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Organisations

Department of Chemistry
22/10/2010 → 07/04/2016 Former
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Innate Immunology
17/01/2017 → present
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Publications:

**Binding of hydrophobic antigens to surfaces**
A first aspect of the present invention is a method of detecting antibodies comprising the steps of: i) providing a first group of beads comprising a surface modified with C1-C10 alkyl groups comprising amine, ammonium, ether and/or hydroxyl groups, ii) contacting said first group of beads with a first hydrophobic antigen to provide a first group of bead-antigen conjugates by adsorption of the first hydrophobic antigen on the first group of beads, iii) isolating said bead-antigen conjugates, iv) contacting said bead-antigen conjugates with a sample to bind antibodies therein to provide bead-antigen-antibody conjugates, and v) detecting said bead-antigen-antibody conjugates. Further aspects include an antibody detection kit, a bead-antigen conjugate and a composition comprising at least two different groups of bead-antigen-conjugates.

**Simultaneous detection of antibodies to five Actinobacillus pleuropneumoniae serovars using bead-based multiplex analysis**
We have developed and made a preliminary validation of a bead-based multiplexed immunoassay for simultaneous detection of porcine serum antibodies to Actinobacillus pleuropneumoniae serovars 1, 2, 6, 7, and 12. Magnetic fluorescent beads were coupled with A. pleuropneumoniae antigens and tested with a panel of serum samples from experimentally infected pigs and with serum samples from uninfected and naturally infected pigs. The multiplex assay was compared to in-house ELISAs and complement fixation (CF) tests, which have been used for decades as tools for herd classification in the Danish Specific Pathogen Free system. Assay specificities and sensitivities as well as the

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corresponding cutoff values were determined using receiver operating characteristic (ROC) curve analysis, and the A. pleuropneumoniae multiplex assay showed good correlation with the in-house ELISAs and CF tests with areas under ROC curves ≥ 0.988. Benefits of multiplexed assays compared to ELISAs and CF tests include reduced serum sample volumes needed for analysis, less labor, and shorter assay time.
A multiplexed immunoassay for simultaneous detection of antibodies to PRRSV, Actinobacillus pleuropneumoniae and Salmonella in pigs

General information
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Organisations: National Veterinary Institute, Section for Immunology and Vaccinology, Section for Epidemiology
Authors: Berger, S. S. (Intern), Boas, U. (Intern), Lauritsen, K. T. (Intern), Lind, P. (Intern), Andresen, L. O. (Intern)
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Anthelmintic activity of chicory (Cichorium intybus): in vitro effects on swine nematodes and relationship to sesquiterpene lactone composition

Chicory is a perennial crop that has been investigated as a forage source for outdoor-reared ruminants and pigs, and has been reported to have anthelmintic properties. Here, we investigated in vitro anthelmintic effects of forage chicory-extracts against the highly prevalent swine parasites Ascaris suum and Oesophagostomum dentatum. Methanol extracts were prepared and purified from two different cultivars of chicory (Spadona and Puna II). Marked differences were observed between the anthelmintic activity of extracts from the two cultivars. Spadona extracts had potent activity against A. suum third (L3) and fourth (L4) - stage larvae, as well as O. dentatum L4 and adults, whereas Puna II extracts had less activity against A. suum and no activity towards O. dentatum L4. Transmission-electron microscopy of A. suum L4 exposed to Spadona extracts revealed only subtle changes, perhaps indicative of a specific anthelmintic effect rather than generalized toxicity. Ultra-high liquid chromatography-mass spectrometry analysis revealed that the purified extracts were rich in sesquiterpene lactones (SL), and that the SL profile differed significantly between cultivars. This is the first report of anthelmintic activity of forage chicory towards swine nematodes. Our results indicate a significant anthelmintic effect, which may possibly be related to SL composition.

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Authors: Williams, A. (Ekstern), Pena-Espinoza, M. A. (Intern), Boas, U. (Intern), Simonsen, H. T. (Intern), Enemark, H. (Intern), Thamsborg, S. M. (Ekstern)
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  Scopus rating (2015): SJR 1.331 SNIP 1.063 CiteScore 2.62
  Web of Science (2015): Indexed yes
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  Scopus rating (2014): SJR 1.035 SNIP 1.014 CiteScore 2.3
  Web of Science (2014): Indexed yes
  BFI (2013): BFI-level 2
  Scopus rating (2013): SJR 1.145 SNIP 0.915 CiteScore 2.45
  ISI indexed (2013): ISI indexed yes
  BFI (2012): BFI-level 2
  Scopus rating (2012): SJR 1.017 SNIP 1.004 CiteScore 2.55
  ISI indexed (2012): ISI indexed yes
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  Scopus rating (2011): SJR 1.178 SNIP 1.021 CiteScore 2.63
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  Web of Science (2011): Indexed yes
  BFI (2010): BFI-level 2
  Scopus rating (2010): SJR 1.12 SNIP 0.941
  BFI (2009): BFI-level 2
  Scopus rating (2009): SJR 0.961 SNIP 0.931
  Web of Science (2009): Indexed yes
  BFI (2008): BFI-level 1
  Scopus rating (2008): SJR 1.066 SNIP 0.973
  Web of Science (2008): Indexed yes
  Scopus rating (2007): SJR 0.966 SNIP 0.987
  Web of Science (2007): Indexed yes
  Scopus rating (2006): SJR 0.895 SNIP 0.975
  Scopus rating (2005): SJR 0.814 SNIP 0.965
  Scopus rating (2004): SJR 1.017 SNIP 1.163
  Web of Science (2004): Indexed yes
  Scopus rating (2003): SJR 1.112 SNIP 1.298
  Web of Science (2003): Indexed yes
  Scopus rating (2002): SJR 1.19 SNIP 1.138
  Web of Science (2002): Indexed yes
  Scopus rating (2001): SJR 1.008 SNIP 1.113
  Scopus rating (2000): SJR 1.01 SNIP 1.041
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Anthelmintic activity of forage chicory (Cichorium intybus) and field efficacy of ivermectin against gastrointestinal nematodes in Danish cattle

