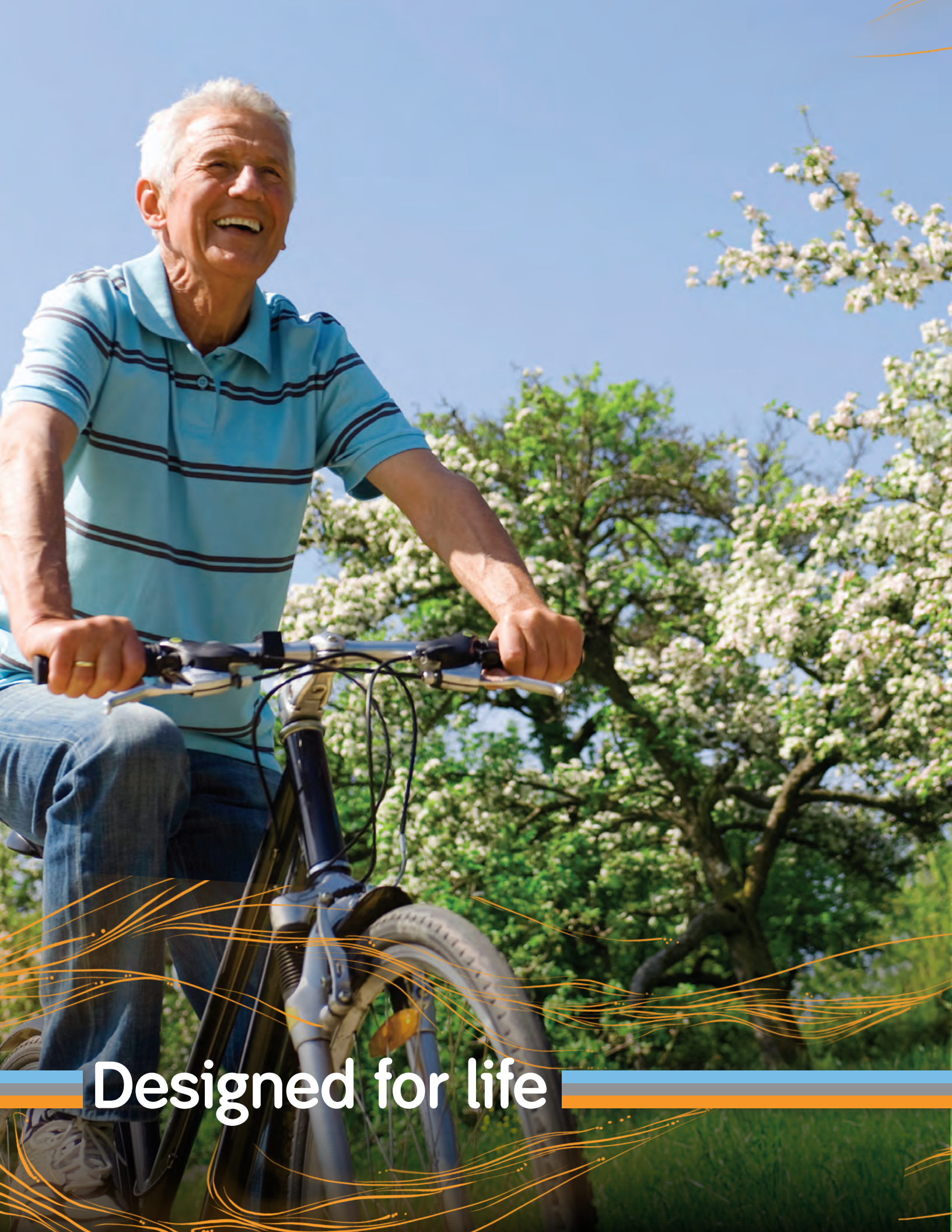
smith&nephew

VERILAST◇
Oxidized Zirconium with XLPE

Designed for life

Implant technology with unmatched performance



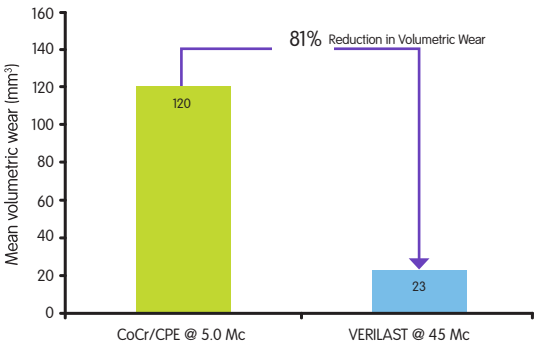
Designed for life

Wear Performance
Biocompatibility
Real-life results

Wear performance

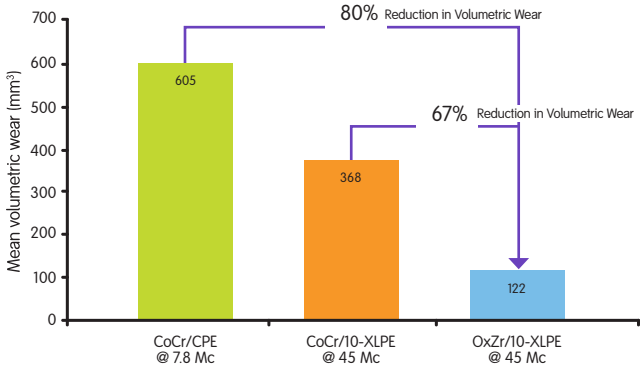
As today's patients seek more active lifestyles than traditional patients, knee and hip implants will be expected to endure more stress without succumbing to wear. However, the functional lifetime demand of younger and active patients is 10-fold greater than the estimated functional lifetime of traditional polyethylene[1]. VERILAST◇ Technology from Smith & Nephew is the only bearing technology with published results of 45 Million Cycles of hip and knee in-vitro wear simulation testing, R3◇ Hip System and LEGION◇ Primary Knee System, respectively. This means the replacement may be expected to provide improved wear performance. More importantly, if implanted earlier, it may restore patients to their active lifestyles sooner.

VERILAST Technology in the LEGION Primary Knee System demonstrates superior wear performance in 45 million cycle testing.



Comparison of the mean volumetric wear of CoCr/CPE after simulating 5 Mc of use and VERILAST after simulating 45 Mc respectively[2].

VERILAST Technology for Hips demonstrates superior wear performance in 45 million cycle testing.



