# NCMM Molecular Medicine Research Course

Course no.: MF9120BTS - Molecular Medicine (national PhD-level course)

Time: November 9-20, 2020

Place: Oslo Science Park, Level 0, Hagen 1+2 (see daily plan)

Organized by: Centre for Molecular Medicine Norway, Nordic EMBL Partnership, University of Oslo and Oslo University Hospital

## Topics and Programme

1. **Disease mechanisms and development** (10 h)
    a. Targeting signaling pathways in cancer (2h, Sigrid Skånland)
    b. Inflammation (2h, Bente Halvorsen/Espen Melum)
    c. Metabolic diseases, diabetes (2h, Pål Njølstad)
    d. Epigenetics and chromatin structure (1h, Nikolina Sekulic)
    e. DNA repair mechanisms (1h, Hilde Nilsen)
    f. Disease mechanism and risk factors of venous thrombosis (2h, Lynn Butler)

2. **Animal models of disease** (5 h)
    a. Stem cells and organoids (2h, Judith Staerk)
    b. Disease mechanisms and animal models of cardiovascular disease (2h, Andreas Romaine /Arne Olav Melleby)
    c. The use of zebrafish to model and understand mechanisms underlying neurological disorder (1h, Camila Esguerra)

3. **Biobanks, health registries and biomarker discovery** (7 h)
    a. Use of population biobanks to understand human disease (2h, Kristian Hveem)
    b. Predictive medicine: Use of health registries and epidemiology (2h, Trude E. Robsahm)
    c. Cancer biomarkers (1h, Laxmi Silwal-Pandit)
    d. Biomarkers for early diagnosis and management of heart diseases (2h, Torbjørn Omland)

4. **Imaging disease** (6 h)
    a. Introduction to imaging modalities (2h, Lars Tore Gyland Mikalsen)
    b. Imaging cardiovascular diseases in animal models and patients (2h, Bill Louch/Magnus Arnonsen)
    c. Brain MR imaging in schizophrenia and bipolar disorder (2h, Ole Andreassen)

5. **Structure-based drug discovery** (6 h)
    a. Basics of Chemical Biology and High throughput screening (1h, Johannes Landskron)
    b. Introduction to structural biology (1h, Hartmut Luecke)

c. Introduction to cryoEM in drug design (2h, Eva Cunha)
d. Drug development in the pharmaceutical industry (1h, Herbert Nar, BI)
e. Molecular dynamics studies (1h, Matteo Dal Peraro, EPFL)

6. **Tailored and personalized medicine** (8 h)
    a. Introduction to Precision Medicine (1h, Janna Saarela)
    b. Precision medicine in everyday practice - rare diseases (2h, Dag Undlien)
    c. Precision cancer medicine, implementation and the IMPRESS-Norway trial (1h, Kjetil Taskén)
    d. Drug sensitivity testing and personalized medicine (2h, Krister Wennerberg/ Bjørn Tore Gjertsen)
    e. Utilizing common genetic variation to predict disease predisposition (2h, Samuli Ripatti, Elisabeth Widen)
    f. Nano-medicine (1h, Irep Gözen)

7. **Advanced cell-based therapies** (5 h)
    a. Stem cells and their niche as a basis for future therapies (1h, Lorena Arranz)
    b. Cell based therapies in medicine – Laboratory work flow and clinical practice in cancer treatment (2h, Else Marit Inderberg)
    c. T cell receptor engineering and T cell therapies in cancer (1h, Johanna Olweus)
    d. Stem cell treatment in diabetes (1h, Hanne Scholz)

**8.** **Computational biology** (6 h)
    a. Biostatistics and epidemiology (1h, Arnoldo Frigessi)
    b. Single cell genomics (1h, Oliver Stegle)
    c. Novel analytics in personalized medicine (2 h, Anthony Mathelier/Marieke Kuijjer)
    d. Deep learning in biomedicine (1h, Esa Pitkänen )
    e. Germline vs somatic mutations: commonalties, distinctions, and interplay (1h, Sebastian Waszak)

