

**Dr Helen Connaris**

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***PERSONAL PROFILE***

An experienced group leader and manager of research projects and teams in academia and in SME, with focus on developing novel non-antibody protein therapeutics for application in disease. Strongly motivated individual to find biological solutions to existing biological problems, particularly in the area of health. An assertive but conscientious team player with experience in delivering projects to specific timelines.

***EMPLOYMENT***

2020 – Present **Senior Research Fellow in Enzyme Production, Purification and Assessment (Translationally Focused)**, *School of Chemistry, University of St Andrews, Scotland*.

Main focus is on the large-scale production and purification of different halogenases in the group of Professor Rebecca J. M. Goss.

2020 – Present **Lecturer (Education Focused)**, *School of Biology, University of St Andrews, Scotland*

Supporting teaching and administrative activities in the School of Biology, including student supervision.

2016 – 2020 **Co-Founder and Chief Scientific Officer, Pneumagen Ltd.** *St Andrews, Scotland*.

A start-up biotechnology company from the University of St. Andrews (incorporated in 2015), main responsibilities to lead the research and platform development of drug products, based on carbohydrate-binding modules (CBMs), for application in disease, primarily respiratory infectious disease and oncology. Also, a board director of the company until May 2020.

2016 – 2020 **Principal Investigator**, *School of Biology, University of St Andrews, Scotland*.

Led the research team involved in identifying and developing novel carbohydrate binding proteins using CBMs derived from bacterial glycosidases that can be utilised as protein therapeutics against respiratory infectious disease and in the area of oncology. As part of this research, the aim was to also gain further understanding on the mechanism of action of these therapeutics when directed to the host and to the pathogen. The work formed part of an externally funded programme that was supported by Pneumagen Ltd. Research has led to five patents.

2009 – 2016 **Senior Research Fellow**, *School of Biology, University of St Andrews, Scotland*

Key achievements: as co-Investigator, won two translational MRC Biocatalyst DPFS awards (2011-2014), a first in St Andrews, for the development and application of novel receptor-binding proteins as therapeutics against respiratory pathogens. Main responsibilities were the day-to-day management of both projects including liaising with UK and international collaborators to achieve set milestones. Also, named postdoctoral fellow in a BBSRC Follow-on-Fund (2009-2010), a PoC for CBMs as therapeutics. Projects have led to high impact publications including four patents.

1999 – 2009 **Postdoctoral Fellow**, *School of Biology, University of St Andrews, Scotland*

Key scientist in a BBSRC project developing high affinity, multivalent CBMs from bacterial sialidases as reagents which led to the idea of CBMs as therapeutics, and co-inventor of the technology; also involved in a Wellcome-funded project studying viral cell-surface glycoproteins that bound host sialic acids involved in paramyxovirus infections. Projects have led to high impact publications including one patent.

1995 – 1998 **Postdoctoral Research Officer**, *University of Bath, UK*

Key achievements: creation of archaeal gene libraries for the isolation of relevant genes to study the thermostability of enzymes from microbes that live in extreme environments to support projects in the Centre for Extremophile Research (CER) in Bath, including process development of archaeal proteins in bacterial expression systems.

1992 – 1995 **Postdoctoral Research Officer**, *Royal Free Hospital, London.*

Main responsibilities: development of host-vector systems for archaeal organisms.

1988 – 1992 **Technical Demonstrator**, *University College London*

Part-time technical demonstrator in Department of Biochemistry for undergraduate practical classes.

1986 – 1987 **Research Assistant**, *MRC Clinical Research Centre, London*

Project on the isolation and purification of glycosidases from the flagellate protozoan *Trichomonas foetus* to understand their role in aborted non-human foetuses.

1985 – 1985 **Trainee Medical Laboratory Scientific Officer**, *Guys Hospital, London*

Department of Histology (6 months).

## ***EDUCATION***

1988 – 1992 **Doctor of Philosophy (PhD), Biochemistry**, *University College London.*

Thesis entitled "Heterogeneity of Proteinases from the Hyperthermophilic Archaeon *Pyrococcus furiosus*." Research supported as part of an Industrial CASE PhD studentship, with a placement year in CAMR Porton Down (now Public Health England), to perform UK's first large-scale production of a hyperthermophilic organism for the isolation of thermostable proteins.

1985 – 1988 **BSc Industrial Biology, 1st Class (Hons)**, *London Southbank University*

1983 – 1985 **BTEC HND Applied Biology (Distinction)**, *London Southbank University*

## ***PROFESSIONAL MEMBERSHIPS AND AWARDS***

2012-2013 Member of ESCMID

1990-1998 Member of UK Extremophile Network (UKEN)

1989-1995 Member of the Society for General Microbiology (SGM)

1988-1992 Member of the Biochemical Society.

