



National Centre
for the Replacement
Refinement & Reduction
of Animals in Research



Challenge 34
Sharp and to the
Point

Developing needles for high
throughput and critical
compound administration in
mice.

CRACK IT



Precision Injection System: *PrecIS*TM

Revolutionary injection device for preclinical animal studies

A CRACK IT innovation sponsored by and developed in collaboration with:



The
University
Of
Sheffield.



Precision Injection System: *Preci/S*TM

An injection system devised by Active Needle Technology Ltd in answer to the NC3Rs CRACK IT Challenge 34: Sharp and to the Point.

Responding to the issues limiting the single use of needles in pre-clinical animal studies by offering:

1. **Rapid, safe and easy one handed needle exchange**
2. Almost complete **elimination of dead space** losses of injectate

Additionally providing:

3. **Superior accuracy** of dose administered when compared to conventional needle and syringe so supporting the generation of reliable, robust, highest quality study data
4. Significant **cost and time savings**
5. Potential **reduction** in animal cohort required

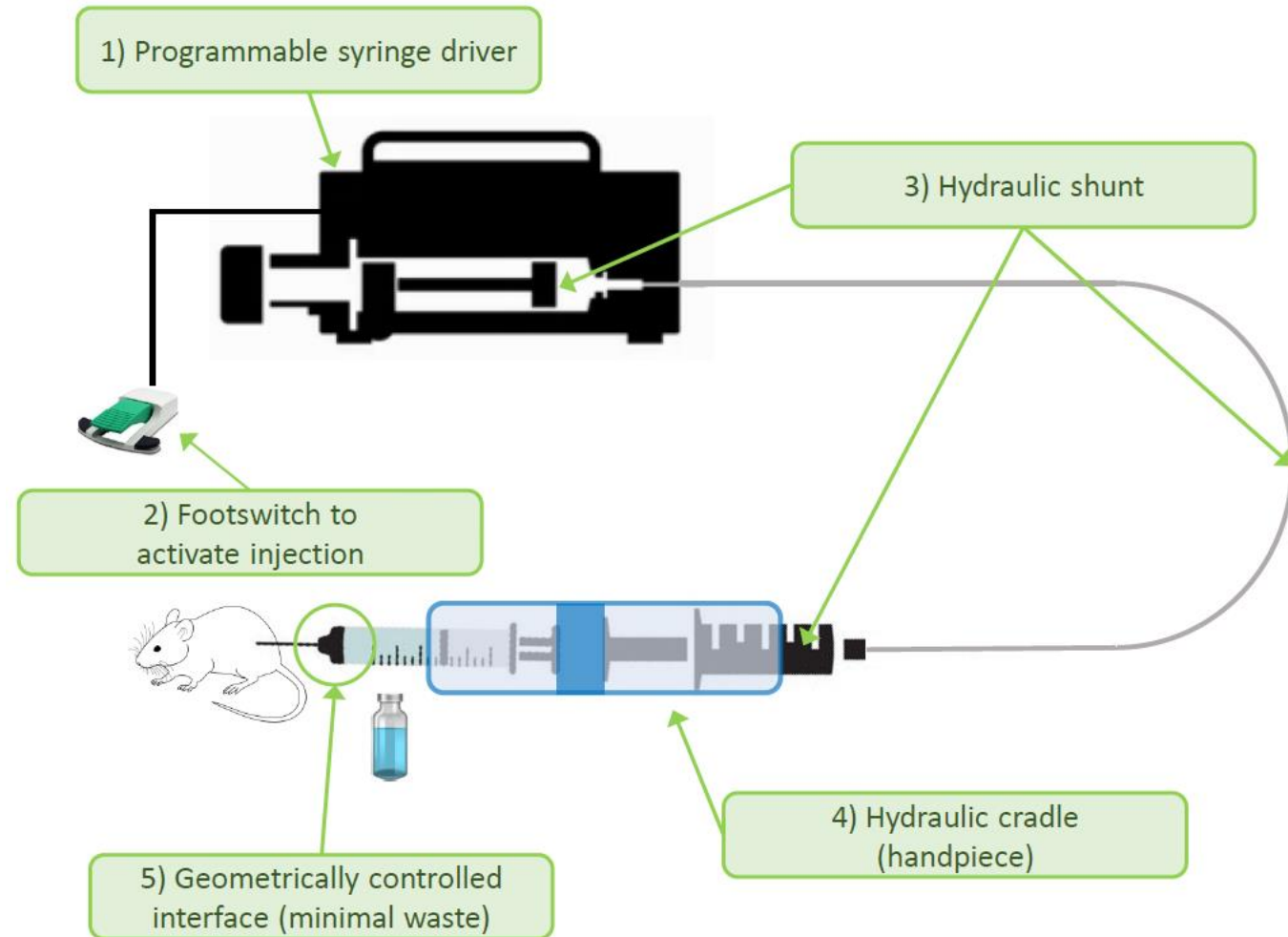


Design & Development Philosophy

1. Adapt and combine technologies that are established in other industrial sectors.
2. Establish system performance.
3. Integrate technologies and “industrialise” design.



For illustration purposes only



Precision Injection System: *PreciS*TM

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For more details on the original CRACK IT Challenge:

<https://nc3rs.org.uk/crackit/sharp-and-point>



**NC
3R^s**

Challenge 34
Sharp and to the Point

Developing needles for high throughput and critical compound administration in mice.

Precision Injection System: *PreciS™*

Please read on for more information



Precision Injection System: *PrecIS*TM

Background

2019 NC3Rs CRACK IT Challenge 34: Sharp and to the Point



Overview of the Challenge and Project

“To develop a device that enables injections in mice without losing material to dead space, allows needles to be changed quickly and safely between animals to ensure sharpness and sterility, and which prevents cross-contamination between animals. This must be competitively priced to facilitate broad uptake across the bioscience sector”



In 2020 Active Needle Technology (ANT) Ltd. were selected and awarded the CRACK IT challenge and has since developed and evaluated in collaboration with the challenge sponsors a **Precision Injection System** for use with rodents: *PrecIS*.

