Restoration of Appearance and Function Trust
Chief Executive Officer Leonor Stjepic
Restoring quality of life

The Restoration of Appearance and Function Trust may have a modest public profile, but from hair removal to cancer prevention, millions of people have benefitted from its research, most without even realising it. Chief Executive Officer Leonor Stjepic describes the very human impacts of the Trust’s work.

**WHEN ASSESSING THE SIGNIFICANCE** of research, it is useful to consider its impact, where the impact of scientific research is described as any contribution to the development of society, from manufacturing to public health. All research – applied and basic – causes ripples, but for Restoration of Appearance and Function Trust (RAFT), based in the UK, the impacts of our research are unambiguous, numerous and life changing.

**WORKING FOR PATIENTS**

Since its establishment 27 years ago, RAFT has conducted research with the aim of restoring good quality of life to patients coping with the after-effects of disease, injury or congenital conditions. Our research has led to practical innovations that restore appearance and function to patients – helping them regain their dignity and independence – and advancing understanding of prevention and treatment of conditions associated with deformities.

We are a truly individual organisation, partly due to our relationships with the hospitals putting our research into practice. At RAFT, scientists, doctors and patients alike contribute to our research, meaning that all the research we do is truly fit for purpose. We get clinical input and feedback constantly, so we will not create something that may be a clever scientific idea but is impractical.

Another factor that makes us unique is our charitable status, meaning that in addition to conducting and publishing our research, we are responsible for raising every penny that we spend. Despite the lack of public funding for RAFT, we celebrate success after success. Today, there are dozens of RAFT innovations in clinical use, and the quality and quantity of our research is recognised internationally in journals and at conferences.

**CHANGING THE FACE OF SURGICAL RESEARCH**

RAFT’s founders felt that plastic surgery was a vital area of medicine that did not attract sufficient attention from academics. I believe that by taking on and training surgeons in a research environment, RAFT has brought about a change in the academic reputation of reconstructive surgery.

Along with providing practical solutions to improve lives, one of our objectives is to help establish a generation of plastic surgeons with a strong research ethic. In 2012, we found that 15 per cent of consultant plastic surgeons in the UK have a background with RAFT, including more than 50 former surgical research fellows.

Our surgical research fellows are trainee surgeons who opt to spend some time in an academic environment. We want to give them a different experience to the one they would get in a university; when they are at RAFT they are expected to get involved with fundraising, both to support the Trust and to give them experience in explaining their work to people without scientific backgrounds. Some are so inspired by the end of their time with us that they continue with research careers, while others become consultant plastic surgeons.

The contributions of our surgical research fellows have had impacts in reconstructive surgery and other fields. A former research fellow developed a method – called ‘reverse colour coding’ – to count muscle fibres under a microscope, while another uncovered an association between the c-Myc gene and melanoma activity, ultimately winning him the prestigious Hunterian Professorship.

We are proud of the work our surgical research fellows accomplish during their period with us and we are always delighted to hear that they leave RAFT feeling that the experience has made them better surgeons. One former research fellow, Rajiv Grover, who became President of the British Association of Aesthetic Plastic Surgeons, commented that: “RAFT changed our lives so we could help our patients. It trained us in the scientific method and we learned to question dogma; to no longer accept the accepted”.

**INNOVATION OUTSIDE THE BOX**

In 2005, one of our surgical research fellows started a walk-in clinic at Mount Vernon Hospital in Middlesex where patients could have suspicious-looking moles assessed and, if necessary, removed immediately under local anaesthetic. For the first time, early detection was shown to be effective in preventing relapse in melanoma patients. This public-spirited activity reflects RAFT’s willingness to step outside the laboratory and get involved with managing public health. Our work with the UK’s National Health Service (NHS) includes the creation of a burns patient database, a survey of the effectiveness of burns treatment.

**BEDS FOR BURNS PATIENTS**

Pressure sores are a painful condition affecting immobile patients confined to beds or chairs, and cost the UK’s National Health Service (NHS) an estimated £1.4-2.1 billion every year, around 4 per cent of its budget. Patients with burns covering large areas of their bodies suffer particularly badly as pressure sores disrupt healing. Inspired by the idea of levitating a patient on an upturned hovercraft, RAFT researchers developed an alternating air pressure mattress that prevents the development of pressure sores. This proved effective, and these mattresses are used in most intensive care units around the world.
in A&E units, and founding a network of ‘Skin Banks’, now run in association with the National Blood Service.

At RAFT, we are a hotbed of scientific creativity, and our researchers are encouraged to thinking of ideas beyond the laboratory bench. For instance, an investigation into the effect of a surgeon’s morning latte established that caffeine has a detrimental effect on a surgeon’s abilities to perform microsurgery. The result of this somewhat quirky study is now recognised as part of standard practice for surgeons. However, our research is not limited to surgical techniques; we try to explore all areas that have an impact on patients. For example, the importance of recovering a patient’s appearance is frequently overlooked, but the RAFT Psychological Research Programme, which involved detailed interviews with more than 200 patients, demonstrated that deformities cause real harm to mental health. This research led to the founding of a dedicated scar support clinic at Mount Vernon Hospital.