1991 Awarded UCL Biochemistry Alan Souter award for the improvement of communication and relations between staff and students within the department.

## ***FUNDED PROJECTS***

Pneumagen Research Agreement (as PI). 5<sup>th</sup> Oct 2016 – 4<sup>th</sup> Jul 2020.

SMART sub-award (as PI): Neumonco application in oncology. 18<sup>th</sup> Feb 2109 – 5<sup>th</sup> Nov 2019.

Combating Respiratory Virus Infections – Novel Immunomodulatory Proteins (as co-PI). Cunningham Trust. 1st Mar 2014 – 31st Aug 2016.

Multivalent proteins for the prophylaxis of influenza (as co-PI). MRC. 1st Jan 2014 - 31st Dec 2014

Multivalent therapeutic proteins for influenza (as co-PI). MRC. 1st Jun 2011 – 31st Jul 2013.

## ***TECHNICAL SKILLS***

**Molecular Biology and Genetics:** isolation of genomic DNA and plasmid DNA, Southern blots, construction of genomic libraries, synthetic biology, radiolabelling primers, PCR, DNA cloning, sequencing, and bacterial/mammalian gene expression systems.

**Biochemistry:** Protein purification chromatography systems, enzymatic assays, enzyme kinetics, trypsinolysis of proteins, denaturing and non-denaturing gel systems, Western blotting, antibody assays (ELISA), isolation of soluble proteins from inclusion bodies, as well as refolding and renaturation of proteins. Knowledge of biophysical techniques involved in the characterization of proteins, such as ITC, SPR, DLS, ThermoFluor.

**Cell/tissue culture-based models:** primary cells (human airway cell lines), immortalised mammalian cell lines, transfection, transformation of genetic material. Functional analysis of genes and proteins.

**Immunology:** identification of inflammatory mediators using multiplex analysis kits, analysis of antibodies and antibody levels from tissue.

**Structural biology:** Crystallization trials, including use of Rhombix suite, crystallographic data collection, knowledge of data processing packages such as MOSFLM, AMoRe, REFMAC and other CCP4 packages, and good knowledge of program O.

## ***COMPUTER SKILLS***

Most PC/Mac driven packages such as Microsoft Office, Powerpoint, Excel etc. Use of protein and molecular biology databases such as sequence analysis programs, statistical packages, bioinformatics tools for high-throughput data analysis, image processing packages.

## ***TEACHING EXPERIENCE***

Guidance throughout students' research projects (PhD, and final year undergraduates), laboratory practice, presentation of results, helping in preparation of oral presentations.

## ***PUBLICATIONS*** (including patents)

**Connaris, H** and Rogers, G: Cancer Treatment. Patent Publication date 11 June 2020. Publication No. WO2020115495 (A1)

**Connaris, H.**, Yang, L., Potter, JA: Viral Treatment. Patent Publication date 27 February 2019. Publication No. WO2019166802 (A1)

**Connaris, H** and Potter, JA: Modified Protein. Patent Publication date 9 January 2019. Publication No. WO2019/138222 (A1)

**Connaris, H.**, Telford, J., Rogers, G: Cell Modulation. Patent Publication date 29 Mar 2018. Publication No. WO2018055373 (A1)

**Connaris, H.**, Taylor, GL., Randall, RE: Novel Adjuvants. Patent Publication date 29 Mar 2018. Publication No. WO2018055370 (A1)

**Connaris, H.**, Taylor, G., Yesilkaya, H., Andrew, P: Treatment and/or Prevention of Sepsis. Patent Publication date 29 Mar 2018. Publication No. WO2018055365 (A1)

Taylor, GL and **Connaris, H.** Immunomodulatory Compounds. Patent Publication date 23 January 2015. Publication No. WO2015110831(A1)

Yang, L., **Connaris, H.**, Potter, JA, and Taylor, G.L. (2015). Structural characterisation of the carbohydrate-binding module of NanA sialidase, a pneumococcal virulence factor. *BMC Structural Biology* 15, 10 p15

Govorkova, E.A., Baranovich, T. Marathe, B.M., Yang, L., Taylor, M.A., Webster, R.G., Taylor G.L. and **Connaris, H.** (2015). Sialic Acid-Binding Protein *Sp2CBMTD* Protects Mice against Lethal Challenge with Emerging Influenza A (H7N9) Virus. *Antimicrobial Agents and Chemotherapy*, 59 1495-1504.

