VISION PAPER
IMMUNOLOGY
& INFLAMMATION

medicon valley alliance
Creating Opportunities

THE EUROPEAN UNION
The European Regional Development Fund

Interreg IV A
ÖRESUND – KATTEGAT – SKAGERRAK

invest in skåne
part of business region skåne

The Medicon Valley Beacons is part of the collaboration project "Medicon Valley – a world-class life science cluster" between Medicon Valley Alliance and Invest in Skåne. It is partly funded by the EU Interreg IV Programme.

TABLE OF CONTENTS

Photo: National Cancer Institute – Bruce Wetzel & Harry Schaefer

① WHY IMMUNOLOGY & INFLAMMATION?

To preserve the local presence of the industry, Medicon Valley must continue to be a region that trains, attracts and retains skilled life science experts from the entire value chain, including corporate R&D, venture financing and production. To train, attract and retain this kind of talent, the local scientific environment should become sufficiently competitive, to secure a steady stream of highly skilled graduates and scientists. It is essential that our local universities interact with private companies, to provide a research and teaching environment, which is internationally competitive and secures optimal individual opportunities for foreigners and locals.

Prosperous regions like Boston, Oxford-Cambridge and the San Francisco Bay Area, where local companies are growing, and foreign investments are significant, have one thing in common – world class talent due to the presence of world-class teaching, and research environments at top ranked universities. These scientific environments have succeeded in branding themselves as places with the best faculty, most fertile research environments and brightest students. Talent itself has a tendency to attract more talent – the best want to be with the best.

As an interest organization representing governmental, academic and industrial life science entities in the Oresund region, Medicon Valley Alliance has launched the "Beacon initiative". The objective is to develop, expand and brand 4-5 research environments – beacons – that build on Swedish-Danish synergies between existing strongholds, in both the private and public sector, and which span the entire life science value chain, from early research all the way to commercialization, job creation and economic growth. A beacon is a multi-symbol. It is a signpost that says "we are here, on strong ground." It is a pheromone, which attracts foreign companies, scientists, and investors. A small region such as Medicon Valley cannot be world leading, and internationally attractive, in every area. Hence, Medicon Valley should focus on a few beacons that can be scientifically and economically justified. A beacon should respond to the needs of tomorrow's life science environment, and thus needs to be created with a clear understanding of future trends and requirements.

Together with Boston Consulting Group (BCG) MVA conducted an in-depth bibliometrics analysis of the various scientific strongholds in Medicon Valley. Based on these measures, 10 potential beacon areas were identified. Each of these was then evaluated through more than 40 extensive interviews with some of the stakeholders. When this information was combined with other analyses, it was demonstrated that Immunology & Inflammation is one of the scientific areas where the region will be particularly strong, when and if the research efforts in the region are brought together and combined. It is concluded that the region has the potential to become a world-leading region within immunology and inflammation research.

