

### The final step in Bilirubin metabolism

Although bilirubin metabolism is understood, the final step to the conversion to urobilinogen has remained essentially unknown. Bilirubin is an intermediate of the haem degradation pathway and has long been considered to be a well understood series of metabolic steps, however the final step for the conversion from bilirubin to the yellow urobilinogen has remained an unknown metabolic step for over 125 years. Bilirubin glucuronide is excreted into the gut where it is either reabsorbed or excreted. By excreting bilirubin (and its conjugates) as urobilinogen or stercobilinogen the cycle of bilirubin metabolism is completed. In a recent publication (1) a collaborative research investigation in the USA has finally identified the mechanism for the conversion into urobilinogen. Using a combination of biochemical analysis and comparative genomics the authors mapped out the relationship between gut micro bacteria and the conversion of bilirubin to urobilinogen. The authors identified that anaerobic bacteria such as the Firmicutes species all contained an enzyme, bilirubin reductase which can reduce bilirubin and its conjugates to urobilinogen. Additional support for this work by the authors comes from their analysis of newborn bilirubin metabolism which increases urobilinogen production as their gut matures and from patient with inflammatory bowel disease who also have a decreased Firmicutes species gut flora and a diminished synthesis of urobilinogen.

### How significant is Barbie®?

The advent of the Barbie® film created a wide-ranging discussion on the role of Barbie® dolls and their influence on girls and young women. In a recent publication from the USA (2), the author has analysed the role of medical and scientific career dolls on influencing career decisions and their accuracy in representing the relevant health related professions. A total of 97 Barbie® dolls across six health professional groups were compared with 65 non-Barbie® dolls across the same health professional groups (medicine, scientist, science educator, nurse, dentist, and paramedic). Overall, the Barbie® brand largely treated children (66%) with only 4% as working with adults. Of the 12 dolls representing scientists none met the criteria for personal protective clothing. The comparison dolls also had similar shortcomings. The author emphasizes the dangers of having loose hair in laboratory settings which all dolls seemed to have. While women are continuing to gain stronger footholds in health care, particularly medicine, dentistry and nursing as well as significant academic achievements the author considers that a more accurate representation of the health-related professions. In addition, the author recommended a more ethnically diverse range of dolls in the health professions.

### Effects of mergers and acquisitions in Pathology

A publication from the USA surveyed 732 pathology laboratories subject to mergers and acquisitions (3). In addition, the authors surveyed 819 pathology laboratories that were not subject to mergers and acquisitions. Both surveys considered qualifications, geographic location, age, and gender. Although this publication was based in the USA, there is relevance to pathology in New Zealand, in the present climate. Evidence suggests that despite the perceived corporate benefits there are a range of issues relating to this type of restructuring. The overall result indicated a higher statistically significant levels of personnel burnout amongst staff who were subject to mergers and acquisitions and considered that the lack of leadership contributed to the high levels of staff burnout. They also identified an overall lack of social relationships in those undergoing mergers and acquisitions. The authors concluded that the major contributors to burnout compared to the non-merger and acquisition laboratories was the lack of social interactions and communications as well as a satisfactory policy by the administration to reduce staff burnout.

### Diagnostic testing leading to harm

Diagnostic errors can be associated with laboratory testing, however there is a lack of a suitable and relevant measure for evaluation. Where traditionally laboratory testing was only used to test for organ and system dysfunction, now laboratory testing is used for a wide range of diagnostic applications such as; cancer diagnosis and monitoring, molecular analysis, monitoring a patient's response to treatment etc. This increases the medical practitioner's dependence on diagnostic laboratory testing and may in some cases reduce the examination skills. In addition, 40 risk factors have been identified for diagnostic errors associated with send out diagnostic testing. In the current publication (4), the authors identified three major areas contributing to diagnostic testing leading to patient harm. A requirement to have processes to identify patient harm (e.g. ordering an inappropriate test, not ordering the appropriate test and the appropriate test result is misapplied). Second, the appropriate test is ordered but a delay occurs in the testing/reporting process, and third the result of the appropriate test is inaccurate. The authors conclude that there needs to be stronger links between pathology laboratories and clinicians, and the importance of communication between both parties to reduce diagnostic errors. They also considered that a system should be in place to track to track any diagnostic errors.

### How chondrocytes survive hypoxia

It is accepted that the availability of oxygen to cells in the body is essential for survival. This is achieved by a sophisticated vascular system and haemoglobin in the red blood cells. The cartilage system is however avascular and has been believed to rely on diffusion of oxygen to the avascular tissues and on glycolysis to provide the necessary energy requirements. This is controlled by hypoxia inducing factor which if inhibited results in cell death in chondrocytes and immediate tissues. A recent publication from China (5) has provided new and novel evidence relating to chondrocyte oxygen metabolism. The authors identified that haemoglobin is synthesized by chondrocytes under the influence of several transcription factors. The haemoglobin is synthesized as membrane less condensates which form cytoplasmic bodies capable of supplying oxygen to the avascular tissues that have a left shift compared to red cell haemoglobin thereby allowing binding and storing oxygen in low oxygen environments. When synthesis of the haemoglobin condensates was blocked in culture, the chondrocytes died. The authors conclude that this discovery may have implications for diseases such as rheumatoid arthritis and that other non-red cell sites of haemoglobin synthesis are likely.

### REFERENCES

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