Bone markers have in general a large degree of preanalytical variation due to both technical and biological components. Biological components, some of which can be controlled, include age, sex, season, diet, exercise, pregnancy and medical conditions (fractures, hyperparathyroidism, hyperthyroidism, steroid therapy). Analytical aspects can be confounded by the analyte stability

or assay specificity, e.g. osteocalcin is unstable and there are a number of circulating forms, while DPD is affected by photolysis. Further problems include those inherent to collection of urine samples such as time of collection, completeness, and use of analyte creatinine ratios. In clinical research studies many of these components can be controlled. Research has demonstrated measurement of bone markers to be useful both in the assessment and diagnosis of metabolic bone disease. In routine practice this has been difficult due to the large day-to-day variation of bone marker levels. Bone turnover markers currently are not suitable for diagnosis of osteoporosis as there is no marker which gives an indication of the absolute bone mineral density. Bone marker levels after drug therapy reflect the mechanism of action of the drug relative to the mechanism of marker production. For example, parathormone (PTH) causes bone formation, and both formation and resorption markers increase with PTH therapy, whereas bisphosphonates result in decreased production of markers. Bone markers can demonstrate the effectiveness of drug therapy more quickly than measurement of bone mineral density. There are no Australian position statements for the use of biochemical bone turnover markers, and clinicians are often unsure of which sample matrix and markers to use. Early studies on bone markers required the use of both serum and urine to assess bone turnover, particularly urine for bone resorption markers. Formation and resorption markers are now available in serum and it is likely that future bone turnover or bone function panels will be predominantly serum based.

Recent reviews in the scientific literature indicate that fasting serum CTX and P1NP are currently the best markers of bone resorption and formation respectively.

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**Sullivan  
Nicolaides**  
PATHOLOGY

**Coffs Harbour and Grafton laboratories now ranked  
Australia's first officially green private pathology labs.**



Coffs Harbour Laboratory

Coffs Harbour and Grafton have become the first private pathology labs in Australia to be awarded international environmental certification. This is the first step in taking the entire SNP network to ISO 14001:2004 certified Environmental Management Systems (EMS).

The ISO EMS is the world's best practice when it comes to reducing our impact on the planet. It helps us to continually improve our collective and individual management of resources consumption and waste disposal. It also helps us to identify possible emergencies, plan for them, and reduce the potential for environmental disasters.

To achieve certification, the Coffs Harbour and Grafton labs, collection centres and couriers had to comply with all relevant local, state and federal environmental legislation, regulations and guidelines.

The Coffs Harbour lab was purpose built, incorporating a range of design and technology features to minimise energy and water usage. In addition, procedures and equipment were implemented at the Coffs Harbour and Grafton sites to ensure that potentially harmful chemical wastes are not discharged into the sewerage or stormwater systems, and that recycling and reuse procedures are in place for solvents, paper, mobile phones, IT consumables, plastics and glass.

**Sullivan Nicolaides Pathology requests for full respiratory virus panel – (RVP)**

Due to the current crisis in flu testing requests, Sullivan Nicolaides Pathology has introduced influenza only testing (influenza A and B with follow-up swine flu testing on all influenza A positive patients).

It is our intention to still test the full respiratory virus panel (influenza A, influenza B, RSV, parainfluenzae 1,2,3, human metapneumovirus and rhinovirus) on immunocompromised patients (both inpatients and outpatients) and RSV in children less than 5 years.

In order to avoid mistakes in coding for the appropriate test panel for immunocompromised patients could you please assist by requesting:

**Full RVP (incl RSV and para)**

If only RVP is requested, only influenza testing will be performed if it is not recognised that the patient falls into the immunosuppressed group.

**Swabs for bacterial cultures**

Please record the site of the swab so that our microbiology laboratory can set up the correct and relevant culture plates. Certain organisms may be significant in one site but not in another.

**H1N1 09 swine influenza – reporting update**

Following the 22/06/09 implementation of the PROTECT phase for H1N1 09 Swine Influenza, SNP have returned to routine delivery methods for reporting results for these investigations. Only in the case of urgent requests will results be faxed or phoned as indicated on the request form. Please visit [www.snp.com.au](http://www.snp.com.au) for links to the most up-to-date information.

**Whats new!**

[labtestsonline.org.au](http://labtestsonline.org.au)

A free, non-commercial website developed by pathologists and scientists working in diagnostic laboratories.

Now available as a patient note and can be ordered on your stores order – Item # 07827.



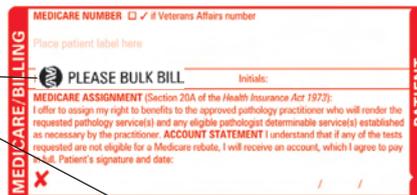
**SNP billing policy for outpatient tests...**

SNP routinely bulk bills concession patients who have a current white or gold DVA, pension or health care card for services included in the Medicare Benefits Schedule. Non-concession patients will receive an account for services. The maximum out-of-pocket payment for Medicare eligible pathology tests performed on one day regardless of the number or complexity is \$80\*.

To request bulk billing for non-concession patients experiencing financial hardship **handwrite 'please bulk bill'** or apply the **SNP PLEASE BULK BILL** label to the request form over the concession card tick boxes.

Labels can be ordered on your stores order Item # 07993.

We understand that patients can put you in a difficult position if they ask you to intervene when they receive an account from SNP. We encourage you to refer patients to the SNP Patient Service Centre on 1300 732 030 to discuss their account. The centre is staffed by highly trained and empathetic people who understand the intricacies of the pathology items in the MBS.



**Collection centre updates  
Regional**

Coffs Harbour - relocation  
80 Albany Street  
Mon – Fri 7 am - 5 pm  
Saturday 8 am - 11 am  
Phone (02) 6648 2144



Szyzygy – now on 100% recycled paper  
Environmental savings per issue of Szyzygy compared to using non-recycled paper:  
3.7 trees saved  
720 kg carbon dioxide emissions reduced  
55% less water used  
60% less energy used.

\*Correct at time of printing, subject to change without notice. For further information visit our website [www.snp.com.au](http://www.snp.com.au). Applicable to outpatient pathology services.