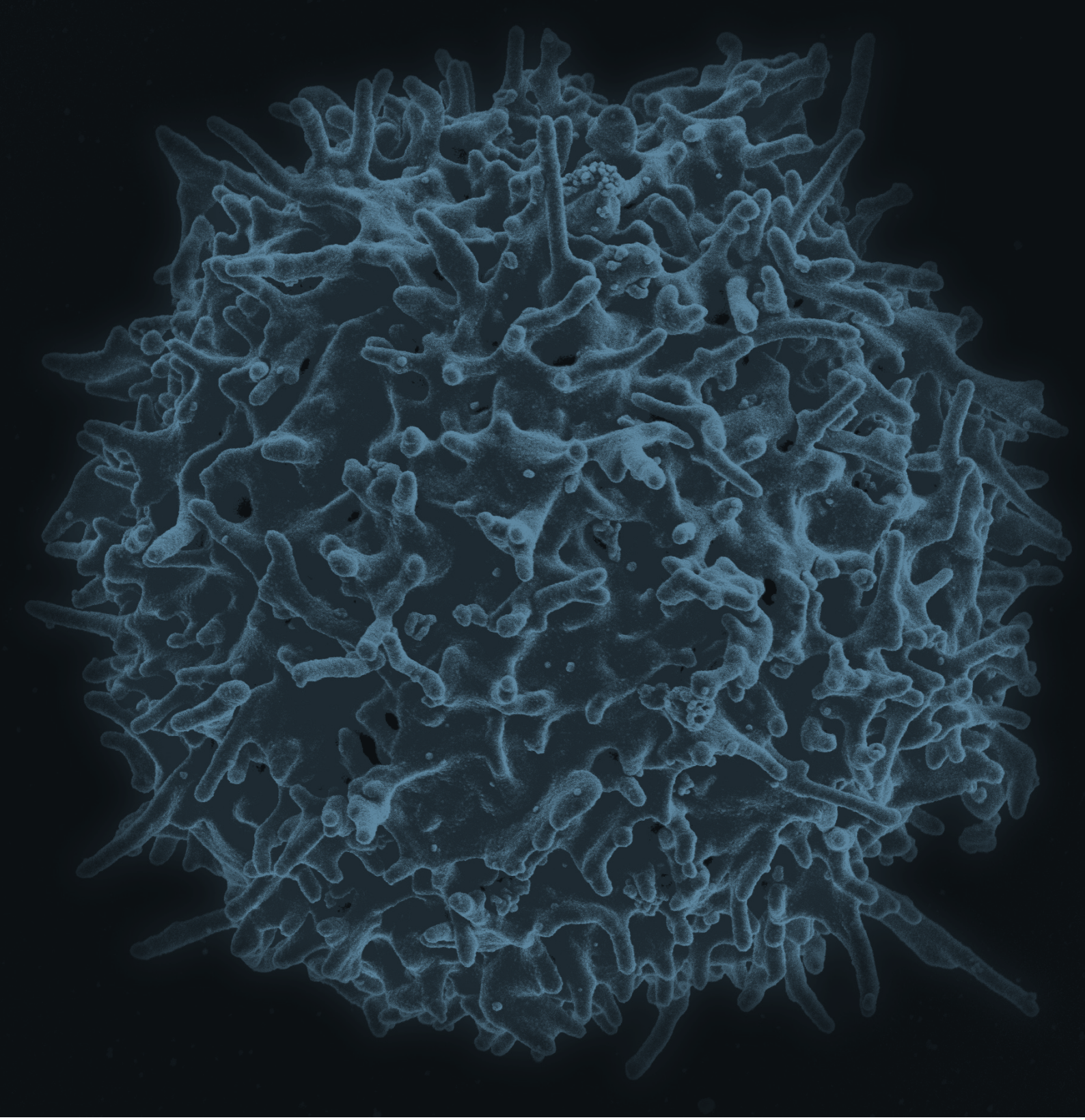
The idea was first to establish a group of interested parties from both academia and industry, in order to create a joint vision for how to develop the region to become internationally recognized as one of the world's leading centers in basic and translational immunology/inflammation research and education.

What's in it for academia?

- **Uniting cuttingedge research and methods in order to expand synergies and scientific interactions**
- **Coordinating teaching and mentoring within the region to enhance the quality and scope**
- **Increasing the interest from private/governmental/EU funding agencies**
- **Increasing the attraction for national and foreign students/Ph.D.s/postdocs/scientists.**
- **Increasing the interaction and collaboration with industry**

What's in it for industry?

- **Ensure the quality and translational aspects of basic research**
- **Better qualified PhD students**
- **Enhanced collaboration and interaction with academia**
- **Increased projects/industrial spin-offs**



The focus is the academic approach to the basic research to be able to achieve cutting edge results, which lead to a better understanding of disease mechanisms, leading to novel treat-ment methods and technologies. The translational research is a consequence of high-level basic and preclinical research, leading to results which can be commercialized, and thereby become beneficial to patients and the society.

The commercial perspective should furthermore be achieved by support functions and collaborations, but also by research projects financed by pharma/biotech/medtech companies.