9. **SARS-CoV-2 detection, vaccination and drug targeting** (3 h)
    a. SARS-CoV-2 – a study of replication and immunity (1h, Christine Hanssen Rinaldo, UiT)
    b. Vaccine strategies (1h, Gunnveig Grødeland, KG Jebsen Center)
    c. Inhibitor development for $M^{pro}$, the main protease of SARS-CoV-2 (1h, Hudel Lab)

10. **Organizational**
    a. Introduction and organization (30 min, Hartmut Luecke/Elisa Bjørgo)

## Week 1 Schedule; NCMM Molecular Medicine Research Course

| Date | Day/Room | Time | Topic | Title | Lecturer |
|---|---|---|---|---|---|
| 09.11.2020 | Mon<br>Hagen 1+2 | 09.00 –<br>09.15 | Organizational | Info & organization | Hartmut Luecke (or Elisa Bjørgo) |
| 09.11.2020 | Mon<br>Hagen 3 | 09.30 –<br>11.15 | - Disease mechanisms<br>- Tailored and personalized medicine | - DNA repair mechanisms<br>- Introduction to Precision Medicine | - Hilde Nilsen<br>- Janna Saarela |
| 09.11.2020 | Mon<br>Hagen 1+2 | 12:00 –<br>13:45 | Disease mechanisms | Targeting signaling pathways in cancer | Sigrid Skånland |
| 09.11.2020 | Mon<br>Hagen 1+2 | 14.00 –<br>15.45 | Disease mechanisms | Metabolic diseases, diabetes | Pål Njølstad |
| 10.11.2020 | Tue<br>Hagen 1+2 | 09.00 –<br>10.45 | Disease mechanisms<br><br>Tailored and personalized medicine | - Epigenetics and chromatin structure<br><br>- Precision cancer medicine, implementation and the IMPRESS-Norway trial | Nikolina Sekulic<br><br>Kjetil Taskén |
| 10.11.2020 | Tue<br>Hagen 1+2 | 11.00 –<br>12.45 | Tailored and personalized medicine | Precision medicine in everyday practice - rare diseases | Dag Undlien |
| 10.11.2020 | Tue<br>Hagen 1+2 | 14.00 –<br>15.45 | Tailored and personalized medicine (zoom if necessary) | Drug sensitivity testing and personalized medicine in leukemia | Krister Wennerberg/ Bjørn Tore Gjertsen |
| 11.11.2020 | Wed<br>Hagen 1+2 | 09.00 –<br>10.45 | Imaging disease | Introduction to imaging modalities | Lars Tore Gyland Mikalsen |
| 11.11.2020 | Wed<br>Hagen 1+2 | 11.00 –<br>12.45 | Imaging disease | Imaging cardiovascular diseases in animal models and patients | Bill Louch/ Magnus Aronsen |
| 11.11.2020 | Wed<br>Hagen 1+2 | 14.00 –<br>15.45 | Disease mechanisms | - Inflammation - the fuel in atherosclerosis<br>- Gut and liver inflammation | - Bente Halvorsen<br>- Espen Melum |
| 12.11.2020 | Thu<br>Hagen 1+2 | 09.00 –<br>10.45 | Animal models of disease | Stem cells and organoids | Judith Staerk |
| 12.11.2020 | Thu<br>Hagen 1+2 | 11.00 –<br>12.45 | Animal models of disease | Disease mechanisms and animal models of cardiovascular disease | Andreas Romaine/Arne Olav Melleby |
| 12.11.2020 | Thu<br>Hagen 1+2 | 14.00 –<br>15.45 | - Advanced cell-based therapies<br><br>- Tailored and personalized medicine | - Stem cells and their niche as a basis for future therapies<br><br>- Nano-medicine | - Lorena Arranz<br><br>- Irep Gözen |
| 13.11.2020 | Fri<br>Hagen 1+2 | 09.00 –<br>10.45 | Disease mechanisms | Disease mechanism and risk factors of venous thrombosis | Lynn Butler |
| 13.11.2020 | Fri<br>Hagen 1+2 | 11.00 –<br>11.45 | - Animal models in disease | - The use of zebrafish to model and understand mechanisms underlying neurological disorder | - Camila Esguerra |
| 13.11.2020 | Fri<br>Hagen 1+2 | 13.00 –<br>14.45 | Tailored and personalized medicine (online/zoom) | - Genomics in Disease Prevention and Management<br>- Genomics in Action: Preventing Ischemic Heart Disease | - Samuli Ripatti<br><br>- Elisabeth Widen |

