

“Positive data could result in fewer cases of heart attack and stroke in diabetic patients in the future”*

Follicum develops peptide-based medication for hair growth stimulation and diabetes. The combination might at first seem strange, but the company justifies the grouping through the biological connection of the indications involved. BioStock has spoken to professor Anna Hultgårdh, one of the company founders, who clarifies how the two indications are connected and how synergies arise while working in parallel with the two different projects.

Candidate against hair loss emerging from academic research

Follicum develops medications based on shorter sequences of human proteins, known as peptides. While studying arteriosclerosis at Lund University, the founders of Follicum discovered that a modified variant of the bodily produced protein osteopontin increased hair growth in mice.

This unexpected finding resulted in the development of the company’s hair growth stimulating candidate, FOL-005. It showed positive results in the preclinical programme and in early clinical trials. As such, Follicum recently announced that all patients in a follow-up phase IIa-study on human scalps have completed treatment and that top-line results are expected by the end of the year.

A study to investigate the mechanism of action resulted in a new project

In order to study the mechanism of action for FOL-005, the company studied beta cells from the pancreas. The pancreas regulates blood sugar levels and produces and releases insulin to this effect.

Further research unexpectedly showed that the studied peptide stimulates insulin release – an important parameter in the treatment of diabetes. This resulted in a new peptide class which is currently being developed towards treating diabetes. The potential has been confirmed in several experimental models in vitro, ex vivo and in vivo, where Follicum’s peptides have shown similar potential to current GLP-1 analogues. The preclinical programme is progressing at full speed, and a candidate is to be selected before the end of the year.

The diabetes project is well-known among significant actors

Follicum has, since 2017, been a member of a comprehensive diabetes project led by **Lund University**, financed by the **Swedish Foundation for Strategic Research**. Other partners in this project are industry leaders within diabetes research, such as **Novo Nordisk**, **Johnson & Johnson Innovation**, **Probi**, **CardioVax**, **Region Skåne**, **Skåne University Hospital** and **Pfizer**. This context provides Follicum with valuable contacts and networking opportunities at the top international level.

Furthermore, **Novo Nordisk Foundation** has, in both 2017 and 2018, awarded professor Jan Nilsson’s research group at the Clinical Research Center at Lund University, research grants to perform preclinical diabetes studies using Follicum’s peptides.

The biological connection between hair loss and diabetes

Despite hair loss and diabetes being two starkly different indications, our peptide-based treatments have

* This is a translation of the [BioStock article published](#) in Swedish on 27 September 2018

the potential to treat both conditions effectively and securely. The underlying reason why this is possible, is that there is a biological connection between the two conditions.

Research has shown that men can suffer hair loss symptoms even at early stages of diabetes and that a progression in this direction may be an early sign of type 2 diabetes. Normal hair growth requires oscillation between active and inactive states in hair follicles. Insulin seems to have a negative effect on the hair follicles' transition to the active phase, meaning that hair growth slows or stops completely.

Improved tissue repair, fewer diabetes complications

The process of hair growth is reminiscent of tissue repair and many diabetes complications arise because of a reduced ability to repair damaged tissue. Because Follicum's peptides have the potential to improve the ability of tissue repair, the company aims to develop a diabetes treatment that is effective in treating elevated blood sugar levels in diabetes while lowering the risk for complications compared with other current treatment alternatives.

The founder's insight into peptide treatments and the advantages of parallel projects

Anna Hultgårdh is professor of vascular wall biology at Lund University and is also one of the founders of Follicum. BioStock contacted Anna to further clarify the relation between hair loss and diabetes, as well as getting her view on what kind of synergies the development of parallel projects can create in the company.

Anna Hultgårdh, could you start by describing what a peptide is and what their natural properties are?

Answer: A peptide is a molecule consisting of a chain of building blocks called amino acids. What differentiates a peptide from a protein is size. A smaller number of amino acids yield a peptide, while a larger number of amino acids result in a protein. Peptides exist in many places in the body and they have an important role as they transfer signals between different cells in the body. Simply put, they are crucial for the normal functioning of the body and directly affect movement, pain reaction, well-being and a number of other areas.

Generally speaking, how do peptide treatments work?