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Organisations: National Veterinary Institute, Section for Immunology and Vaccinology, Norwegian Veterinary Institute, University of Copenhagen
Authors: Pena-Espinoza, M. A. (Intern), Boas, U. (Intern), Larsen Enemark, H. (Ekstern), Thamsborg, S. M. (Ekstern)
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Relations
Projects:
Anthelmintic activity of forage chicory (Cichorium intybus) and field efficacy of ivermectin against gastrointestinal nematodes in Danish cattle
Publication: Research › Ph.D. thesis – Annual report year: 2016

Design, synthesis and characterization of polylysine dendrones for biomedical applications

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Organisations: National Veterinary Institute, Section for Immunology and Vaccinology, University of Oslo
Authors: Mirsharghi, S. (Intern), Boas, U. (Intern), Heegaard, P. M. H. (Intern), Nyström, B. (Ekstern)
Number of pages: 126
Publication date: 2016

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Publisher: National Veterinary Institute, Technical University of Denmark
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Design, synthesis and characterization of polylysine dendrones for biomedical applications
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Preparation and self-assembly of amphiphilic polylysine dendrons
Polylysine dendrons with lipid tails prepared by divergent solid-phase synthesis showed self-assembling properties in aqueous solutions. Herein, we present the synthesis of new amphiphilic polylysine dendrons with variable alkyl chain lengths (C1–C18) at the C-terminal. The dendrons were synthesized in moderate to quantitative yields by divergent solid-phase synthesis (SPS) employing an aldehyde linker. The self-assembling properties of the dendrons in aqueous solutions were studied by small angle neutron scattering (SANS) and dynamic light scattering (DLS). The self-assembling properties were influenced by the length of the alkyl chain and the generation number (Gn). Increasing the temperature and concentration did not have significant impact on the hydrodynamic diameter, but the self-assembling properties were influenced by the pH value. This demonstrated the need for positively charged amines in the head groups for the successful formation of controlled self-assemblies. Dendrons having alkyl chains below C8 did not self-assemble. Well-defined micellar structures observed with SANS were formed with alkyl chain lengths above C12. Large structures detected with DLS for dendrons with alkyl chain lengths above C12 are ascribed to intermicellar aggregates stabilized by hydrophobic and electrostatic forces in accordance with the observed pH effect. Finally, the cytotoxicity of the dendrons was evaluated in mouse fibroblast (NIH/3T3) and human embryonic kidney (HEK 293T) cells at 5, 10 and 20 μM concentrations. The dendrons showed low cytotoxicity, displaying cell viability well above 80%.

General information
Anthelmintic activity of sesquiterpene lactones from forage chicory against Ascaris suum

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Organisations: National Veterinary Institute, Section for Bacteriology, Pathology and Parasitology, Section for Immunology and Vaccinology, University of Copenhagen
Authors: Williams, A. R. (Ekstern), Pena-Espinoza, M. A. (Intern), Hansen, T. V. (Ekstern), Boas, U. (Intern), Thamsborg, S. M. (Ekstern)
Number of pages: 1
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Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2015

Convergent synthesis of degradable dendrons based on L-malic acid
New degradable polyester dendrons based on the cellular tricarboxylic acid cycle component L-malic acid were synthesized up to the third generation by convergent synthesis. The dendron wedges could be introduced in a stepwise, highly regioselective fashion. HMBC-NMR revealed that the C1-carbonyl on malic acid was exclusively esterified, before the reaction of the second dendron wedge at C4 took place. Degradation studies on a first generation dendron analyzed by HPLC showed that hydrolytic degradation of the dendron most profoundly takes place at pH 4 and pH 9 with the highest degradation rate at alkaline pH. NMR shows that the dendron degrades to malic acid and fumaric acid derivatives. Preliminary studies performed in the cell culture show low toxicity of the dendrons in concentrations of up to 50 μg mL<sup>-1</sup>.

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Authors: Meyhoff, U. (Ekstern), Riber, U. (Intern), Boas, U. (Intern)
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Scopus rating (2015): SJR 0.954 SNIP 0.836 CiteScore 3.27
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Scopus rating (2014): SJR 1.01 SNIP 0.872 CiteScore 3.14
Web of Science (2014): Indexed yes
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Scopus rating (2013): SJR 1.047 SNIP 0.838 CiteScore 3.03
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Coping with anthelmintic resistance in ruminants: the potential use of chicory (Cichorium intybus) as an antiparasitic forage in cattle

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State: Published
Organisations: National Veterinary Institute, Section for Bacteriology, Pathology and Parasitology, Section for Immunology and Vaccinology, University of Copenhagen
Authors: Pena-Espinoza, M. A. (Intern), Boas, U. (Intern), Thamsborg, S. M. (Ekstern), Enemark, H. (Intern)
Number of pages: 1
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Main Research Area: Technical/natural sciences
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Oral Presentation at the Joint Spring Symposium of the Danish Society for Parasitology and Danish Society for Tropical Medicine &amp; International Health, 20th March 2015, Frederiksberg C, Denmark.

