Scientists find evidence of how incurable cancer develops

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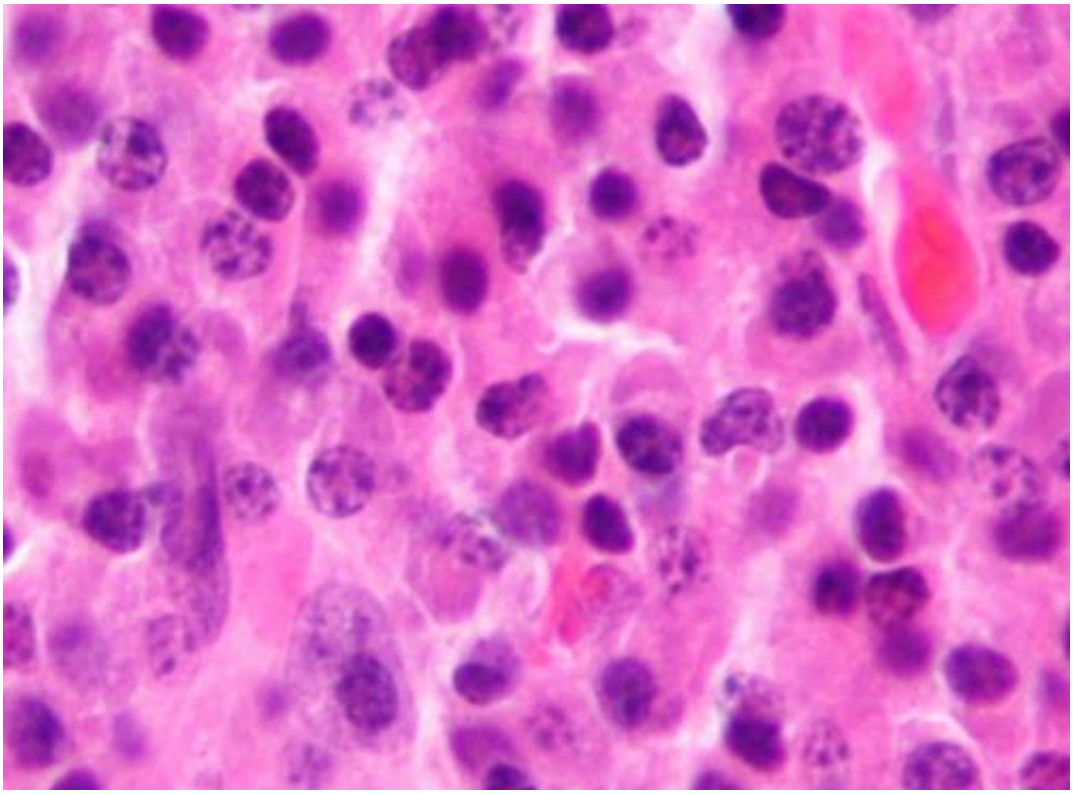

Micrograph of a plasmacytoma, the histologic correlate of multiple myeloma. H&E stain. Credit: Wikipedia/CC BY-SA 3.0

Researchers in the West Midlands have made a breakthrough in explaining how an incurable type of blood cancer develops from an often symptomless prior blood disorder. The findings could lead to more effective treatments and ways to identify those most at risk of

developing the cancer.

All patients diagnosed with myeloma, a cancer of the blood-producing bone marrow, first develop a relatively benign condition called 'monoclonal gammopathy of undetermined significance' or 'MGUS'.

MGUS is fairly common in the older population and only progresses to cancer in approximately one in 100 cases. However, currently there is no way of accurately predicting which patients with MGUS are likely to go on to get myeloma.

Myeloma is diagnosed in around 4,000 people each year in the UK. It specifically affects antibody-producing white blood cells found in the bone marrow, called plasma cells. The researcher team from the University of Birmingham, New Cross and Heartlands Hospitals compared the cellular chemistry of bone marrow and blood samples taken from patients with myeloma, patients with MGUS and healthy volunteers.

Surprisingly, the researchers found that the metabolic activity of the bone marrow of patients with MGUS was significantly different to plasma from healthy volunteers, but there were very few differences at all between the MGUS and myeloma samples. The research was funded by the blood cancer charity Bloodwise, which changed its name from Leukaemia & Lymphoma in September.

Metabolism is the chemical process through which cells create energy and the substances needed to grow and perform cell functions. Cancer cells promote metabolic changes to kick start and drive their rapid growth.

The findings, published in *Blood Cancer Journal*, suggest that the biggest metabolic changes occur with the development of the symptomless

condition MGUS and not with the later progression to myeloma.

Dr Daniel Tennant, who led the research at the University of Birmingham, said, "Our findings show that very few changes are required for a MGUS patient to progress to myeloma as we now know virtually all patients with myeloma evolve from MGUS. A drug that interferes with these specific initial metabolic changes could make a very effective treatment for myeloma, so this is a very exciting discovery."

The research team found over 200 products of metabolism differed between the healthy volunteers and patients with MGUS or myeloma, compared to just 26 differences between MGUS patients and myeloma patients. The researchers believe that these small changes could drive the key shifts in the bone marrow required to support myeloma growth.

Dr Matt Kaiser, Head of Research at Bloodwise, said, "Myeloma is a devastating cancer that can cause debilitating and painful bone damage and, although we have become better at treating it and extending the lives of myeloma patients, it is ultimately almost always fatal. This research provides the basis for developing new and more targeted treatments and minimally invasive ways of identifying those MGUS patients at risk of progressing to myeloma. If we can find ways to block the progression of MGUS, we hope to prevent many cases of myeloma in the future."

Provided by University of Birmingham