Answer: All peptides work as messengers and have the important trait of being able to facilitate communication between cells. They transfer information to cells of how they should function in the optimal way. Peptides used as medication have advantages such as low toxicity, high specificity, high biological activity, and relatively speaking, low production cost. The first peptide to be released on the market was insulin.

What is your experience of peptides and the development of peptide-based pharmaceuticals?

Answer: Being a founding member of Follicum and working as a member of the board ever since the start in 2011, I have followed the progress of FOL-005 very carefully. This has given me knowledge of how the production of peptides occurs and how you can work with peptides in a laboratory. Ever since we began studying potential treatments for diabetes, I encounter questions pertaining to research and peptide development on a daily basis.

What do you now know about the mechanism of action regarding both FOL-005 and Follicum's new peptide class? How are they similar?

Answer: Both peptides are endogenous, and we have identified the receptors that bind the peptides in both hair follicles and in the beta-cells of the pancreas. Our analysis shows that the peptides respond in the same way to both cell types. They have the ability to stimulate damaged cells to survive and based on this knowledge we believe that they may be important for how tissue or an organ can heal or repair when wounded.

Are there any particular diabetes complications that are affected by the above suggestion of tissue repair and that you therefore direct particular attention towards when improving your peptides?

Answer: Yes, there are several. Cardiovascular complications are very common in diabetic patients. Previous studies performed by our collaboration partners at CRC in Malmö show that a cause for this might lie in inadequate repair in the vascular wall, leading to a higher prevalence of heart attack and stroke. We are

now researching the effect of Follicum's peptides in animals and cell-based models, for instance, what occurs on the vascular wall when it is damaged. It will be very exciting to follow this new path of the project. NASH is another example of a complication often seen in diabetic patients, and even here we believe that the ability of the peptides to improve the repair of a tissue wound can be hugely beneficial.

What synergies does the company create by developing two distinct peptide treatments for two different conditions?

Answer: I see two main advantages. The first one stems from experimental work with peptides in the laboratory. Peptides have largely proven to function in similar ways in different cell types. It might also be the case that the mode of action for the peptides is similar. If that is the case, we would be able to save time and reduce costs by understanding the mechanisms of action. This is an avenue that we have begun to explore. A second advantage is that all peptides need to go through the same stages of development. As Follicum has a broad experience within this area, the knowledge is transferable to the development of other peptide projects, such as the diabetes project.

What tangible lessons have you been able to draw from the FOL-005 project that have aided your work with diabetes?

Answer: In the experimental work with FOL-005 we have built a platform using different analyses focusing on mechanisms of tissue reparation. Optimising the dosage of peptides in our experiments is a central aspect which is often very time consuming. As this has already been done with FOL-005 we have a benchmark to work from concerning the peptides in the diabetes project.

Beyond finalising the results from the phase IIa-study with FOL-005 in the autumn, you have previously announced that you aim to select a diabetes candidate by the end of the year. What steps do you need to take in order to make this happen?

Answer: Yes, that is correct. An important goal is to have a candidate selected by the end of the year. By then, the results from the ongoing cell and animal studies from our own and contracted lab partners should be complete. The focus lies in identifying and choosing a peptide that despite having a positive effect on insulin release, also has a definitive effect for the repair of sick or damaged tissue.

What other milestones do you expect to reach within each project within the coming year?

Answer: We have broad portfolio of studies. An example of an interesting question that we would like to explore in the coming year, is to study whether the new peptide class can affect stabilisation of arterial calcified plaque in diabetics. The ability of the peptides to repair tissue is crucial for the stabilisation of plaque. We are now waiting for the results to choose the most appropriate peptide. A study could be done at my lab at BMC in Lund where we have a mouse model prepared for that very purpose. Everything is set for the work to start and it will be incredibly exciting to see how the peptides affect plaque stability. Should such a study render positive data, this could result in fewer cases of heart attack and stroke in diabetic patients in the future.

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About Follicum AB

Follicum is a biotech company focused on the discovery and development of peptide-based drugs. The primary focus is in hair growth stimulation, where Follicum has obtained very promising results with FOL-005 in a recently completed clinical trial. In diabetes, Follicum's research has resulted in a new peptide class which significantly increases the release of insulin in pre-clinical models. The company was founded in 2011, and is based in Lund, Sweden. Follicum is listed on the Swedish small cap exchange Spotlight since 2014. www.follicum.com