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Modern man inherited 'Immune Gene' from Neanderthals

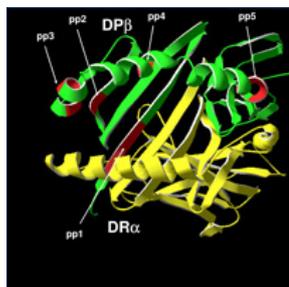


Image of the structure of the novel receptor HLA-DR(alpha)DP(beta)

In close cooperation with a team of international scientists, the research group of **Sebastian Springer**, Professor of Biochemistry and Cell Biology at Jacobs University, have discovered a novel receptor that allows the immune system of modern humans to recognize dangerous invaders and subsequently elicits an immune response. The blueprint for this advantageous structure was also identified in the genome of Neanderthals, hinting at its origin. The receptor probably provided these early humans with immunity against local diseases. The presence of this receptor in Europeans but its absence in early men suggests that it was inherited

from Neanderthals. The results have been published in the *Journal of Biological Chemistry*.

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When pathogens infect the human body, the immune system identifies and attacks dangerous invaders. During evolution, an efficient defense system developed: With the help of certain genes, the human leukocyte antigen system (HLA) produces receptors that assess the risk rate of the pathogens using their profile which has just eight amino acids.

Immune system scans Amino Acids of Pathogens

In order to tell dangerous and harmless pathogens apart, the immune system breaks down the invaders' proteins into peptide fragments and subsequently scans a proportion of these peptides for their amino acid sequences. Up to now, a total of three different peptide receptors of more than 1000 different manifestations were known, which in humans can read the telltale letter combinations. A fourth receptor has now been found by an international team of scientists from the **University of Bonn, Jacobs University Bremen, the University of Düsseldorf, the Technical University of Munich, and Cambridge University**.

This receptor, which is abbreviated as HLA-DR(alpha)DP(beta), consists of a combination of subunits of already known receptors. "The receptor in its new combination was a real surprise, as we hadn't thought this combination possible before," comments **Sebastian Springer**, who – together with the Munich team – was involved in predicting the molecular structure of the new receptor. "In future, it will be very interesting to study the receptor's role in a patient's immune response."

Scientists compared the gene sequence, which encodes the discovered receptor, with existing data bases and determined that an estimated two-thirds of Europeans carry this important structure. Scientists were nonetheless surprised to learn that the gene sequence required for this receptor is rare in people in southern Africa, the region known as the cradle of mankind. When early men, the ancestors of today's humans, left Africa and migrated to Europe a few hundred thousand years ago, they were not as yet equipped with this receptor.

Researchers at **University of Düsseldorf** compiled the sequence of the Neanderthal genome, from small fragments obtained from the Neanderthal data base. They found that the identified Neanderthal gene sequence is almost identical with that of modern humans.

Unlike our ancestors from Africa, the Neanderthals carried this receptor in their immune cells. Neanderthals lived in Europe for probably hundreds of thousands of years, during which time they developed the HLA receptor that provided them with immunity against many pathogens – a distinct evolutionary advantage. The researchers presume that modern humans in Europe owe this advantageous

receptor to the Neanderthals.

Publication: A novel family of human lymphocyte antigen class II receptors may have its origin in archaic human species, *Journal of Biological Chemistry*, DOI: [10.1074/jbc.M113.515767](https://doi.org/10.1074/jbc.M113.515767)

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