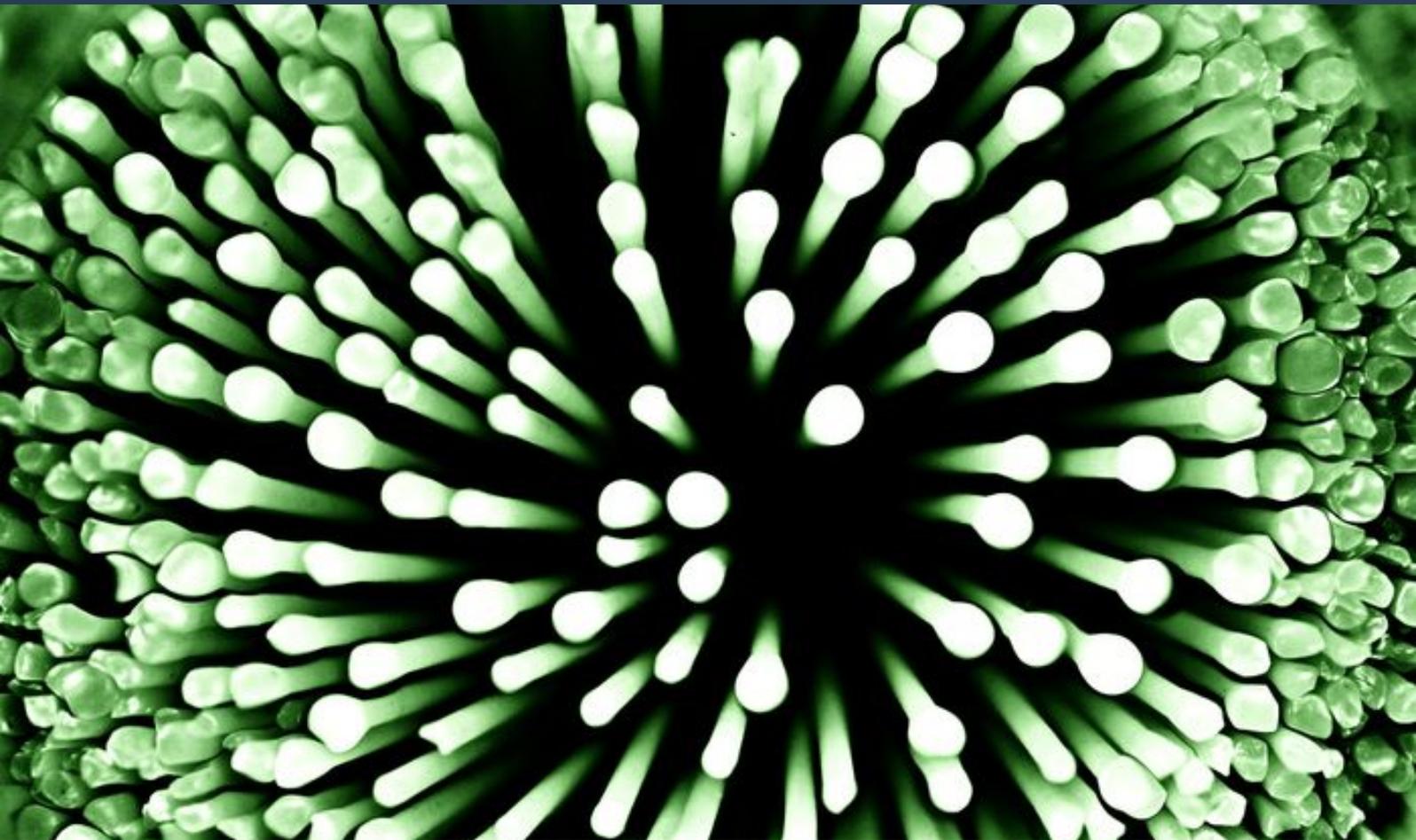




# nanoMIPs: Versatile, Robust and Highly Stable Alternatives to Antibodies

Nanostructured polymer particles typically containing a single binding site for their target.



*Please note, header image is purely illustrative. Source: geralt, pixabay, CC0*

## Seeking

University spin out

## About **University of Leicester**

The University of Leicester works hand in hand with industry to generate business growth and find real applications for its leading innovation and research.