② WHAT IS IMMUNOLOGY & INFLAMMATION?

Immunological and inflammatory processes play a central role in a wide range of disabling diseases such as infections, allergic diseases, autoimmunity, rejection of organ transplants, graft-versus-host reactions, as well as cardiovascular, neurodegenerative and metabolic diseases and cancer. The identification and development of novel therapeutic targets for these diseases and conditions require a deeper understanding of the basic mechanisms regulating innate and adaptive immune responses.

Considering the large unmet medical need, therapy based on controlling innate and adaptive immunity is a very attractive research area, both within established therapeutic principles, such as treatment with antibodies and inflammatory antagonists, and within new innovative ways to activate the immune system to treat e.g. cancer.

A strong focus on basic research and thereby basic mechanisms has the potential to benefit all conditions where immunology and inflammation play an important role, but the main areas of immunology and inflammation research within which the region has the strongest potential to become a world leading region are:

1) Autoimmune diseases, such as RA, type 1 diabetes, Mb. Sjögren, SLE, IBD.
2) Metabolic diseases (obesity, type 2 diabetes, metabolic syndrome).
3) Autoimmune CNS diseases, such as multiple sclerosis.
4) Allergy and Asthma.
5) Neuro inflammatory diseases, such as Parkinson's and Alzheimer's diseases
6) Autoimmune skin diseases, such as psoriasis and scleroderma.
7) Cardiovascular diseases.
8) Oncology. Controlling the inflammatory mechanisms of tumor pathology
9) Oncology. Antibody therapy and activation of cellular innate immune responses.
10) Next generation therapeutic vaccines.

The potential to become world leading does not encompass all the areas mentioned above but within niches of these areas where the region is truly competitive. The narrowing of the areas shall be based on a tissue specific focus, e.g. skin, brain, endocrine pancreas, intestine, blood vessels, and lung.

Immunology and inflammation research is highly inter-disciplinary, and therefore the establishment of a research center encompassing many different disciplines is believed to release strong synergies and innovative approaches to reach groundbreaking research achievements.

Photo: NIAID

③ VISION FOR IMMUNOLOGY & INFLAMMATION

The following vision has been developed:
Within a decade, we will have an immunology/inflammation research center in the region, for seamless integration between basic and translational innate and adaptive immunology, of the highest international scientific standard for the benefit of basic science, industry, healthcare providers, patients, and society in the region.

The "highest international scientific standard" should primarily be evaluated based on biblio-metrics, and be benchmarked against the best in the world.

The vision builds on the strongholds of the region. These are found to be:

- Health registers and biobanks are of a world-class standard
- Strong positions within immunology and inflammation in specific tissues such as intestine, endocrine pancreas, skin, brain, blood vessels, and lung.
- Pharma, biotech and medtech are key sectors in the region
- Strong position within different disease areas of immunology and inflammation: diseases of mucosal tissues (intestine, lung), neurological diseases, rheumatology, diabetes and metabolism, infections
- ESS and MAX IV will give the region the world's best neutron and X-ray synchrotron research infrastructure. These "super-microscopes" have the potential to dramatically improve our understanding of disease biology at the molecular and cellular level.
- Vaccine design and technologies
- Long tradition of manufacturing of biologicals

Mission statement:

The uniqueness of this beacon will be the tissue specific targeting of immune response, immune regulation, and inflammation; and that the research is based on a combination of A) basic immunology & inflammation, (B) patient registry/organ banks, (C) early clinical devel-opment expertise (D) close connections with proteomics, metabolomics, and systems biology research groups.