Purified extracts from chicory (Cichorium intybus) inhibit Ascaris suum glutathione-S transferase activity and reduce survival of larvae in vitro

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Sesquiterpene lactone-containing extracts from two chicory cultivars show different anthelmintic activity in vitro against Ostertagia ostertagi

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State: Published
Organisations: National Veterinary Institute, Section for Bacteriology, Pathology and Parasitology, Section for Immunology and Vaccinology, University of Copenhagen
Authors: Pena-Espinoza, M. A. (Intern), Boas, U. (Intern), Williams, A. (Ekstern), Thamsborg, S. M. (Ekstern), Enemark, H. (Intern)
Number of pages: 1
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Publication date: 2015

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Sesquiterpene lactone containing extracts from two cultivars of forage chicory (Cichorium intybus) show distinctive chemical profiles and in vitro activity against Ostertagia ostertagi

The study investigated direct anthelmintic effects of sesquiterpene lactones (SL)-containing extracts from forage chicory against free-living and parasitic stages of Ostertagia ostertagi. Freeze-dried leaves from chicory cultivars ‘Spadona’ and ‘Puna II’ were extracted using methanol/water. Total SL were further fractionated by solid-phase extraction and resulting extracts were characterised by high-performance liquid chromatography (HPLC). O. ostertagi eggs from faeces of mono-infected calves were hatched and L1 were used in a larval feeding inhibition assay (LFIA), while cultured L3 were used in a larval exsheathment inhibition assay (LEIA). Adult worms were immediately recovered after slaughter and used for motility inhibition assays (AMIA). Electron microscopy (EM) was performed on adult O. ostertagi exposed to 1000 μg extract mL−1 of both chicory cultivars. In all assays, decreasing concentrations of SL-containing extracts in PBS (1% DMSO) were tested in replicates with 1% DMSO in PBS as negative controls. HPLC demonstrated similar concentrations of most SL in both extracts. However, Spadona-extract contained significantly higher concentrations of 11, 13-dihydro-8-deoxyactucin (P = 0.01), while Puna II-extract had increased levels of 11, 13-dihydroactucin (P < 0.0001). In the LFIA, both extracts reduced larval feeding at increasing concentrations, but Spadona-extract showed greater activity confirmed by significantly lower EC50 (P < 0.0001). In the LEIA, neither of the two extracts interfered with the exsheathment of L3 (P > 0.05). In the AMIA, both SL-containing extracts induced a dose-dependent effect but Spadona-extract showed greater activity and exerted faster worm paralysis than Puna II-extract with significantly lower EC50 (P < 0.0001). No cuticular damage was observed by EM in worms exposed to any of the extracts. We have demonstrated that SL-containing extracts from forage chicory can inhibit feeding of free-living larvae and exert direct effects against parasitic stages of O. ostertagi. Our results may contribute to the identification of natural anti-parasitic compounds and to interpret the in vivo anthelmintic effects of forage chicory.
Urea and thiourea modified polypropyleneimine dendrimers clear intracellular α-synuclein aggregates in a human cell line

Synucleinopathies are neurodegenerative pathologies in which disease progression is closely correlated to brain accumulation of insoluble α-synuclein, a small protein abundantly expressed in neural tissue. Here, two types of modified polypropyleneimine (PPI) dendrimers having either urea or methylthiourea (MTU) surface functional groups were investigated in a cellular model of synucleinopathy. Dendrimers are synthetic macromolecules that may be produced in a range of well-defined molecular sizes. Using cellomics array scan high-content screening, we show that both types of dendrimers are able to significantly reduce intracellular levels of α-synuclein aggregates dependent on the concentration, the type and molecular size of the dendrimer with the bigger size MTU-dendrimers having the highest potency. The intracellular clearance of α-synuclein aggregates by dendrimers was achieved at nontoxic concentrations. (Figure Presented).

Forage chicory, Sesquiterpene lactones, Anthelmintic, Ostertagia ostertagi, Cattle, Electron microscopy

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Publication: Research - peer-review › Journal article – Annual report year: 2015

Urea and thiourea modified polypropyleneimine dendrimers clear intracellular α-synuclein aggregates in a human cell line

Synucleinopathies are neurodegenerative pathologies in which disease progression is closely correlated to brain accumulation of insoluble α-synuclein, a small protein abundantly expressed in neural tissue. Here, two types of modified polypropyleneimine (PPI) dendrimers having either urea or methylthiourea (MTU) surface functional groups were investigated in a cellular model of synucleinopathy. Dendrimers are synthetic macromolecules that may be produced in a range of well-defined molecular sizes. Using cellomics array scan high-content screening, we show that both types of dendrimers are able to significantly reduce intracellular levels of α-synuclein aggregates dependent on the concentration, the type and molecular size of the dendrimer with the bigger size MTU-dendrimers having the highest potency. The intracellular clearance of α-synuclein aggregates by dendrimers was achieved at nontoxic concentrations. (Figure Presented).

