

## OUTSIDE JEB

## Sounds like good immunity



Everybody wants to have a ‘good’ immune system, especially when winter flu season hits. When the body is faced with a pathogen, how well the immune system responds is largely determined by a set of molecules that are collectively called the major histocompatibility complex, or MHC. It is MHC’s job to identify foreign entities, or antigens, and trigger an immune response from other molecules like T-cells. However, MHC cannot identify all possible antigens that enter the body. Which antigens MHC can identify is determined by the suite of genes that code for MHC proteins. Having a good assortment of different genes to produce MHC components is one essential part of a healthy immune system. And what determines the selection of MHC genes you have? The MHC genes of your parents.

Across the animal kingdom, researchers have found that animals tend to choose

mates that have different sets of MHC genes from their own. This will ensure that their offspring have maximal pathogen fighting power by having a wide range of MHC components. But how do animals identify partners with optimal MHC gene distributions? One way to do this is through traits that are affected by pathogens. As MHC determines disease resistance, physical traits that are degraded by disease and signal an individual’s condition may also communicate the diversity of that individual’s MHC components or immune system quality to a prospective partner.

Joel Slade, Matt Watson and Elizabeth MacDougall-Shackleton from Western University, Canada, set out to test whether immune system quality could be advertised in a novel cue: the sounds that an animal produces. The researchers used a songbird species, the song sparrow, to test their hypothesis. Song sparrow males learn a unique repertoire of songs during development, and hardships while maturing can impact the diversity of songs that a bird sings. Additionally, females pay attention to male song repertoires and prefer mates with a thicker songbook.

Slade’s team went into the field and recorded songs from male song sparrows. They then analysed hundreds of recordings and identified the number of unique songs each bird sang. Next, they captured the birds, took blood samples and used them to characterize the

diversity of MHC for each bird whose song they had recorded.

As they had predicted, the team found that the sparrows’ MHC diversity was indeed related to their song repertoire size, but in an interesting way. They found that the largest song repertoires were actually associated with an intermediate assortment of MHC genes rather than the widest range. Females are therefore most attracted to mates that have a medium level of diversity in MHC. This was slightly surprising, and they surmised that there might be a delicate balance between ensuring disease resistance and contracting autoimmune disorders (where an overactive MHC identifies parts of the animal’s own body as antigens). It is possible that being ‘too diverse’ is actually a bad thing.

The team’s research is one of the first studies to show that a sound can advertise MHC diversity, and it opens up several new exciting paths for future research, such as the opportunity to follow songbird pairs across the breeding season to measure whether the offspring of ‘optimally’ diverse parents are better disease fighters.

10.1242/jeb.169870

**Slade, J. W. G., Watson, M. J. and MacDougall-Shackleton, E. A.** (2017). Birdsong signals individual diversity at the major histocompatibility complex. *Biol. Lett.* **13**, 20170430.

**Erin McCallum**  
**Umeå University**  
 erin.mccallum@umu.se