Comparison of the mean volumetric wear of CoCr/CPE and CoCr/XLPE at 7.8Mc and 45Mc respectively[3].

Multitude of options

Smith & Nephew is the only company to offer VERILAST Technology. With the combination of OXINIUM◇ alloy and highly cross-linked polyethylene (XLPE), VERILAST Technology offers a complete array of beneficial hip and knee implant options.

Knee systems

VERILAST Technology is available through our GENESIS◇ II, LEGION CR, LEGION PS, JOURNEY◇ II BCS and JOURNEY II CR systems.

Hip systems

VERILAST Technology is available through our R3 Acetabular System, POLARCUP◇ Dual Mobility System, and REFLECTION◇ Acetabular System.

How many knee systems have wear performance technologies expected to last 30 years‡?

Just one:

LEGION◇ Primary Knee System with VERILAST◇ Technology

‡The LEGION◇ Primary Knee System with VERILAST◇ Technology is expected to provide wear performance sufficient for 30 years of actual use under typical conditions, based on in-vitro wear simulation testing. The results of in-vitro wear simulation testing have not been proven to quantitatively predict clinical wear performance. Also, a reduction in total polyethylene wear volume or wear rate alone may not result in an improved clinical outcome as wear particle size and morphology are also critical factors in the evaluation of the potential for wear mediated osteolysis and associated aseptic implant loosening. Particle size and morphology were not evaluated as part of the testing.