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A multiplexed immunoassay for detection of antibodies to Actinobacillus pleuropneumoniae (App) in pigs

The bacterium Actinobacillus pleuropneumoniae (App) is the causative agent of porcine pleuropneumoniae, a contagious and severe respiratory disease in pigs. Based on capsular antigens, 15 App serovars have been described, and the prevalence and morbidity of these serovars vary with geographic regions (1). In Denmark, the most important serovars are considered to be App 1, 2, 5, 6, 7, 10 and 12. As part of the Danish surveillance program for App, the Danish Veterinary Institute uses ELISAs and complement fixation tests (CFT) to test for porcine anti-App antibodies (2-7). In an effort to improve our diagnostic tools, we are currently developing a novel indirect fluorescent microsphere immunoassay that can facilitate simultaneous detection of antibodies towards multiple App serovars within a single serum sample volume. The multiplex immunoassay is based on Luminex technology (8) and has several benefits compared to ELISA and CFT, including reduced serum sample volumes, lowered amount of labor and faster acquisition of results.

Color test for selective detection of secondary amines on resin and in solution.

Resins for solid-phase synthesis give orange to red-brown resin beads selectively when secondary amines are present on the resin when treated with a solution of acetaldehyde and an Fmoc-amino acid in NMP. The method shows good specificity and gives colorless beads when exposed to a variety of other functional groups. Furthermore, the acetaldehyde/Fmoc amino acid method can be used as a selective colorimetric test for secondary amines in solution.
In vitro anti-parasitic effects of sesquiterpene lactones from chicory against cattle nematodes

Chicory (*Cichorium intybus*) has the potential as an anti-parasitic crop for ruminants. However, the mechanisms behind observed *in vivo* effects are poorly understood but it is likely that plant secondary metabolites like sesquiterpene lactones (SL) play a role. In this study we tested the effect of SL-rich extracts from 2 chicory cultivars on the viability of first-stage larvae (L1) of *Ostertagia ostertagi*, a pathogenic cattle nematode. Chicory Spadona and Puna II were grown at the same farm and leaves were sampled the same day. 1 g of freeze-dried leaves was extracted in methanol/water. Resulting extracts were incubated with cellulase enzymes, recovered in ethyl acetate and purified by normal solid-phase extraction. Obtained extracts were dissolved in 100% dimethyl sulfoxide (DMSO). A calf infected with *O. ostertagi* served as donor of nematode eggs. Eggs were hatched and L1 obtained were incubated in 8 extract concentrations for each cultivar (in duplicates) ranging from 2000 µg to 16 µg dry matter (DM) extract/ml (final concentration 1% DMSO in phosphate buffered saline-PBS). Ivermectin (1 mg/ml) and 1% DMSO in PBS were used as positive and negative controls, respectively. Viability of L1 was evaluated morphologically after 12 h of incubation (25°C) and was expressed as the number of live L1 to the total number of L1. Spadona-SL dramatically decreased the survival of *O. ostertagi* L1, with a mortality of 99% at concentrations ≥500 µg/ml and EC50 of 132.8 µg/ml (CI=117.5-150.2 µg/ml). Conversely, Puna-SL induced a larval mortality of only 37% at the highest concentration tested (2,000 µg/ml), thus estimation of EC50 was not possible. Results showed a marked difference in the anti-parasitic activity of SL-rich extracts from 2 different chicory cultivars. Further biochemical analyses of the extracts may reveal the responsible compounds.
In vitro anti-parasitic effects of sesquiterpene lactones from chicory against cattle nematodes

Chicory (Cichorium intybus) is currently being investigated for potential use as an anti-parasitic crop for ruminants. However, mechanisms behind observed in vivo effects are poorly understood but it is likely that plant secondary metabolites like sesquiterpene lactones (SL) play a role. In this study we tested the effect of SL-rich extracts from 2 chicory cultivars on the viability of first-stage larvae (L1) of Ostertagia ostertagi, a pathogenic cattle nematode. Chicory Spadona and Puna II were grown at the same farm and leaves were sampled the same day. 1 g of freeze-dried leaves was extracted in methanol/water. Resulting extracts were incubated with cellulase enzymes, recovered in ethyl acetate and purified by normal solid-phase extraction. Obtained extracts were dissolved in 100% DMSO. A calf infected with O. ostertagi served as donor of nematode eggs. Eggs were hatched and L1 obtained were incubated in 8 extract concentrations for each cultivar (in duplicates) ranging from 2000 μg to 16 μg dry matter (DM) extract/mL (final concentration 1% DMSO in PBS). Ivermectin (1 mg/mL) and 1% DMSO in PBS were used as positive and negative controls, resp. Viability of L1 was evaluated morphologically after 12 h of incubation (25°C) and was expressed as the number of live L1 to the total number of L1. Spadona-SL dramatically decreased the survival of O. ostertagi L1, with a mortality of 99% at concentrations ≥ 500 μg/mL and EC50 of 132.8 μg/mL (CI = 117.5-150.2 μg/mL). Conversely, Puna-SL induced a larval mortality of only 37% at the highest concentration tested (2000 μg/mL), thus estimation of EC50 was not possible. Results showed a marked difference in the anti-parasitic activity of SL-rich extracts from 2 different chicory cultivars. Further biochemical analyses of the extracts may reveal the responsible compounds.

