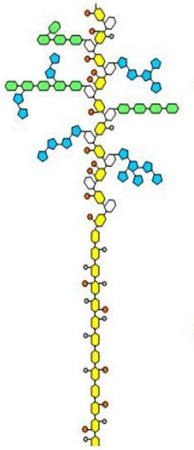




Pharmacognosy seminar

in honor of

**Professor Berit Smestad
Paulsen**



Program

Auditorium 1, School of Pharmacy, Friday 20th of March.

10.00-10.15 Welcome. Henrik Schultz, Head of School, School of Pharmacy, Oslo.

10.15-11.00 Drissa Diallo, Department of Traditional Medicine, Bamako, Mali.

“North-South Partnership: An example of Academic and Research Collaboration between Mali and Norway”

11.00-11.45 Anna K. Jäger, University of Copenhagen, Denmark.

“Pharmacognosy – The past, the present and the future”

11.45-12.30 Lunch-break

12.30-13.15 Steve Harding, University of Nottingham, UK.

“Hydrodynamics, Carbohydrates ... and the Vikings”

13.15-13.35 Adiaratou Togola, Department of Traditional Medicine, Bamako, Mali.

“Healing of Donkeys’ wounds and complement fixing properties of *Cassia nigricans* and *Leptadenia lancifolia*”

13.35-13.55 Kari Inngjerdingen, School of Pharmacy, Oslo.

“Immunomodulating pectic polysaccharides from Malian medicinal plants”

13.55-14.15 Coffee

14.15-14.30 Karl E. Malterud, School of Pharmacy, Oslo.

“Zanthoxylum heitzii, a possible anti-malaria medicine”

14.30-14.50 Trond Vidar Hansen, School of Pharmacy, Oslo.

“The Novel Lipid Mediator PD1_{n-3} DP_A: Structural Elucidation, Biosynthesis, Bioactions and Total Organic Synthesis”

14.50-15.10 Gro Fossum, The Norwegian Medicines Agency

“Herbal medicinal products: bridging the gap between traditional usage and European regulation”

15.10-16.00 Berit Smestad Paulsen, School of Pharmacy, Oslo.

“A retrospective view on my life devoted to pharmacognosy”



Professor Drissa DIALLO
Department of Traditional Medicine /INRSP
Faculty of Pharmacy/USTTB. Bamako, Mali.

North-South Partnership: An example of Academic and Research Collaboration between Mali and Norway (University of Oslo, Institut National de Recherche en Santé Publique, Université de Bamako, Université des Sciences, des Techniques et des Technologies de Bamako).

Mali is a country situated in West Africa. Since 1989 Mali and Norway developed a north-south partnership based on academic and research collaboration.

This collaboration started with the Soudan Sahel Ethiopia (SSE) programme between University of Oslo and Malian Research institutions under the coordination of the National Centre of Scientific Research. This programme ended in 1992 with the starting of developing a NUFU programme. In 2008 NUFU programme in Mali ended. Two projects were funded by the National Research Council (NRC). Since 2011 University of Oslo and University of Bamako have been involved in a consortium programme of the European Union called Multi-disciplinary University Traditional Health Initiative (MUTHI) which ended in 2014. A meeting in Lucknow (India) in 1994 with Berit Smestad Paulsen was the starting point of the collaboration in Pharmacognosy between Mali and Norway.

This partnership aim was capacity building in both places by organizing: ethnopharmacology studies, phytochemical analysis, biological activities testing and toxicity studies of Malian medicinal plants-

In Mali, like most African countries, traditional medicine is contrasted with conventional medicine. Since 1978, the World Health Organization (WHO) has been calling for more cooperation, even integration, of traditional medicine and biomedicine. During this collaboration human capacity building was done with 9PhD (4 Malians), one Malian for maintenance of equipment, one Malian for Master degree in Management, 1 Malian for master degree in plant biology, more than 60 students in pharmacognosy and phytotherapy. Norwegian students visited Mali for fieldworks.

