



Division of labour in the black garden ant (*Lasius niger*) leads to three distinct proteomes

Author(s): Martin Quque, Martin Quque , Margaux Benhaim-Delarbre , Jean-Louis Deneubourg , Cédric Sueur , François Criscuolo , Fabrice Bertile

Institution(s): Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France ; Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France ; Unit of Social Ecology, Université Libre de Bruxelles, Belgique ; Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France ; Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France ; Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France ; Institut Pluridisciplinaire Hubert Curien, CNRS - Université de Strasbourg, France

Division of labour (DoL) is one of the criteria of eusociality and its behavioural consequences have been extensively described in many species. Genome sequencing highlights the importance of genetic or epigenetic mechanisms in DoL and correlative or experimental studies on the social insect ontogeny shed light on the hormonal mechanisms making larvae become queens or workers. However, little is known about the signalling pathways actually active and building the caste-specific phenotype at the adult stage. Analysing the whole proteome after larval development provides the opportunity to confirm or deny the suggested pathways in genomics analyses and to find new ones. Colonies of the black garden ant (*Lasius niger*) have only one queen fertilized by only one male. The inter-individual genetic variability is thus very low, making easier to focus on the individual molecular differences solely due to the caste. Mass spectrometry-based proteomics and a selection procedure by PCA enabled us to highlight which biological functions (e.g. immunity, digestion) make the difference between a queen, a domestic and a forager. Molecular data did not only differentiate the queen from workers but also, among the latter, the domestics from the foragers. The proteome of each caste reflected nicely their particular social role: reproduction for queens, immunity for foragers and, surprisingly, digestion for domestics. In queens, social immunity likely favours energy allocation to reproduction over immunity. In accordance with the hyperfunction theory of senescence, the nutrient-sensitive ToR pathway might be proposed as a key driver of the contrasted longevity of ants from different castes. In conclusion, this study highlights the fact that social organization in the black garden ant has major impacts on individual proteome, especially in controlling immunity and modulating longevity. Further studies should elucidate if this is also the case in other eusocial species, including mammals.