

The Research Group
Structural Biology Brussels

has the honor to invite you to the public defence of the PhD thesis of

Aline D'Hondt

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

**Chaperone-Usher pili in enteric *Escherichia coli*:
From adhesome profiling to functional characterization**

Supervisor:

Prof. dr. Han Remaut (VUB)

The defence will take place on

Wednesday, October 21, 2026 at 4 pm

VUB Etterbeek campus, Pleinlaan 2, Elsene,
in Promotiezaal D.2.01

Members of the jury

Prof. dr. ir. Eveline Peeters (VUB, chair)

Prof. dr. ir. Stefan Magez (VUB)

Prof. dr. Doris Vandeputte (VUB)

Prof. dr. ir. Julie Bouckaert (CNRS/ULille, FR)

Prof. dr. Nico Callewaert (VIB-UGent Center for
Medical Biotechnology)

Curriculum vitae

Aline D'Hondt obtained a Master of Science in Bioengineering Sciences: Cell and Gene Biotechnology from the Vrije Universiteit Brussel in 2018. Following her graduation, she started a PhD in the research group of Prof. dr. Han Remaut, funded by a fellowship from the Research Foundation Flanders (FWO).

Her research resulted in a first-author publication in BMC Microbiology and a co-authored publication in Nature. In addition, she supervised five (master's) thesis students and assisted in practical laboratory courses for both bachelor's and master's students.

Abstract of the PhD research

Pathogenic bacteria often require tight attachment to host tissues to establish a successful infection. They do so using a diverse set of adhesins that recognize glycan and protein receptors with high tissue and host specificity. For many pathogens, adhesion is essential for the initiation and persistence of infection and has therefore emerged as an effective target for therapeutic or prophylactic interventions with small molecules or antibodies. Genomic analyses of bacterial pathogens and commensals reveal a diversity of hundreds of different fimbrial adhesins, among which the chaperone-usher (CU) pili family represents one of the most widespread and diverse classes. Understanding the function and mode of action of this bacterial “adhesome” provides insights into the infectious disease process that can lead to new therapeutic options, but can also provide biotechnological tools for diagnostic or therapeutic applications in non-infectious diseases including cancer and inflammatory diseases.

In this thesis, a systematic strategy was used to explore the functional diversity of CU pili. A comprehensive library of 211 fimbrial adhesins was generated through the cloning and purification of representative adhesin lectin domains. Glycan array analysis led to the discovery of two previously uncharacterized mannose-specific adhesins, Yqil and YbgO. Structural and biophysical characterization demonstrated that these adhesins harbor a conserved glycan-binding site with specificity for the Mana1-3Man motif found in paucimannosylated N-glycans. This finding expands the repertoire of mannose-binding adhesins in *Escherichia coli*, which has thus far been largely attributed to the type 1 pilus adhesin FimH. In addition, this work investigated the role of FimH variation in the context of colorectal cancer (CRC)-associated *E. coli*. Analysis of clinical isolates revealed intra-patient diversity in FimH alleles, with multiple distinct strains co-colonizing individual hosts. These findings underscore the importance of strain-level characterization when assessing virulence traits and their contribution to disease progression.

Collectively, this thesis provides new insights into the diversity and functional specialization of CU pili, identifies novel mannose-specific adhesins with unique glycan specificities, and emphasizes the complexity of adhesin-mediated host interactions.