The Malian medicinal plants *Entada africana*, *Trichilia emetica*, *Vernonia kostchyana*, *Cochlospermum tinctorium*, *Biophytum petersianum*, *Glinus oppositifolius*, *Opilia celtidifolia*, *Terminalia macroptera*, *Ximenia americana*, *Parkia biglobosa*, *Combretum glutinosum*, *Sizugium guineense*, *Cola cordifolia* are, among others, used in traditional medicine against wounds and gastric ulcer and were investigated during this collaboration. Since 1998 the number of publications of Department of Traditional Medicine (DMT) was increasing with a maximum of 26 in 2006.

The technical equipment, chemicals of the DMT was improved and in 2005 the DMT has new laboratories and in 2014 the DMT was identified as Reference centre for Research in Traditional Medicine by the West African Organisation for Health (WAHO).

This partnership has contributed to improve health state and has developed collateral collaboration with traditional medicine practitioners in Bamako (FEMATH), Kolokani, health centre in Daoudabougou, school in N'tiobougou, Daoudabougou, Students cooperation (FUG) in Sido, Madina.

Professor Anna K Jäger
Natural Products Research
Department of Drug Design and Pharmacology
Faculty of Health and Medical Sciences University of Copenhagen, 2 Universitetsparken,
Denmark

Pharmacognosy – The past, the present and the future

The written sources do not give any clues to medicinal plants in the Viking age, so knowledge comes from archeological sites. The Viking *Materia Medica* seems to have contained only a small number of plants. The introduction of Christianity in Scandinavia brought a new medicine system, with plants still in use today. The globalization during colonial times expanded our list of medicinal products. Then followed a period where pharmacognosy yielded to synthetic chemistry. This lasted until modern techniques in the middle of the 20th century made it possible to analyse the chemical composition of plants, followed by an explosion of knowledge and techniques in pharmacology, where especially the *in vitro* assays were used in pharmacognosy research. In the last decades of the 20th century, focus partly changed from drug discovery to improvements of traditional medicine with scientific evidence for safety and efficacy. The future for pharmacognosy looks bright, new developments in both analytical and pharmacological techniques, coupled with bioinformatics, makes it possible to understand how natural products works, often several active compounds may exert activity at multiple targets. Thus, the established paradigm of 'one compound-one target' is now giving way to an appreciation of the benefits of polypharmacology, in which herbal/natural products may re-enter the scene.

Professor Steven Harding
University of Nottingham, School of Biosciences
Sutton Bonington, LE12 5RD, England

Hydrodynamics, Carbohydrates ... and the Vikings

Hydrodynamic methods play a huge role in our understanding of the molecular size, conformation and stability of macromolecules in a watery environment. This applies particularly to large polymers of carbohydrate and their optimisation for use in the biopharma and food industries, especially when combined with chemical characterisation technologies as championed by Professor Paulsen's team at Oslo. And, surprisingly, polymers of carbohydrate are now very much relevant to one of the best known exports from Norway - the Vikings - in terms of (i) the huge problem of cellulose decay and replacement in archaeological ships like the Oseberg and (ii) the glycoconjugate commonly known as DNA.

Researcher Adiaratou Togola

Département de Médecine Traditionnelle, Institut National de Recherche en Santé publique
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Healing of Donkeys' wounds and complement fixing properties of *Cassia nigricans* and *Leptadenia lancifolia*

Introduction: *Cassia nigricans* and *Leptadenia lancifolia* are the most cited animal wound healing plants in Malian traditional medicine.

Objective: This study was conducted to verify the wound healing property of these plants and to evaluate the complement fixing ability of their water soluble polysaccharides.

Methods: Donkeys naturally wounded during work were recruited by SPANA Mali (Animal care NGO), classified in three groups, each treated with either the powder of the areal part of *Cassia nigricans*, *Leptadenia lancifolia*, or a conventional wound spray. The closure speed, the wound condition and the treatment duration were monitored. Water soluble polysaccharides were extracted from defatted plant powder and tested for their complement fixing ability using a test based on inhibition of haemolysis of sheep red blood cells by human complement.