Method to conjugate polysaccharide antigens to surfaces for the detection of antibodies

A new generic method for the conjugation of lipopolysaccharide (LPS)-derived polysaccharide antigens from gram-negative bacteria has been developed using Salmonella as a model. After removal of lipid A from the LPS by mild acidolysis, the polysaccharide antigen was conjugated to polystyrene microbeads modified with N-alkyl hydroxylamine and N-alkyl-O-methyl hydroxylamine surface groups by incubation of antigen and beads for 16 h at 40°C without the need for coupling agents. The efficiency of the new method was evaluated by flow cytometry in model samples and serum samples containing antibodies against Salmonella typhimurium and Salmonella dublin. The presented method was compared with a similar method for conjugation of Salmonella polysaccharide antigens to surfaces. Here, the new method showed higher antigen coupling efficiency by detecting low concentrations of antibodies. Furthermore, the polysaccharide-conjugated beads showed preserved bioactivity after 1 year of use.
Solid-phase synthesis of polyfunctional polylysine dendrons using aldehyde linkers
A straightforward method for the solid-phase synthesis of C-terminally modified polylysine dendrons has been developed by applying bisalkoxybenzaldehyde and trisalkoxybenzaldehyde linkers. The method has been used for the synthesis of polylysine dendrons with a variety of C-terminal ‘tail groups’ such as alkyl, propargyl, and dansyl to give dendrons in high crude purity. Furthermore, the method was successful for the synthesis of dendrons with multiple N-terminal pentapeptide groups together with C-terminal alkyl and propargyl tail groups. Finally, the method was shown to be well-suited for automated synthesis.

General information
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Organisations: National Veterinary Institute, Section for Immunology and Vaccinology, Center for Nanomedicine and Theranostics, Technical University of Denmark
Authors: Svenssen, D. K. (Ekstern), Mirsharghi, S. (Intern), Boas, U. (Intern)
Number of pages: 4
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Main Research Area: Technical/natural sciences

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BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.757 SNIP 0.747 CiteScore 2.3
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.794 SNIP 0.796 CiteScore 2.41
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.904 SNIP 0.802 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.084 SNIP 0.844 CiteScore 2.45
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.216 SNIP 0.949 CiteScore 2.76
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.232 SNIP 0.916
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.289 SNIP 0.937
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.325 SNIP 0.881
Web of Science (2008): Indexed yes
Improved coupling of bacterial polysaccharides to macromolecules and solid supports

The invention relates to a method of producing a polysaccharide-carrier conjugate comprising coupling a polysaccharide to a carrier, said polysaccharide comprising at least one monosaccharide unit comprising a keto-carboxy group according to the formula \(-C(=O)COOR\), where \(R\) is either hydrogen or \(C1-C6\) alkyl or a ringclosed ketal or hemi-ketal corresponding thereto, said method comprising the steps of, i) providing a carrier comprising \(N\)-hydroxylamine- or \(N\)-alkoxyamine groups according to the formula \(-NHOR\), wherein \(R\) is \(H\) or \(C1-C6\) alkyl attached thereto, ii) reacting said \(N\)-hydroxylamine or \(N\)-alkoxyamine group of the carrier with a keto-carboxy group of said polysaccharide to form a covalent amide bond between the carrier and the polysaccharide. Another aspect of the present invention relates to a compound or solid surface obtained when performing the method of the present invention. A third aspect of the present invention relates to the use of the compound or solid surface in the preparation of an assay device for the detection of antibodies against gram negative bacteria.

General information

State: Published
Organisations: National Veterinary Institute, Section for Immunology and Vaccinology
Authors: Boas, U. (Intern)
Publication date: 2013

Publication information
IPC: G01N33/569
Patent number: WO2013060335
Date: 24/10/2012
Original language: English
Main Research Area: Technical/natural sciences
Publication: Research - Patent – Annual report year: 2013

Enhancement of Muramyldipeptide (MDP) Immunostimulatory Activity by Controlled Multimerization on Dendrimers

Peptidoglycan is a widespread bacterial PAMP molecule and a powerful initiator of innate immune responses. It consists of repeating units of MDP, which as a monomer is only weakly immunostimulatory. Here, MDP-coupled dendrimers were prepared and investigated for stimulation of pig blood mononuclear cells. Compared to monomeric MDP, MDP-dendrimers induced a markedly enhanced production of IL-12 p40, IL-1β and IL-6 and completely down-regulated surface expression of B7 and MHC class II. These results suggest a possible novel strategy based on controlled multimerization of minimal PAMP motifs on dendrimers for preparing molecularly defined immunostimulators with predictable bioactivities.
Dendrimers for Vaccine and Immunostimulatory Uses: A Review