Implementation of the Mission and Vision:

- An Academy in Immunology and Inflammation should be established in the region. This should include an advisory board, and an administrative office.
- Before having established a center, the short-term ambition is to exploit existing research facilities, and the Academy will coordinate players, attract/apply for funding, facilitate interdisciplinary collaboration, and manage innovative joint projects.
- The administrative office shall ensure the sharing of information about relevant initiatives, activities, and meetings in the region. An internet site for Immunology & Inflammation in Medicon Valley will be established, to facilitate this information flow, and promote the region.
- Regular scientific meetings on immunology and inflammation in the region, as collaboration between the universities and the industry. These should be held quarterly, with invited international speakers, and with special emphasis on attracting PhD students and young scientists.
- International conferences in Immunology and Inflammation should be attracted to the region.
- The longer term-goal is the establishment of a Center which shall operate as an internationally open environment, where scientists work in project teams and converge many different disciplines', based on the regional strongholds.
- The Center will be organizationally integrated with the local universities, and committed to provide the best teaching environment.
- The Center must ensure that it has the resources and attractiveness, to be able to attract first class international scientists.
- The universities will collaborate on strengthening the education in basic immunology and inflammation, PhD courses, and master degrees in immunology.
- University hospitals in the region will be affiliated to the center, and committed to ensure strong clinical input to the research.
- The center provides fully equipped laboratories, with access to state-of-the-art instrumentation.
- The scientific ambition is to publish research results in the top ranked international journals, but also to explore commercialization, either through company spin-outs or external collaborations.
- A large international immunology science prize, to position the region as a strong international hub for immunology/inflammation.

④ OPPORTUNITIES FOR IMPROVEMENTS

Knowledge/technology/infrastructure areas to improve

- Basic immunology
- Identification of needed high throughput analytical platforms
- The application of systems biology within immunology and inflammation
- Public-private collaboration on usage of biobanks
- Mapping of existing facilities
- Career structures for younger scientists
- Mobility between regions and the public-private sector
- Tech transfer culture – and understanding of what it can deliver for the public sector

⑤ STAKEHOLDER **MAPPING**

5.1

Academic groups

LU, Faculty of Medicine
Basic mechanisms of immune regulation
Mucosal Immunology: William Agace

Infection and Immunology: Jenny Persson/Fredric Carlson/Marcus Svensson

Imaging/Cellular migration: Lena Svensson

B cell/T cell: allergy, autoimmunity: Bengt Johansson LindbomHematopoiesis/Cancer/aging: David Bryder

Diabetes and Inflammation: Dan Holmberg, Lena Eliasson, Erik Renström, Charlotte Ling

Inflammation and cancer: Fredrik Ivars, Tomas Leanderson.

Immunotherapy (brain tumors): Peter Siesjö

B-cell development: Mikael Sigvardsson

Skin Inflammation: Vaselios Bekiaris

LU, Malmö
Human tumor immunology: Karin Leandersson

Inflammation: Anna Blom

DTU Vet.
Large animal models for infection/inflammation research.
Mucosal Immunology: William Agace

Innate Immunology: Peter Heegaard

Adaptive immunology and vaccine development: Gregers Jungersen

Expression analyses of immune regulators: Kerstin Skovgaard

Immunology and vaccinology: Jørgen Schøller

KU, Faculty of Health and Medical Sciences
Molecular and cellular regulation of the immune system cells, with particular emphasis on understanding immune-related diseases with focus on chronic inflammatory diseases, organ specific inflammation, cancer immunology, immune metabolism, immunological prevention, and development of new vaccines: the research groups in the Immunology Section, ISIM (Dpt. of International Health, Immunology and Microbiology). Mogens Holst Nissen, Carsten Geisler, Niels Ødum.

Immune & inflammatory islet pathology (Diabetes): Immuno-Endocrinology Lab, Sect. of En-docr. Res., Dept. of Biomedical Sciences, Faculty of Health and Medical Sciences. Niels Juul Holst, Thomas Mandrup-Poulsen.

Basic and translational aspects of innate and adaptive immunological mechanisms in organ specific inflammation related to transplantation rejection mechanisms, cancer, autoimmunity, immunodeficiency, trauma and infectious diseases in patients: Department of Clinical Immunology at Rigshospitalet. Peter Garred.

The biobank at Rigshospitalet. Henrik Ullum.

Immunotherapy: Development of novel immunological concepts in immunotherapy and cancer vaccination. Experimental cancer therapies: CCIT – Herlev Center for Cancer Immune ther-apy. Per Thor Straten, Inge Marie Svane, Mads Hald Andersen.

