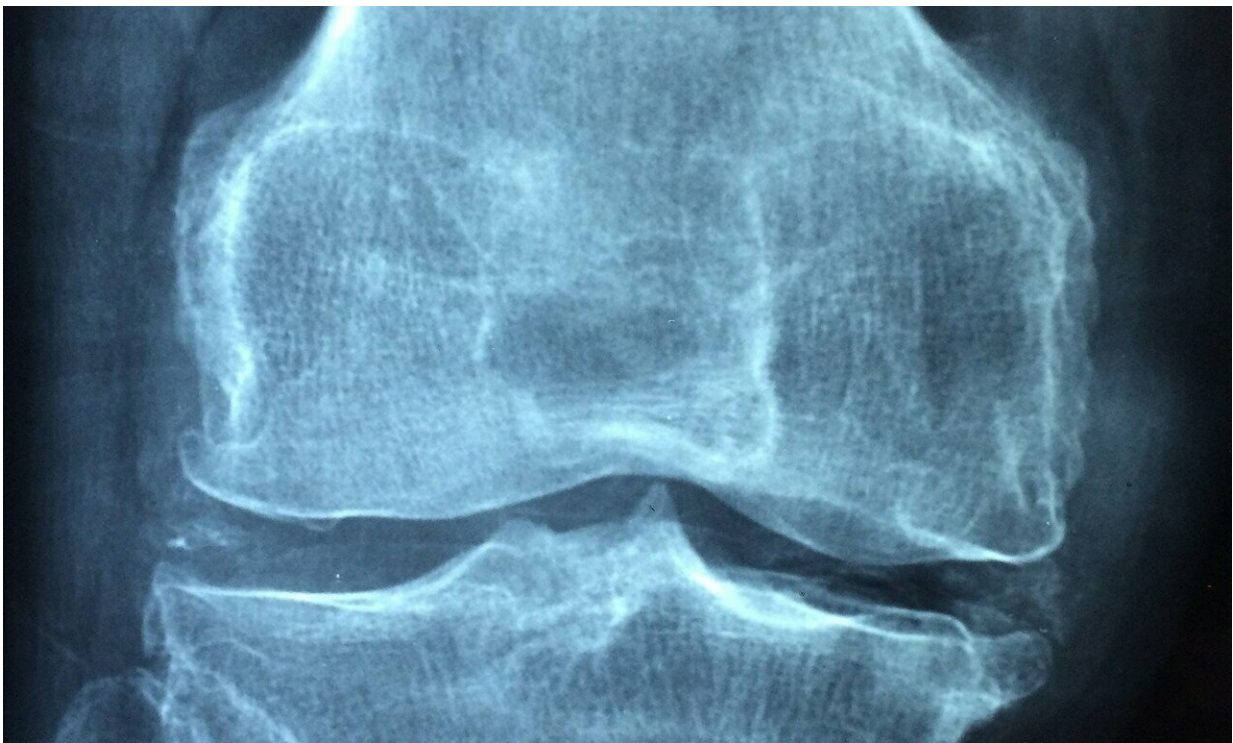# Profiling immune system in pediatric arthritis patients offers hope for improved diagnosis and treatment

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A team of scientists from VIB and KU Leuven has developed a machine learning algorithm that identifies children with juvenile arthritis with almost 90% accuracy from a simple blood test. The new findings,

published this week in *Annals of the Rheumatic Diseases*, pave the way for the use of machine learning to improve diagnosis and to predict which juvenile arthritis patients may respond best to different treatment options. The work was led by Professor Adrian Liston, from VIB and KU Leuven in Leuven, Belgium and the Babraham Institute in Cambridge, UK.

Juvenile idiopathic arthritis is the most common rheumatic disease in children, but it presents in many different forms, severities and outcomes. This diversity makes patient classification difficult, especially in the early stage of the disease.

A team of researchers at Belgian research organisations VIB, KU Leuven and UZ Leuven undertook a detailed biological characterisation of the immune system of hundreds of children with and without juvenile arthritis to help the diagnosis or treatment decisions for this disease.

"Essentially, we took blood samples from more than 100 children, two thirds of whom had childhood arthritis," explains Erika Van Nieuwenhove (VIB-KU Leuven), and first author of the study. "We analysed their immune system at a greater level of detail than was ever done before for this disease, and simply using this data we then used machine learning to see if we could tell which children had arthritis."

The results were quite remarkable: the algorithm was about 90% accurate at identifying the children with the disease. "Using only information on the immune system, and no clinical data at all, we could design a machine learning algorithm that was about 90% accurate at spotting which kids had arthritis," says Professor Adrian Liston (VIB—KU Leuven, Belgium and Babraham Institute, Cambridge, UK). "This result is a proof-of-principle demonstration that immune phenotyping combined with machine learning holds huge potential to diagnose different forms of juvenile arthritis early in the disease course.

Similar approaches could be applied to improve patient selection for treatments and clinical trials."

The researchers are hopeful about the impact of this research in improving patient outcomes. "The tool needs further validation but otherwise there are no scientific barriers to this approach being quickly translated to the clinic," comments Professor Carine Wouters (UZ Leuven), who was the clinical lead for this study. "Down the line, we could use this kind of detailed classification information—and machine learning analysis—to identify which patients will respond best to specific treatment options."

  More information: Machine learning identifies the immunological signature of Juvenile Idiopathic Arthritis, Van Nieuwenhove et al., *Annals of the Rheumatic Diseases*

Provided by VIB (the Flanders Institute for Biotechnology)