## Week 2 Schedule; NCMM Molecular Medicine Research Course

| Date | Day/Room | Time | Topic | Title | Lecturer |
|---|---|---|---|---|---|
| 16.11.2020 | Mon<br>Hagen 1+2 | 09.00 – 10.45 | Advanced cell-based therapies | Cell based therapies – Laboratory work flow and clinical practice | Else Marit Inderberg |
| 16.11.2020 | Mon<br>Hagen 1+2 | 11.00 – 12.45 | - Biobanks, health registries and biomarker discovery<br>- Advanced cell-based therapies | - Cancer biomarkers: from discovery to clinical practice<br>- Stem cell treatment in diabetes | - Laxmi Silwal-Pandit<br>- Hanne Scholz |
| 16.11.2020 | Mon<br>Hagen 1+2 | 14.00 – 15.45 | Imaging disease | Brain MR imaging in schizophrenia and bipolar disorder | Ole Andreassen |
| 17.11.2020 | Tue<br>Hagen 1+2 | 09.00 – 10.45 | Computational Biology | - Biostatistics and epidemiology<br>- Single cell genomics (zoom lecture) | - Arnoldo Frigessi<br>- Oliver Stegle |
| 17.11.2020 | Tue<br>Hagen 1+2 | 11.00 – 12.45 | Computational Biology | Novel analytics in personalized medicine | Anthony Mathelier/ Marieke Kuijjer |
| 17.11.2020 | Tue<br>Hagen 1+2 | 14.00 – 15.45 | Computational Biology | - Deep learning in biomedicine-<br>- Germline vs somatic mutations: commonalties, distinctions, and interplay | - Esa Pitkänen<br>- Sebastian Waszak |
| 18.11.2020 | Wed<br>Hagen 1+2 | 09.00 – 10.45 | Structure-based drug discovery | - Introduction to structural biology<br>- Basics of Chemical Biology and High throughput screening | - Hartmut Luecke<br>- Johannes Landskron |
| 18.11.2020 | Wed<br>Hagen 2 | 11.00 – 12.45 | Structure-based drug discovery | Introduction to cryoEM in drug design | Eva Cunha |
| 18.11.2020 | Wed<br>Hagen 2 | 14.00 – 16.00 | Structure-based drug discovery (online/zoom) | - Molecular dynamics studies<br>- The Role of Structural Biology and Biophysics in Drug Discovery | - Matteo Dal Peraro<br>- Herbert Nar |
| 19.11.2020 | Thu<br>Hagen 1+2 | 09.00 – 10.45 | Biobanks, health registries and biomarker discovery | Predictive medicine: Use of health registries and epidemiology | Trude Eid Robsahm |
| 19.11.2020 | Thu<br>Hagen 1+2 | 11.00 – 12.45 | Biobanks, health registries and biomarker discovery | Use of population biobanks to understand human disease | Kristian Hveem |
| 19.11.2020 | Thu<br>Hagen 1+2 | 14.00 – 15.45 | Biobanks, health registries and biomarker discovery | Biomarkers for early diagnosis and management of heart diseases | Torbjørn Omland |
| 20.11.2020 | Fri<br>Hagen 1+2 | 09.00 – 10.45 | SARS-CoV-2 detection, vaccination and drug targeting | - Vaccine strategies | - Gunnveig Grødeland<br>- Joel Heim |

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| | | | | - Inhibitor development for $M^{pro}$, the main protease of SARS-CoV-2 | |
| 20.11.2020 | Fri<br>Hagen 1+2 | 11.00 – 12:45 | - SARS-CoV-2 detection, vaccination and drug targeting<br><br>- Advanced cell-based therapies | - SARS-CoV-2 – a study of replication and immunity<br><br>- T cell-based immunotherapy in cancer | - Christine H. Rinaldo<br><br>- Johanna Olweus |
| 20.11.2020 | Fri<br>Hagen 1+2 | 13.00 | Organizational | Summary course & Pizza | Hartmut Luecke/Elisa Bjørgo |