Mechanisms and genes involved in controlling inflammation and cancer in the CNS: The Neu-ro-inflammation Group at BRIC, Issazadeh-Navikas group.

Statens Serum Institut
Center of excellence in basic and translational immunology and vaccinology, Peter Andersen.

Extensive experience and the complete vaccine development pipeline; discovery, GMP production and clinical trials, Ingrid Kromann.

Animal disease models and facilities up to the bio-safety 3 level, Else Marie Agger.

Vaccine QC, regulatory and manufacturing expertise, Ingrid Kromann.

Bioneer (institute under DTU)
Human immune disease modelling.
Lars H. Pedersen.

5.2 Industry

Lundbeck: Brain

Novo Nordisk: endocrine pancreas

Leo: Inflammatory skin disease

Novozymes: adverse inflammatory responses

ALK Abello: asthma/allergy

Active Biotech: CNS/prostate cancer

Genzyme: autoimmune CNS diseases

Cytovac: immune therapy of cancer

Bavarian Nordic: cancer immunotherapy

Symphogen: cancer antibodies

Genmab: cancer antibodies

Biogen Idec: autoimmune CNS diseases

5.3 Infrastructure

Biobanks:
SSI-national biobank, cancerbiobank.dk, ScanB

Patient registries: the national quality in health registries, prescription databases, family relation registries (incl. twin registries), pathology registries, lab test databases, etc. The Scandinavian research infrastructure is unique, since info in registries can be combined, thanks to personal identification codes for all citizens.

⑥ CONCLUSIONS & **RECOMMENDATIONS**

Although the long-term vision is a regional center for immunology & inflammation research, the midterm goal is to establish an academy which can coordinate activities, brand the region, attract funding, attract conferences, etc.

Funding possibilities for such an academy could be private foundations, the universities, the industry, EU-Interreg, etc.

An academy model is illustrated in section 7 below, but the exact content, the resources needed to run the academy, the financial needs, the funding possibilities, the infrastructure, the organization, and the location of the academy should be investigated in a pre-project.

The pre-project is estimated to take 9-12 months, and result in an application for funding of the academy activities. It should be organized by Medicon Valley Alliance, and financed by the stakeholders.

Stakeholders are the universities in the region, as well as pharma/biotech companies interested in the immunology & inflammation area.

⑦ ACADEMY OF IMMUNOLOGY & INFLAMMATION

Industry contacts

- Establish industry collaboration
- Create flow charts and procedures for contacts
- Keep sponsors up-dated
- Demonstrate collaboration opportunities
- Initiate industrial PhD projects.

Marketing /Branding

- Brand name development
- Target group analyses and marketing strategies
- Arange study trips and visitor events
- Communication material
- Political lobbying
- Attract and create events

Registries & Biobanks

- Investigate barriers and opportunities
- Collaborate with national units to solve barriers
- Coordinate biobank activities cross border
- Promote utilization of available data

Education

- Joint PhD courses
- Promote master education in immunology at KU
- Summer schools for PhD students
- Seminars and boot camps

Legal service

- Establish collaboration agreements between research units
- Agreements between academic and private partners
- Coordinate with universities tech trans offices
- Support IP rights and patenting