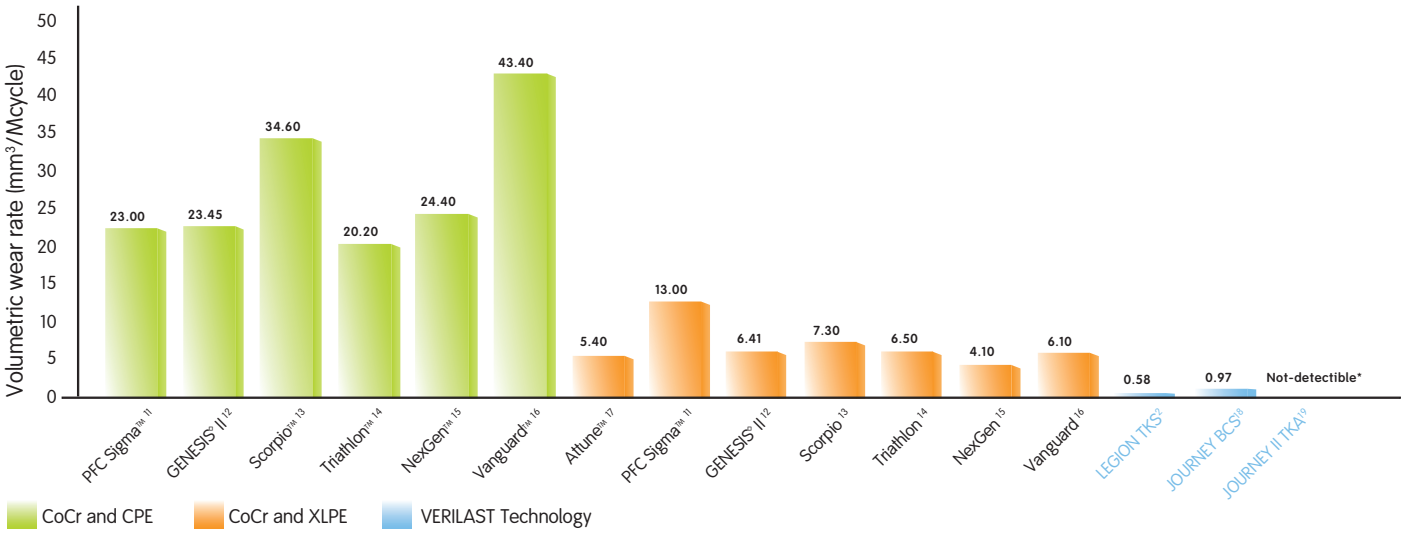
Wear performance
VERILAST® Technology for Knees

VERILAST Technology is the peerless bearing combination of OXINIUM® alloy and highly cross-linked polyethylene (XLPE). By combining the biocompatible, proprietary OXINIUM alloy with XLPE, Smith & Nephew's VERILAST Technology in the LEGION® and JOURNEY® Knee Systems allow surgeons to address their patient's knee pain earlier.

Compared to other bearing technologies of contemporary knees systems using very similar test protocols as published by their respective companies, VERILAST Technology demonstrates exceptionally low wear rates. When comparing conventional technologies to XLPE technologies there is an expected, significant reduction in wear rates. Moreover, when comparing the XLPE technologies to VERILAST, there is another significant reduction in wear again. Understanding these tests were conducted using pristine components, the differences in these wear rates across groups would be even more pronounced with roughened components due to the resistance to micro-scratches of the VERILAST couple.

VERILAST Technology demonstrates lower wear rates than other XLPE formulations using similar test conditions

VERILAST Technology vs Conventional, XLPE and Anti-oxidant Technologies



Mean volumetric wear rates of CoCr against conventional polyethylene (CPE), CoCr against crosslinked polyethylene (XLPE) and OXINIUM against XLPE as published by the respective companies with their respective implants.

*ISO 14243-1 testing protocol used. Other results obtained using ISO 14243-3 protocol.

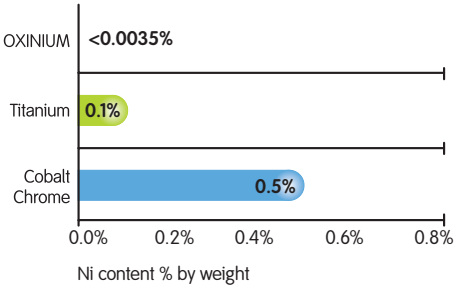
Biocompatibility: Metal sensitivity

Smith & Nephew understands that lower nickel content offers benefits to your metal sensitive patients. Just as metal ions are a well described problem for many hip replacement patients, metal sensitivity to cobalt, chromium and nickel (common materials used in most joint replacement implants) are commonly cited allergens. In many cases, sensitivity to these allergens has resulted in revisions for knee replacement patients[4-7].