Dendrimers are well-defined (monodisperse) synthetic globular polymers with a range of interesting chemical and biological properties. Chemical properties include the presence of multiple accessible surface functional groups that can be used for coupling biologically relevant molecules and methods that allow for precise heterofunctionalization of surface
groups. Biologically, dendrimers are highly biocompatible and have predictable biodistribution and cell membrane interacting characteristics determined by their size and surface charge. Dendrimers have optimal characteristics to fill the need for efficient immunostimulating compounds (adjuvants) that can increase the efficiency of vaccines, as dendrimers can provide molecularly defined multivalent scaffolds to produce highly defined conjugates with small molecule immunostimulators and/or antigens. The review gives an overview on the use of dendrimers as molecularly defined carriers/presenters of small antigens, including constructs that have built-in immunostimulatory (adjuvant) properties, and as stand-alone adjuvants that can be mixed with antigens to provide efficient vaccine formulations. These approaches allow the preparation of molecularly defined vaccines with highly predictable and specific properties and enable knowledge-based vaccine design substituting the traditional empirically based approaches for vaccine development and production.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern), Sørensen, N. S. (Intern)
Pages: 405-418
Publication date: 2010
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioconjugate Chemistry
Volume: 21
Issue number: 3
ISSN (Print): 1043-1802
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.781 SNIP 1.071
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.686 SNIP 1.073 CiteScore 4.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.704 SNIP 1.177 CiteScore 4.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.012 SNIP 1.208 CiteScore 5.12
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.069 SNIP 1.267 CiteScore 4.8
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.28 SNIP 1.292 CiteScore 5.26
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.252 SNIP 1.203
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.03 SNIP 1.111
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.154 SNIP 1.154
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.029 SNIP 1.284
Scopus rating (2006): SJR 1.693 SNIP 1.145
A robust quantitative solid phase immunoassay for the acute phase protein C-reactive protein (CRP) based on cytidine 5'-diphosphocholine coupled dendrimers

C-reactive protein (CRP) is an important acute phase protein, being used as a sensitive indicator of inflammation and infection and is also associated with the risk of cardiovascular problems. The present paper describes a robust and sensitive ELISA for CRP, based on the affinity of CRP for phosphocholine. In this design synthetic globular polymers (dendrimers) are used as scaffolds for the multivalent display of phosphocholine molecules. CRP present in a sample binds to the phosphocholine moiety presented at high density in the coating layer and is detectable by specific antibodies. The ELISA was applied to determination of pig and human CRP using commercially available antibodies against human CRP. The assay was shown to be more sensitive than previously published immunoassays employing albumin-coupled cytidine diphosphocholine. The coating was stable for at least 30 days at room temperature and the assay showed high intra- and interassay reproducibility. Results were compared with an immunoturbidimetric method and with a commercial ELISA kit and there was very good agreement with the immunoturbidimetric method, however not with the commercial assay, probably due to a calibration discrepancy. The assay is applicable to other species by providing an adequate detection antibody having the desired species specificity.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Pedersen, H. G. (Ekstern), Jensen, A. L. (Ekstern), Boas, U. (Intern)
Pages: 112-118
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Immunological Methods
Volume: 343
Issue number: 2
ISSN (Print): 0022-1759
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.061 SNIP 0.655 CiteScore 1.92
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.068 SNIP 0.76 CiteScore 2.07
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.013 SNIP 0.832 CiteScore 1.99
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.08 SNIP 0.837 CiteScore 2.31
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Backbone Amide Linker in Solid-Phase Synthesis

General information
State: Published
Organisations: National Veterinary Institute, Division of Veterinary Diagnostics and Research, Innate Immunology, Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering
Authors: Boas, U. (Intern), Brask, J. (Intern), Jensen, K. J. (Ekstern)
Pages: 2092-2118
Publication date: 2009
Main Research Area: Technical/natural sciences

Publication information
Journal: Chemical Reviews
Volume: 109
Issue number: 5
ISSN (Print): 0009-2665
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 42.79 SJR 19.282 SNIP 10.369

Original language: English
Dendrimer, Acute phase protein, Pig CRP, Phosphocholine, Human CRP, Immunoassay
DOIs:
10.1016/j.jim.2009.02.002
Source: orbit
Source-ID: 249547
Publication: Research - peer-review › Journal article – Annual report year: 2009
Dendrimer based vaccine adjuvants

**General information**

- **State:** Published
- **Organisations:** Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
- **Authors:** Heegaard, P. M. H. (Intern), Boas, U. (Intern), Sørensen, N. S. (Intern)
- **Publication date:** 2009

**Host publication information**

- **Title of host publication:** Polymeric Micelles and Related Nano-delivery Systems
- **Publisher:** Kentus Book Publishers
- **Main Research Area:** Technical/natural sciences
- **Source:** orbit
IMMUNOSTIMULATORY PROPERTIES OF DENDRIMERS MULTIVALENTLY PRESENTING MURAMYLDIPEPTIDE