**Connaris, H.**, Govorkova, E.A., Ligertwood, Y., Dutia, B.M., Yang, L., Tauber, S., Taylor, M.A., Alias, N., Hagan, R., Nash, A.A., Webster, R.G. and G.L. Taylor (2014). Prevention of Influenza by Targeting Host Receptors Using Engineered Proceedings of the National Academy of Sciences (USA), 111 6401-6406.

**Connaris, H** and Taylor, GL. Carbohydrate Binding Molecules: Patent Publication date 3 Mar 2011. Publication No. US2011269670A1

**Connaris, H.**, Crocker, P, and Taylor, GL. (2009). Enhancing the receptor affinity of the sialic acid-binding domain of *Vibrio cholerae* sialidase through multivalency, *Journal of Biological Chemistry*, 284: 7339-7351.

Taylor, G., Xu, G., Newstead, S., Potter, J., **Connaris, H.**, Russell, R., And Andrew, P. (2006). Structural Studies on Sialidases from *Streptococcus pneumoniae* and *Clostridium perfringens*. *Trends Glycoscience Glycotechnology* 18, S6

Moustafa, I., **Connaris, H.**, Taylor, M.G., Zaitsev, V., Wilson, J.C., Kiefel, M.J., von Itzstein, M. and Taylor, G.L (2004). Sialic acid recognition by *Vibrio cholerae* neuraminidase. *Journal of Biological Chemistry*, 279: 40819-40826.

Theodossis, A., Walden, H., Westwick, E.J., **Connaris, H.**, Lamble, H.J., Hough, D.W., Danson, M.J. and Taylor, G.L (2004). The structural basis for substrate promiscuity in 2-keto-3-gluconate aldolase from the Entner-Doudoroff Pathway in *Sulfolobus solfataricus*. *Journal of Biological Chemistry*, 279: 43886-43892.

Takimoto, T, Taylor, GL., **Connaris, H.**, Crennell, SJ. and Portner, A (2002). Role of hemagglutinin-neuraminidase protein in the mechanism of *Paramyxoviruses* cell-membrane fusion. *Journal of Virology*, 79:13028-13033.

Bell, GS., Russell, RJM., **Connaris H.**, Hough, DW., Danson, MJ. and Taylor, GL. (2002). Stepwise adaptations of citrate synthase to survival at life's extremes: From psychrophile to hyperthermophile. *European Journal of Biochemistry*, 269: 1-10.

**Connaris, H.**, Takimoto, T., Russell, R.J.M, Crennell, S., Moustafa, I., Portner, A. and Taylor, G.L (2002). Probing the sialic acid binding site of the hemagglutinin-neuraminidase of Newcastle Disease Virus: Identification of key amino acids involved in cell binding, catalysis and fusion. *Journal of Virology*, 76: 1816-1824.

Buchanan, CL., **Connaris, H.**, Danson, MJ., Reeve, CD. and Hough, DW. (1999). An extremely thermostable aldolase from *Sulfolobus solfataricus* with specificity for non-phosphorylated substrates. *Biochemical Journal*, 343, 563-570.

**Connaris, H.**, Chaudhuri, JB., Danson, MJ. and Hough, DW. (1999). Expression, reactivation and purification of enzymes from *Haloferax volcanii* in *Escherichia coli*. *Biotechnology and Bioengineering*, 64: 38-45.

**Connaris, H.**, West, SM., Hough, DW. and Danson, MJ. (1998). Cloning and overexpression in *Escherichia coli* of the gene encoding citrate synthase from the hyperthermophilic archaeon *Sulfolobus solfataricus*. *Extremophiles*, 2: 61-66.

**Connaris, H.** and Danson, MJ. (1997) 'Evolution of Microbial Life' (eds D. McL. Roberts, P. Sharp, G. Alderson, M. Collins. 1996. Society for General Microbiology, Symposium 54, 299pp. Cambridge University Press, NY). *Protein Science*, 6: 1124.

**Connaris, H.**, Cowan, DA. and Sharp, RJ. (1991). Heterogeneity of proteinases from the hyperthermophilic archaeobacterium *Pyrococcus furiosus*. *Journal of General Microbiology*, 137: 1193-1199.

**Connaris, H.**, Cowan, DA. Ruffet, M. and Sharp, RJ. (1991). Preservation of the hyperthermophile *Pyrococcus furiosus*. *Letters in Applied Microbiology*, 13: 25-27.

**Conference abstracts (invited talks/posters): >40**