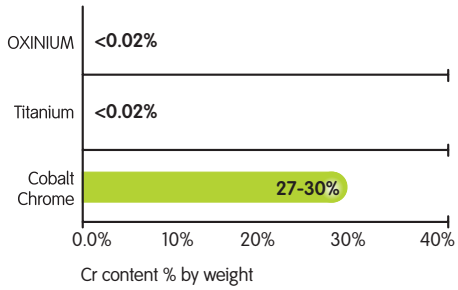
VERILAST® Technology incorporates proprietary OXINIUM® alloy instead of the commonly used cobalt chromium alloy. OXINIUM alloy has <0.0035% nickel content, and <0.02% chromium content compared to up to 0.5% and 30.0% respectively in cobalt chrome. Moreover, oxidized zirconium is a nearly inert material that has not been reported to induce immune reactions[8].

Metal content of implants[10]

Maximum nickel content

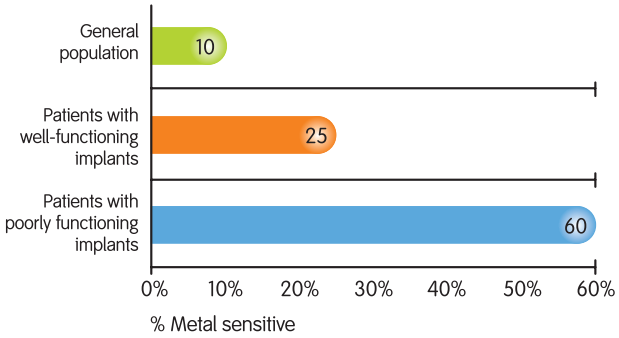


Maximum chromium content



Clinical studies[9]

Prevalence of patients demonstrating metal sensitivity



The perfect equation for hips

VERILAST◇ Technology for Hips

VERILAST Technology for hips from Smith & Nephew uses the exclusive bearing combination of proprietary OXINIUM◇ and highly cross-linked polyethylene, which provides superior clinical survivorship and biocompatibility without sacrificing versatility or introducing the risk of ceramic-like fracture[20]. Most importantly, VERILAST Technology provides **low wear**, **corrosion avoidance** and **real-life results**.

Real-life results

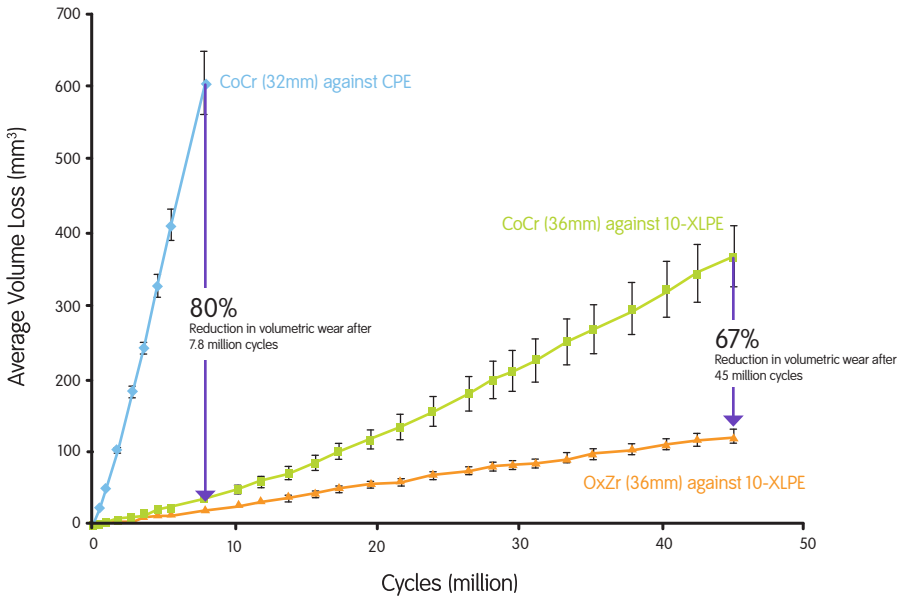
In the 2013 Australian Registry, the ceramicized metal/modified polyethylene category, which includes the exclusive OXINIUM alloy from Smith & Nephew, had the highest survivorship of all bearing categories at five years: 98%[20]. Meaning, OXINIUM provides the lowest risk of reoperation of any bearing combination out to 5 years.

