GLOBAL RESEARCH UPDATE

Jaw tumour mutation discovered

A team of researchers in Finland have discovered a gene mutation in ameloblastoma, a benign but potentially life threatening tumour of the jaw, which could transform treatment strategies through targeted therapies.

Historically, the pathogenesis and recurrence of ameloblastoma have been poorly understood and radical surgery is often required to manage the tumour.

Researchers analysed 24 ameloblastoma samples for *BRAF* mutations by DNA sequencing and discovered that 15 harboured a *BRAF* V600E mutation. This is the first indication of a high-frequency oncogenic mutation in ameloblastoma. Author and Professor Kristiina Heikinheimo of the University of Turku, Finland, told the *BDJ*: 'The discovery of *BRAF* V600E mutations is a significant breakthrough in understanding the pathogenesis of ameloblastoma. Our findings are also an important step towards personalised medicine of ameloblastoma.'

Drugs targeting these mutated genes are already available in the management of other cancers, meaning this finding has immediate implications for treatment. However, problems such as tumour heterogeneity and possible resistance to inhibitors used need to be addressed first before any specifically targeted therapies become widely available, as Professor Heikinheimo stresses: 'It is important to address the resistance mechanisms related to these treatments.'

The Finnish team will next be assessing the feasibility of using mutated *BRAF*-targeted drugs for the treatment of ameloblastoma *in vitro* using primary cells established from ameloblastoma tumours and also studying whether there are additional

driver mutations in the *BRAF* V600E negative ameloblastoma group: 'We wish to be able to pick out the ameloblastoma patients most likely to benefit from mutated *BRAF*-targeted therapy and start treating these patients with inhibitors of mutated *BRAF*.'

1. Kurppa K J, Catón J, Morgan P R *et al*. High frequency of *BRAF* V600E mutations in ameloblastoma. *J Pathol* 2014; **232**: 492–498.

Lasers could regenerate dental tissue

For the first time researchers have successfully used non-ionising, low-power laser (LPL) treatment to differentiate human dental stem cells *in vitro* and promote tissue regeneration.¹ These results could have broad implications for many clinical regenerative applications, not just dentistry.

LPL treatment was used in rodents to activate an endogenous latent growth factor complex, transforming growth factor- β 1 (TGF- β 1), and trigger stem cells to form dentine. After 12 weeks, rat teeth demonstrated significant dentine regeneration, demonstrating the ability to 'direct' stem cell differentiation into functional tissues and organs. Praveen Arany told the *BDJ*: 'this approach could be used as a paradigm for other regenerative tissues such as skin, mucosa, bone, muscle and nerve.'

Arany *et al.* have devised a minimally invasive method to harness the inherent regenerative capacity of cells and tissues, though laser therapy in itself is not new: 'Low power light therapy has been around since the 60s but the field has been plagued with inefficacious treatment outcomes due to a poor understanding of the molecular mechanisms.' Arany adds: 'Further refinement of the treatment protocols is necessary to establish safety and efficacy of the

device prior to routine clinical applications.'

The researchers plan to establish the safe and effective therapeutic dose window of the laser treatment to begin human studies, as well as analyse the ability of laser treatment to differentiate other types of stem cells for further clinical applications.

1. Arany P R, Cho A, Hunt T D *et al*. Photoactivation of endogenous latent transforming growth factor- β 1 directs dental stem cell differentiation for regeneration. *Sci Transl Med* 2014; **6**: 238.

Squid teeth could replace bone

Researchers have identified proteins and determined the structural make-up of squid sucker ring teeth, which could help lay the foundations for a new eco-friendly material used in biomimetic materials engineering, packaging and more.¹

Sucker ring teeth (SRT) are unique in that they are entirely made up of proteins, contain silk-like β -sheet structures and are devoid of minerals and metals. Scientists from Singapore have identified 38 proteins across two types of squid and a cuttlefish (superorder Decapodiformes), and while a full understanding of the molecular mechanisms behind the evolution of these structures has not been reached, RNA sequencing has revealed insights into the biomechanical and adaptive roles of suckerin proteins.

These new findings provide an important model system for the design of robust-structural polymers; SRT-based materials could be the future for reconstructive surgery and bone-scaffolding.

1. Guerette P A, Hoon S, Ding D *et al*. Nanoconfined β -sheets mechanically reinforce the supra-biomolecular network of robust squid sucker ring teeth. *ACS Nano* 2014; DOI: 10.1021/nm502149u

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