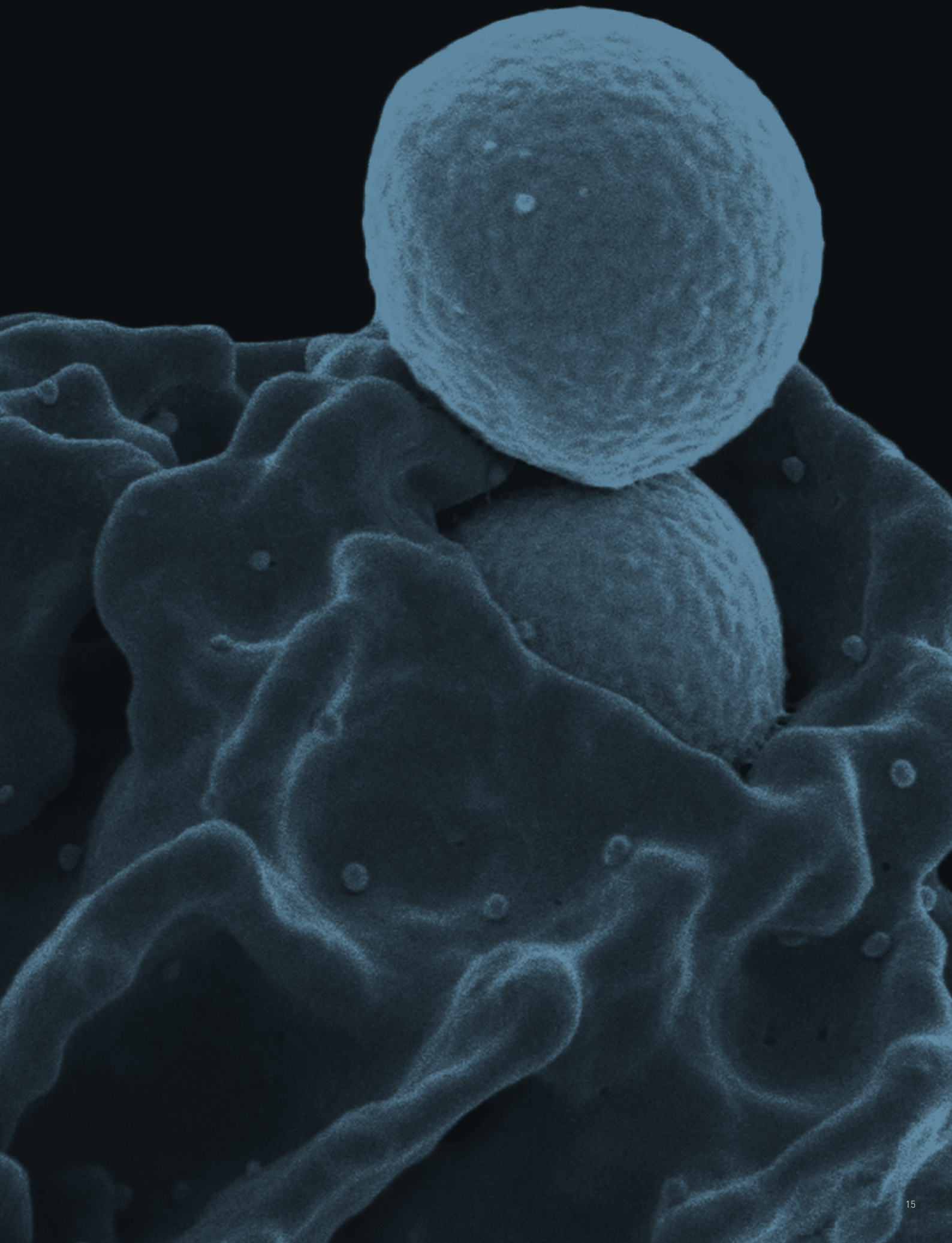
Coordination and funding

- Establsih web based community and coordinate research activities
- Establish and support collaborations locally and internationally
- Atract funding to the research area
- Continue to drive the long term vision for the area

The focus of an academy of Immunology & Inflammation should be activities which strengthen the cross-border collaboration and activities where synergies can be demonstrated. It should build on the regional strongholds and ensure that both scientific and educational elements are striven for.

The content in the figure above are just examples of what could be included in the academy model. The exact content should be investigated in the pre-project described above in section 6.

Photo: National Institutes of Health (NIH)



MEDICON VALLEY
BEACONS

The Medicon Valley Beacons is an initiative to create a handful of world-class research environments, known as Beacons, in the Danish-Swedish life science cluster, Medicon Valley.
The Medicon Valley Beacons cover the following areas: Immune regulation – Structural biology – Systems biology – Drug delivery – Independent living