See the 2013 Australian Registry Results inserts to read more.

Wear performance

As patients today continue to go back to their active lifestyles, bearing longevity is more important. Wear reduction involving the bearing surfaces is critical to implant longevity. VERILAST Technology for total hip arthroplasty has been tested and shown to provide superior wear performance compared to CoCr on highly-crosslinked polyethelene, for up to 45 million cycles. With advanced materials designed to last, VERILAST Technology helps restore patients to their active lifestyles, allowing joint pain to be addressed earlier.

Cumulative volumetric wear comparison[21]



Biocompatibility: Corrosion avoidance

There is a growing concern in the orthopaedic community about fretting and corrosion at the head-neck taper junction. Recent studies have indicated that the choice of femoral head material can have a major impact on the presence of corrosion in vivo. With its biocompatible properties, due to its use of oxidized zirconium, VERILAST® Technology has shown to reduce taper corrosion in total hip arthroplasty, minimizing the concern of trunnionosis. This makes VERILAST Technology the optimal solution for total hip arthroplasty[22-23].

A recent Rush University study compared Co-alloy, Ti-alloy, and Zr-Oxide alloy (OXINIUM®). This study showed that OXINIUM Technology produces less material debris. Additionally, it showed "less toxicity and inflammation in peri-implant cells than either Ti-alloy or Co-alloy, in vitro.[24]"

A study by Pawar et al.[25] used an acidic fretting test to compare the potential corrosive and fretting responses of OXINIUM (OxZr), cobalt chrome (CoCr) and stainless steel (StSt) femoral heads.

Method

- 4 head taper combinations were used:
  - CoCr/ Ti64
  - OxZr/ Ti64
  - StSt/StSt
  - OxZr/ StSt
- 3.5 pH solution used to submerge head neck junction
- Test run for over 5 Mcycles at 50ª C