Results: The wound healing activity of *C. nigricans* and *L. lancifolia* was equivalent to the control. The mean treatment duration was 27 days for *C. nigricans*, 36 days for *L. lancifolia* and 37 days for the control. Water 50° and 100° C extracts of both plants had complement fixing ability; the concentrations inhibiting 50% of haemolysis of the most active extracts were 3.2µg/ml for *L. lancifolia* water 100°C and 5.5µg/ml for *C. nigricans* water 100°C extract.

Conclusion: The powdered areal part of *Cassia nigricans* and *Leptadenia lancifolia* can be used as a good alternative to conventional animal wound healing drugs.

Associate professor K.T. Inngjerdingen
School of Pharmacy, Department of Pharmaceutical Chemistry
University of Oslo, PO Box 1068 Blindern, N-0316 Oslo, Norway

Immunomodulating pectic polysaccharides from Malian medicinal plants

The chemistry and immunomodulating activities of pectic polysaccharides from several Malian medicinal plants have been studied fairly extensively the last 15 years. Although the medical effect of the pectic fractions' influence on the humane immune system remains to be determined, our data suggest that they may participate in boosting the innate immune system, through the complement system, and/or by the influence on antigen-presenting cells like macrophages and dendritic cells. It has further become clear that the rhamnogalacturonan backbone of pectins with sidechains of arabinogalactans is important for the expression of the bioactivities. An overview of the results obtained so far will be presented.

Professor Karl Egil Malterud
School of Pharmacy, Department of Pharmaceutical Chemistry
University of Oslo, PO Box 1068 Blindern, N-0316 Oslo, Norway

Zanthoxylum heitzii, a possible anti-malaria medicine

The Central African plant *Zanthoxylum heitzii* is used by traditional healers against malaria. We have found that the hexane bark extract is active against adults of the mosquito *Anopheles gambiae*, a vector for malaria transmission, and that this is mainly due to its content of the amide pellitorine. Pellitorine also kills *A. gambiae* larvae. In addition, the extract is toxic to the malaria protozoa *Plasmodium falciparum*. In this case, the alkaloid dihydronitidine seems to be the main factor for toxicity. Neither of these compounds have been reported from this plant previously. Eight other substances have been isolated and identified. Seven of these are new to the plant, and one, the alkaloid heitziquinone, is a new natural product. From these investigations, it would seem possible that the traditional use of *Z. heitzii* against malaria may have a rational basis.

Professor Trond Vidar Hansen
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The Novel Lipid Mediator PD1_{n-3 DPA}: Structural Elucidation, Biosynthesis, Bioactions and Total Organic Synthesis

Several novel lipid mediators families coined specialized pro-resolving mediators (SPMs) are formed during the resolution phase of acute inflammation in animal models of self-limited inflammation. The SPMs are biosynthesized from the dietary n-3 polyunsaturated fatty acids (PUFAs) eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The resolvins, protectins and maresins are examples of such SPMs. In 2013 Dalli, Colas and Serhan reported a new SPM that was coined PD1_{n-3 DPA}.¹ This C22 n-3 oxygenated SPM is biosynthesized from n-3 docosapentaenoic acid (n-3 DPA) that can accumulate in humans.

In this presentation, the structural elucidation and the biosynthetic pathway, together with the potent anti-inflammatory and pro-resolving properties of the PD1_{n-3 DPA}, will be presented. The first total organic synthesis will briefly also be outlined. The results presented contribute new knowledge on the structure-function of the growing numbers of endogenous novel SPMs.

Senior Advisor Gro Fossum
Norwegian Medicines Agency
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Herbal medicinal products: bridging the gap between traditional usage and European regulation

The European legislation for pharmaceutical products for human use applies to approval of medicinal products in all EC/EEC countries. Herbals are still a popular treatment alternative in Europe, but the existing legislation was not adjusted to the challenges in approval of these product. In order to harmonize, a simplified registration procedure was suggested by the Commission, and a directive (2004/24/EC) was introduced. Through the provisions of the legislation, challenges in establishing the required safety and efficacy documentation for herbal products are solved. Herbal products are regulated in different European member states either predominantly as medicinal products, food supplements or medicinal devises. This presentation describes how the directive and the Community monographs simplify the work for national agencies and industry and how knowledge about traditional herbal medicinal products can enable safer choices and bridge the gap between tradition and documented effects.