THE BENEFITS OF COLLABORATION
As well as taking on surgical research fellows, we have worked alongside many other organisations including the Mayo Clinic, the London Fire Brigade and all manner of charities. Our relationship with Mount Vernon Hospital is particularly valuable, allowing us to put translational research into practice. Some of our most impactful research has arisen from working with their patients, such as our 1993 study, which identified early signs of toxic shock syndrome in children, leading to the best current diagnosis for this condition. Our collaboration with Mount Vernon Hospital allows us to identify everyday problems, and produce solutions to help patients in the most direct way possible.

Medical research can be very costly and complicated, and you cannot hope to have every single skill set within one institution. Examples of multidisciplinary research made possible by collaborations include using novel techniques in physics to determine the extent of UV damage on cells, and recruiting assistance from one of the designers of the hovercraft – Les Hopkins – to help us engineer the RAFT alternating pressure mattress.

A HANDFUL OF RAFT INNOVATIONS
Some of the 100 RAFT projects used in hospitals around the world include:

- A leech applicator to help attach leeches without handling them
- SmartMatrix™, a specially designed scaffold biomaterial to aid skin regeneration by encouraging new growth of cells and blood vessels
- The ‘Mount Vernon fist test’ to determine whether a hospital bed is fit for use
- A method for manipulating digital colour photographs of tissue samples for colour-blind researchers
- The ruby laser for painless, scar-free laser hair removal

PUTTING SMILES ON FACES
Facial palsy is a condition affecting approximately 100,000 people in the UK. It involves severe facial paralysis, most commonly on just one side, and prevents natural facial expressions forming. The standard surgery for facial palsy requires two stages: using a small muscle from the chest to restore nerve and muscle to the face, then transferring a previously undiscovered blood vessel to reconnect nerve fibre, so the muscle can move. Founder Douglas Harrison and his colleagues at RAFT developed this procedure – considered the best treatment for facial palsy – over the past few decades, and continue to refine it today.

“It was almost embarrassing, the number of papers from RAFT which would be presented at conferences. I remember at one international conference in San Francisco somebody telling me a story about how another non-RAFT researcher seemed disgruntled, talking to a delegate there saying, ‘We’ve had so many papers from RAFT, shouldn’t we restrict the number they can present?’ and the other delegate asked, ‘Well, are they good?’ ‘Yes’, replied the first. ‘Well then, why put a limit on it?’” Douglas Harrison, RAFT founder
One of the greatest benefits of having formed so many partnerships over the past 27 years is that the impact of our research reverberates through this global network. Knowing that our research will improve the lives of patients is fantastic.

FACING UP TO CHALLENGES
The greatest challenge for RAFT is always money. As a charity, we get no government funding whatsoever, and have to do all the fundraising ourselves. In the past, RAFT always depended on pharma companies to help fund clinical trials, but as these companies entered an uncertain transition stage – due to many lucrative products reaching the end of their patent protection – our projects began to slow down alarmingly.

In response, RAFT is moving towards self-sustainability by patenting its innovations. Today, research is progressing well, and we are currently working on three major projects. The first is regrowing bone inside the body. It works in the lab, which is proving very promising, and has potential to make bone grafts for hip replacements unnecessary. Another project focuses on techniques for post-mastectomy breast reconstruction – we are hoping to make the procedure more effective and less traumatic. The third area of research is into bionic limbs; we are looking at implanting electrodes on muscles to pick up electrical signals and feed them to the bone anchor. Many amputees do not wear their prostheses due to discomfort, so identifying that defect is helping us to create something that will be usable.

All three of these projects, should they advance through clinical trials successfully, could lead to huge improvements in quality of life for vulnerable patients.

CONTINUING TO CREATE GLOBAL IMPACTS
RAFT’s key aim is to restore quality of life, and in that respect, we have been extremely successful. Our 2012 review, ‘RAFT: 25 Years of Medical Discoveries’ assessed the impact that we have had since being founded. It showed that our researchers have introduced 100 RAFT innovations into clinical use to improve care for patients, from diagnosis to recovery. The research we produce has a widespread but also deeply personal impact.

www.raft.ac.uk

HOW TO WEAR SUNSCREEN
While it has been established for many decades that UVB radiation causes sunburn, until recently, the role of UVA was unclear. RAFT’s research into UVA-induced cell damage determined that one coat of sunscreen was insufficient protection for sunbathers, particularly as the commercial availability of sunscreen has led to increased sunbathing. RAFT’s work provoked many changes:

- Sunbathers are told to apply two layers of sunscreen
- The public recognises tanning beds as potentially harmful
- Sunscreen labelling is regulated
- Unsupervised coin-operated sunbeds are banned

RAFT felt it was so important that people understood what UVA did, that they gave this research away, and these impacts have reached millions of people.