The nasal mucosa of vertebrate animals is one of the main points of contact between the host and the environment. Detection of environmental chemical stimuli is critical for the survival of all animals. Additionally, olfactory sensory neurons are in direct contact with the external environment where millions of microorganisms (pathogens and commensals) are present. In order to fight invading pathogens, terrestrial vertebrates are known to have a nasopharynx-associated lymphoid tissue (NALT). For instance, humans have tonsils, which is a form of NALT. Although previously NALT was thought to fight air-borne pathogens only, we reported for the first time the conserved presence of NALT in aquatic vertebrates such as nurse shark, rainbow trout and African lungfish. In this seminar, I will cover the main discoveries pertaining the NALT of teleost fish including the molecular and cellular players involved in the immune response against pathogens. An overview of how to exploit teleost NALT for developing nasal vaccines for use in aquaculture will be provided. Using 16s rDNA pyrosequencing, we have characterized the unique composition of the trout nasal microbial community. We propose that the nasal microbiota is essential for the development, differentiation and functioning of vertebrate olfactory systems. I will present novel findings that demonstrate that the microbiota is essential for the adequate differentiation of olfactory sensory systems as well as NALT in all vertebrates, from teleosts to mammals.