Challenge sponsors: AstraZeneca



<https://nc3rs.org.uk/crackit/sharp-and-point>

Precision Injection System: *PreciS*TM

Becton Dickinson started producing syringes for injection in 1897. Injections are widely used in the rapidly expanding preclinical assessment of new and re-purposed therapies prior to human use. Over the past 50 years, there have been minimal improvements in this important area.



125 years



Active Needle Technology (ANT) has prototyped a preclinical injection system that:

1. Provides high throughput injections with world-leading dose accuracy – improving the quality, reproducibility and repeatability of data-sets.
2. Has unrivalled dead-space – reducing the cost associated with the synthesis and formulation of experimental injectate.
3. Provides rapid, single-handed needle exchange, and semi-automated injections – speeding up injection cycles and improving animal welfare.

Precision Injection System: *PrecIS*TM

Reduced Cost

- The novel needle/syringe interface almost eliminates dead space and so almost eliminates waste of costly injectate. This gives a reduction in loss of injectate due to dead space of up to 90µL per injection.
- The combination of improved dose accuracy and reduction of dead spaces means injecting a **100-animal cohort with 0.1mL of a £1000/mL injectate will save approximately £2000-£9000** depending on the choice of conventional needle and syringe used.
- Time is saved by rapid, safe and easy one-handed needle exchange.
- Additional time savings achieved by automated dose volume delivered from a syringe reservoir.

Improved science

- Dose delivered is more accurate than with conventional needle and syringe. Studies show MAPE (mean absolute percentage error) using conventional **1mL syringe is +15% of intended dose. MAPE using PrecIS is reduced to +2%.**
- Reducing the variability in the dose delivered gives greater surety of robust science and high quality, reliable and reproducible data.

Welfare improvement

- Easy needle exchange – supporting single-use of needles thus preventing cross contamination between animals and minimising any pain that might occur from reusing a dulled needle.
- Rapid response, hands-free feature to control injection administration providing a more stable injection process and permitting greater focus on the animal.
- Reduction in dead space loss avoids needle reuse where cost or availability of injectate may limit needle changing.

Potential for reduction

- More accurate dosing has great potential to translate to fewer animals being employed per study.