Objectives: Many pathogens will only be efficiently neutralized by the induction of cell-mediated immunity, and with the enhanced use of subunit-vaccine approaches there is a strong need for the development of efficient and safe Th1-biassing adjuvants. Pathogen-associated molecular patterns (PAMPs) are evolutionarily conserved microbial structures, generally composed of repeated molecular units of small size, and recognized by pattern-recognition receptors (PRRs). Binding of PAMPs to certain PRRs induces dendritic cells to express costimulatory molecules and inflammatory cytokines, enabling an inductive antigen-presentation. This project aims at using small PAMP-units to prepare molecularly defined adjuvants for the targeted delivery of antigens in an optimally immunostimulatory manner. Methods: We investigated whether the repetitive structure of PAMPs may be mimicked by multivalent presentation of PAMP minimal motifs on the surface of monodisperse hyperbranched globular synthetic polymers, dendrimers. Two sizes of polypropylene-imine (PPI) and polyamido-amine (PAMAM) dendrimers were conjugated with muramyldipeptide (MDP), the minimal essential motif of peptidoglycan (PGN), to yield constructs presenting a theoretical number of 16 and 32 MDP molecules, respectively. These conjugates were tested for cytotoxicity, and for their ability to induce cytokines and upregulate MHC and costimulatory molecules in porcine peripheral blood mononuclear cells. Results: Both MDP-PPI and MDP-PAMAM conjugates induced a considerable, dose-dependent production of IL-12 p40, IL-1β and IL-6, in contrast to unmodified dendrimers and free MDP at equivalent concentrations. The MDP-PAMAM conjugates were particularly efficient inducers of all three cytokines, inducing IL-12 p40, IL-1β and IL-6 to the same level as PGN. Interestingly, whereas PGN induced a considerable IL-10-production, no IL-10 was induced by the MDP-conjugated dendrimers. By flow cytometry, enhanced cell death was detected in response to unmodified PPI-dendrimers, whereas none of the MDP-conjugated dendrimers showed any detectable cytotoxicity. The monocytes showed an upregulation of B7 and MHC class II after 24 hours of culture in medium. However, after culture with PGN or MDP-conjugated dendrimers, the monocytes had down-regulated both markers to a degree that corresponded with the magnitude of cytokine production. Conclusion: These results indicate that it is possible to employ dendrimers in the synthesis of molecularly defined globular PAMP-mimics or “artificial microbes” with controlled immunostimulatory properties.
Dendrimers as scaffolds for immune stimulating motifs, a new approach to molecular adjuvants
Dendrimers destabilize proteins in a generation-dependent manner involving electrostatic interactions

Dendrimers are well-defined chemical polymers with a characteristic branching pattern that gives rise to attractive features such as antibacterial and antitumor activities as well as drug delivery properties. In addition, dendrimers can solubilize prion protein aggregates at very low concentrations, but their mode of action is unclear. We show that poly(propylene imine) dendrimers based on di-aminobutane (DAB) and modified with guanidinium surface groups reduce insulin thermostability and solubility considerably at microgram per microliter concentrations, while urea-modified groups have hardly any effect. Destabilization is markedly generation-dependent and is most pronounced for generation 3, which is also the most efficient at precipitating insulin. This suggests that proteins can interact with both dendrimer surface and interior. The pH-dependence reveals that interactions are mainly mediated by electrostatics, confirmed by studies on four other proteins. Ability to precipitate and destabilize are positively correlated, in contrast to conventional small-molecule denaturants and stabilizers, indicating that surface immobilization of denaturing groups profoundly affects its interactions with proteins.
Dendrimers for multivalent display of immune modulating motifs

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern)
Publication date: 2008

Publication information
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 231598
Publication: Research › Sound/Visual production (digital) – Annual report year: 2008

Molecular adjuvants using PAMP motifs: concept and methodology and effects on pig PBMCs

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Sørensen, N. S. (Intern), Boas, U. (Intern), Heegaard, P. M. H. (Intern)
Publication date: 2008
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 258858
Publication: Research - peer-review › Poster – Annual report year: 2008

THAL, a Sterically Unhindered Linker for the Solid-Phase Synthesis of acid sensitive protected peptide acids

General information
State: Published
Dendrimers are synthetic, symmetrically branched polymers that can be manufactured to a high degree of definition and therefore present themselves as monodisperse entities. Flexible and globular in shape and compartmentalized into a partly inaccessible interior and a highly exposed surface, they offer numerous possibilities for interactions with and responses to biological macromolecules and biorstructures including cell membranes and proteins. By way of their multiple functional surface groups, they allow the design of surfaces carrying a multitude of biological motifs and/or charges giving rise to quite significant biological and physico-chemical effects. Here we describe the surprising ability of dendrimers to interact with and perturb polypeptide conformations, particularly efficiently towards amyloid structures; that is, the structures of highly insoluble polypeptide aggregates involved in a range of serious and irreversibly progressive
pathological conditions (protein-misfolding diseases). Interesting as this may be, the interaction of dendrimers with such
generic peptidic aggregates also offers a new perspective on the molecular mechanisms governing assembly and
disassembly of amyloid structures and thereby on determinants of protein and peptide folding. Despite the potent
disaggregative nature of various dendrimers, they have variable effects on the stability of different proteins, suggesting
that they do not act as generic denaturants, but rather exert their effects via specific interactions with individual parts of
each protein.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern), Otzen, D. E. (Ekstern)
Pages: 1047-1059
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Macromolecular Bioscience
Volume: 7
Issue number: 8
ISSN (Print): 1616-5187
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.36 SJR 1.014 SNIP 0.794
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.207 SNIP 0.912 CiteScore 3.8
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.308 SNIP 0.981 CiteScore 3.87
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.387 SNIP 1.03 CiteScore 4.05
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.563 SNIP 1.125 CiteScore 3.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.395 SNIP 1.104 CiteScore 3.69
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.408 SNIP 1.144
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.51 SNIP 1.201
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.405 SNIP 1.236
Scopus rating (2007): SJR 1.289 SNIP 1.213
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.055 SNIP 0.999
Scopus rating (2005): SJR 0.806 SNIP 0.798
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.621 SNIP 0.751
Scopus rating (2003): SJR 0.879 SNIP 1.152
Scopus rating (2002): SJR 0.883 SNIP 0.95
Original language: English
Alzheimer's disease, prion diseases, amyloid aggregates, dendrimers, proteins
DOIs:
10.1002/mabi.200700051
Dendrimers as scaffolds for immune-stimulatory motifs – a new class of well-defined molecular adjuvants