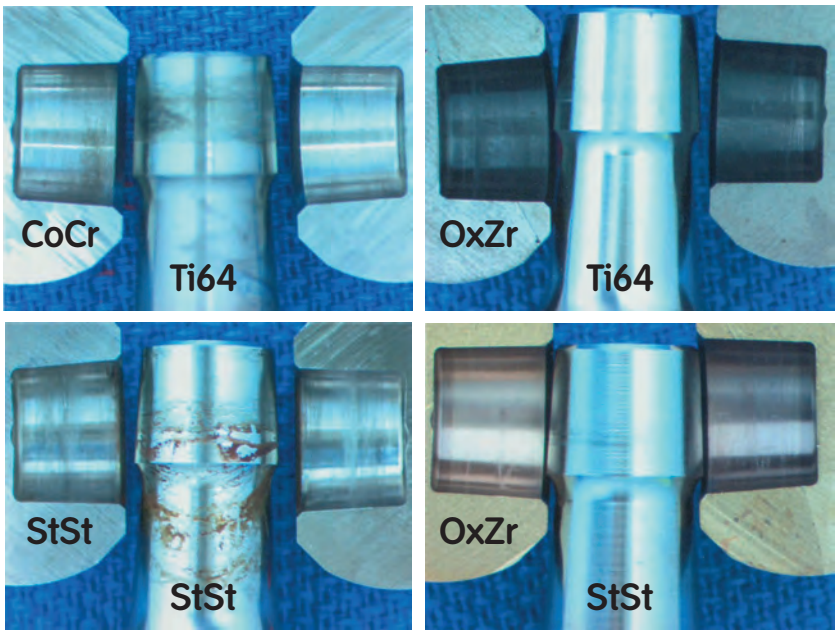
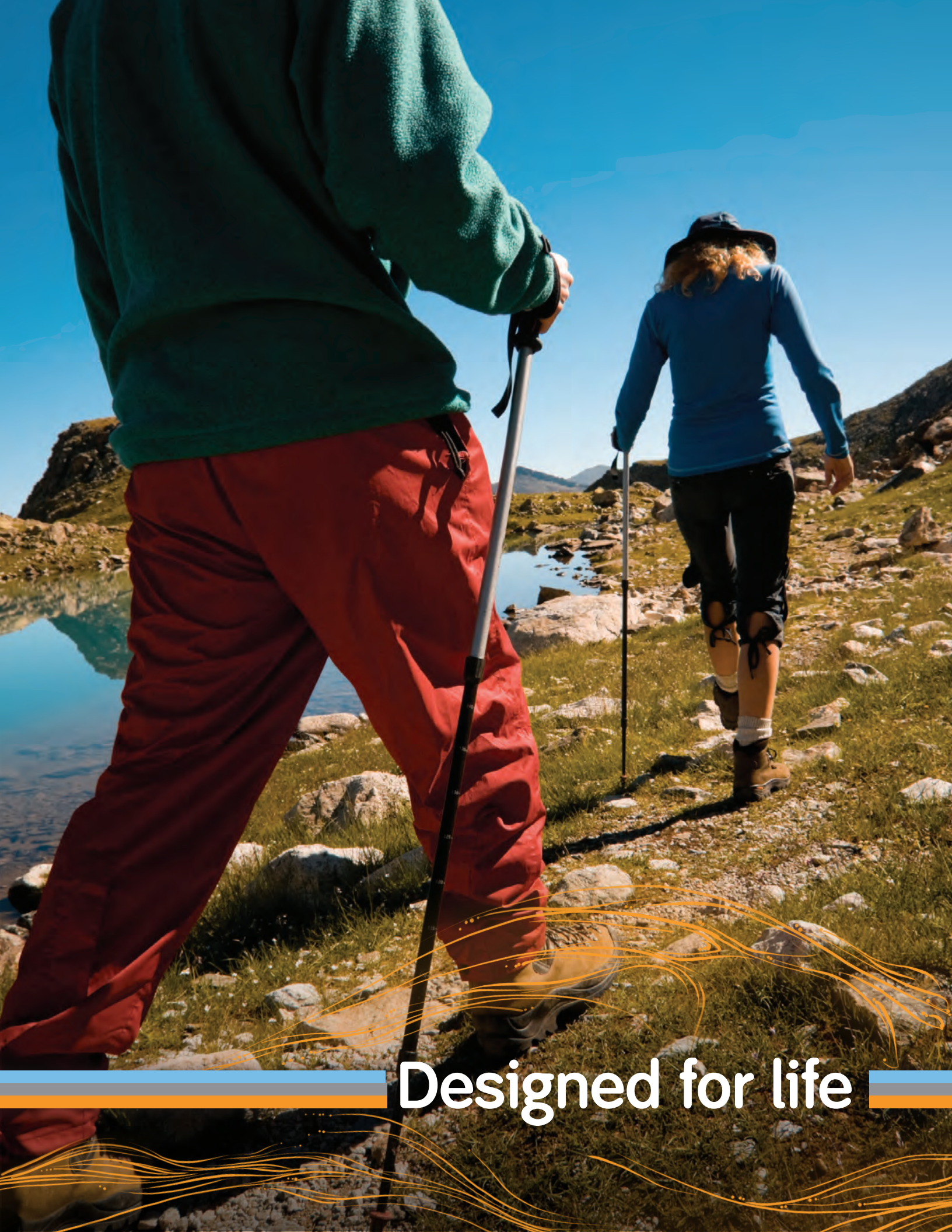


Image from Pawar et al., ASMI 2004.

"The OxZr heads coupled with Ti-6Al-4V and SS trunnions showed the least chemical attack on either the head or the trunnion[25]."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