# Background

MIP Diagnostics Ltd was founded in 2015 as a spin out from the University of Leicester by several leading experts in the field, in order to commercialise various forms of Molecularly Imprinted Polymers.

Their innovative approach involves synthesis of MIP (Molecularly Imprinted Polymer) nanoparticles in the presence of whole protein, partial proteolysis of the protein bound to MIP, and subsequent sequencing of released peptides that were bound to the polymer. The important concept behind this approach is that MIPs synthesised in the presence of protein protect peptide sequences involved in MIP formation from proteolysis.

This approach is both rapid (results in circa two weeks) and offers the opportunity to identify regions on the protein surface that have not yet been demonstrated to be antigenic *in vivo*, but which may offer improved affinity for natural and synthetic receptors.

MIP Diagnostics' approach could also revolutionise the generation of binding molecules for the *in vitro* diagnostics industry. Typically, antibodies are generated at random and subsequently mapped to the molecule – this approach identifies good epitopes that can then be used to produce the binding molecules in a fraction of the time currently taken.

This approach has been proven in multiple applications. In particular, for Acetyl Cholinesterase, this approach identified all known epitopes, plus an additional three peptide sequences as potential novel epitopes.

## Tech Overview

MIPs are prepared using a proprietary imprinting process involving the self-assembly of binding monomers around a target. Monomers are then polymerised to generate a nanoMIP with a single binding site: a 'synthetic' antibody. This proprietary technology includes a novel method to produce nanoMIPs which circumvents the drawbacks of traditional MIP manufacturing methods. NanoMIPs are, as the name suggests, nanostructured polymer particles typically containing a single binding site for their target. They can also be fused to solid substrates, such as sensor surfaces, if required. nanoMIPs have been created to small molecules, metabolites, peptides, proteins, viruses and more.

## Benefits

*A scaffold to fit the target* - MIPs can have extremely high affinity target interactions, and be highly selective. Unlike Antibodies and other protein based reagents which have a fixed scaffold determining the overall size and shape of their binding surface, MIPs are formed around the target itself, which better provides for an optimal complementarity between the target and the MIP.

*Monomers* - Vast arrays of possible monomers and cross linking agents are available from which to form MIPs, several such monomers being specifically developed by MIP Diagnostics and our founders. Recent reviews have counted over 5,000 suitable monomers in the literature.

*Functionality* - MIPs can be enhanced by building in required functionalities. For example MIP Diagnostics have the ability to incorporate a desired fluorophore into the body of the MIP itself, ensuring a consistent, built in tag which is often brighter than the equivalent fluorophore conjugated to an antibody or other affinity probe. They can even make MIPs magnetic to facilitate purification, enrichment etc.

## Applications

The robust nature of MIPs and nanoMIPs make them ideal reagents for a wide range of applications including point-of-care diagnostics and in field based testing. As they are synthetic polymers, MIPs can withstand harsh chemical environments such as extremes of pH, seawater, or high concentrations of organic solvents. In addition, MIPs have a very long shelf life at room temperature which makes them ideal when the cold chain cannot be guaranteed.

MIPs have successfully been created and deployed against all major target classes including peptides, proteins and other macromolecular structures, as well as smaller chemical entities such as drugs, their metabolites and commonly used biochemical species such as enzyme cofactors.

## Opportunity

MIP Diagnostics Limited commercialises many types of Molecular Imprinted Polymers. They have their own proprietary process for the manufacture of NanoMIPS, which was developed by Sergey Piletsky and Antonio Guerreiro, but they also do manufacture more traditional polymers as well such as bulk MIPs and rationally designed polymers.

They provide this primarily as a custom service/technology access offering, so if you are looking for a MIP for a particular target/application, then they can offer a professional service on a commercial basis.

In addition to providing MIPs designed specifically for their customers' targets and applications, they also offer clients the ability to manufacture MIPs for themselves using their automated MIP synthesizer. In this way you can control your own manufacturing process and thereby ensure complete security of supply.

MIP Diagnostics Limited operate a licensing and royalty model, for clients who are looking to commercialise a MIP as an element within a device or test.