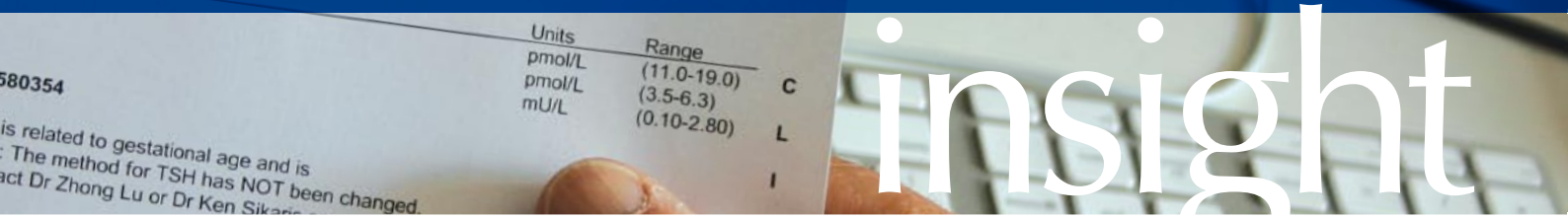
MELBOURNE PATHOLOGY

"We take it personally"

ARE THOSE RESULTS REALLY ABNORMAL?

REFERENCE INTERVAL REFINEMENT

FEBRUARY 2009



insight

- Reference intervals (previously termed normal ranges) should be specific to a patient's age and sex and specific to the method used by that laboratory.
- Melbourne Pathology, as part of the Sonic Healthcare network across Australia, has derived optimal reference intervals for all major biochemistry tests.
- During the next month, reference intervals appropriate for men and women, childhood and the elderly as well as pregnancy specific intervals will be implemented.

From February 2009, virtually all routine biochemistry results will include the reference interval that applies to the specific age, sex and pregnancy status of that particular patient.

The update to our routine biochemical reference intervals has been one of the most significant objectives in pathology over the last decade, and will enable medical practitioners to interpret results with much greater accuracy and relevance for each individual patient.

How have these reference intervals been derived?

The new reference intervals are specific to the Australian population and to the testing methodology used by Australian Sonic Healthcare laboratories, including Melbourne Pathology, who has been at the forefront of this ground breaking project.

The process involved a review of worldwide literature and sophisticated statistical analysis of millions of patient results recorded over the last few years.

Our new reference intervals are based on a minimum of around 10,000 results for some tests in specific groups (such as pregnant women) and up to 1 million results for common tests such as PSA, LFT and urea and electrolytes. This is in stark contrast to some of the existing reference intervals which may be decades old, derived from overseas studies of fewer than 100 results, or derived locally but when another method was in use.

It should be noted that these reference intervals apply to all common biochemical tests except glucose and cholesterol tests, where the decision limits have been set by an expert clinical group.

What does this mean to you?

The new reference intervals will provide medical practitioners with a much greater degree of accuracy for the interpretation of results for each individual patient. Importantly, it will decrease the level of abnormal results that are reported, particularly among patients who are not an 'average' adult.

The new reference intervals will be particularly beneficial for pregnant women where the effect of increased fluid status on most test results was seldom factored in.

How will the new reference intervals be reported?

Virtually all routine biochemistry results will include the reference interval that applies to the specific age, sex and pregnancy status of that particular patient.

Therefore, you may have two patients who each receive the same result for a particular test, but one result is listed as normal, and the other is classed as abnormal. This is because our system has automatically factored in the patient's age, gender and pregnancy status to provide you with the result that is relevant to their individual circumstances.

Can I use the new reference intervals for interpreting test results from other laboratories?

To our knowledge, Melbourne Pathology is the only laboratory in Victoria to have undertaken the exhaustive research required to derive such comprehensive reference intervals.

However, these reference intervals may only relate to tests undertaken by Melbourne Pathology and other Australian Sonic Healthcare laboratories. They are specific to the methodologies and assays used in our laboratory. Different methodologies may be used by other labs, therefore applying these reference intervals to non-Sonic Healthcare laboratories could be misleading and potentially endanger patient safety.

What are the notable impacts on reference intervals for different sub-groups?

Sub-group	Tests	Impact
Infancy and childhood	ALP	Higher in childhood especially in adolescence until bone growth and remodelling stops
	Creatinine	Rises as muscle mass increases and continues to rise even further in boys at adolescence
	Iron	Levels are often marginal until the expansion of red cell mass and muscle mass reduces. Menarche usually prevents the iron accumulation in girls
	Globulins (especially immunoglobulins)	Increases as the immune system matures
	TSH	Slight fall during childhood
	ALT, AST and GGT	Slight fall during childhood
	Calcium	Slight fall during childhood
	Bicarbonate, urea and urate	Slight rise during childhood
Elderly	Urea	Gradually increases with age reflecting the expected age related decline in renal function
	Creatinine	Only rises from about age 70 when the expected decline in renal function actually exceeds an otherwise parallel decline in muscle mass
	TSH	Slight rise with ageing
	fT4	Slight rise with ageing
	fT3	Slight fall with ageing
Men	Creatinine and creatine kinase (CK)	Higher due to testosterone and its effect on muscle
Women	Transferrin	Levels are slightly higher due to both oestrogen effects and the generally lower iron stores in pre-menopausal women
Menopausal women	Calcium	While total calcium generally falls as albumin falls with age, corrected calcium in postmenopausal women actually rises slightly after the menopause due to changes in calcium complexation by bicarbonate
Pregnancy	Sodium	Slightly lower due to increased fluid status
	Creatinine	Slightly lower due to increased fluid status
	Urea	Slightly lower due to increased fluid status
	Albumin	Slightly lower due to increased fluid status
	Total calcium	Slightly lower due to increased fluid status
	Corrected calcium	Rises slightly, although this is probably an artefact of the standard formula applied to pregnancy
	Liver enzymes (including ALP)	Slightly lower, however ALP rises steeply in the third trimester
	Ferritin	Levels fall markedly as iron stores are usually depleted
	TSH	Levels are lower, particularly in the first trimester due to thyrotropic effect of hCG.
Tumour markers		While most doctors are generally aware of the age related rise in PSA levels with ageing, it is important to note that most 'tumour markers' (eg. CEA, CA125 and hCG) also increase in the elderly.

Melbourne Pathology is part of Sonic Healthcare, the third largest pathology provider in the world. The Sonic Reference Interval Group for Chemical Pathology includes three chemical pathologists from Melbourne Pathology as well as another eight chemical pathologists from across Australia and several clinical biochemistry scientists with postgraduate qualifications. Much of this work has been presented at open scientific conferences over the last three years.

Please contact your Melbourne Pathology Business Development Manager on 9287 7700 if you would like a copy of our new reference intervals. Tables are available for adults, pregnant women, boys and girls.

For further information, please contact our Chemical Pathologists Dr Ken Sikaris, Dr Zhong Lu or Dr Gisela Wilcox on 9287 7720.