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Adaptive Immunology & Parasitology
Authors: Sørensen, N. S. (Intern), Boas, U. (Intern), Skovgaard, K. (Intern), Jungersen, G. (Intern), Heegaard, P. M. H. (Intern)
Publication date: 2007
Event: Poster session presented at 2nd EPIZONE Theme 5 Meeting, Greifswald, Germany.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 242512
Publication: Research › Poster – Annual report year: 2007

Dendrimers as scaffolds for molecular well defined adjuvants.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Sørensen, N. S. (Intern), Heegaard, P. M. H. (Intern)
Publication date: 2007
Event: Abstract from International Dendrimer Symposium, Toulouse, France.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 242507
Publication: Research › Conference abstract for conference – Annual report year: 2007

New guanidino- and urea modified dendrimers as potent solubilizers of misfolded prion protein aggregates at non-cytotoxic concentration. Dependence on dendrimer generation and surface charge

General information
State: Published
Organisations: Adaptive Immunology & Parasitology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Innate Immunology
Authors: Hvass, H. C. (Intern), Boas, U. (Intern), Olsen, P. (Ekstern), Heegaard, P. M. H. (Intern)
Pages: 3578-3583
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Biomacromolecules
Volume: 8
ISSN (Print): 1525-7797
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.74 SJR 1.973 SNIP 1.334
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.134 SNIP 1.449 CiteScore 6.05
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.207 SNIP 1.652 CiteScore 6.38
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.085 SNIP 1.617 CiteScore 6.07
ISI indexed (2013): ISI indexed yes
S-((5-Formyl-3,4-ethylenedioxy)thiophene-2-yl)-3-propionic acid: Relationship between low formyl group reactivity and crystal structure

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Hammershøj, P. (Ekstern), Jessing, M. (Ekstern), Madsen, A. Ø. (Ekstern), Jensen, K. J. (Ekstern), Christensen, J. B. (Ekstern), Boas, U. (Intern)
Pages: 209-212
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: International Journal of Peptide Research and Therapeutics
Volume: 13
ISSN (Print): 1573-3149
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.323 SNIP 0.427 CiteScore 0.94
BFI (2015): BFI-level 1
A robust, species cross-reactive, dendrimer based immunoassay for C-reactive protein with high sensitivity

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern), Pedersen, H. G. (Ekstern)
Number of pages: 45
Publication date: 2006

Host publication information
Title of host publication: Proceedings of the 6th European Colloquium on Acute Phase Proteins
Main Research Area: Technical/natural sciences
Conference: European Colloquium on Acute Phase Proteins, Copenhagen, Denmark, 01/01/2006
Source: orbit
Source-ID: 241846
Publication: Research - peer-review › Article in proceedings – Annual report year: 2006

Carbocations in action. Design, synthesis and evaluation of a highly acid sensitive naphthalene based backbone amide linker for solid phase synthesis

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Pittelkow, M. (Ekstern), Boas, U. (Intern), Christensen, J. B. (Ekstern)
Dendrimer based anti-infective and anti-inflammatory drugs

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern)
Pages: 333-351
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Recent Patent Reviews on Anti-Infective Drug Discovery
Volume: 1
ISSN (Print): 1574-891X
Ratings:
Scopus rating (2016): SJR 0.442 SNIP 0.766 CiteScore 1.39
Scopus rating (2015): SJR 0.412 SNIP 0.68 CiteScore 1.4
Scopus rating (2014): SJR 0.752 SNIP 0.826 CiteScore 1.58
Scopus rating (2013): SJR 0.453 SNIP 0.624 CiteScore 1.67
ISI indexed (2013): ISI indexed no
Scopus rating (2012): SJR 0.497 SNIP 0.721 CiteScore 2.07
ISI indexed (2012): ISI indexed no
Scopus rating (2011): SJR 0.386 SNIP 0.443 CiteScore 1.61
ISI indexed (2011): ISI indexed no
Scopus rating (2010): SJR 0.508 SNIP 0.612
Scopus rating (2009): SJR 0.451 SNIP 0.375
Scopus rating (2008): SJR 0.327 SNIP 0.144
Scopus rating (2007): SJR 0.218
Primary language: English
Source: orbit
Source-ID: 241492
Publication: Research › Journal article – Annual report year: 2006

Dendrimers: design, synthesis and chemical properties

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Christensen, J. (Ekstern), Heegaard, P. M. H. (Intern)
Pages: 3785-3798
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Materials Chemistry
Volume: 16
Issue number: 38
ISSN (Print): 0959-9428
Ratings:
BFI (2015): BFI-level 2
BFI (2014): BFI-level 2
BFI (2013): BFI-level 2
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
BFI (2012): BFI-level 2
Web of Science (2012): Indexed yes
Dendrimers in medicine and biotechnology. New molecular tools

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Christensen, J. B. (Ekstern), Heegaard, P. M. H. (Intern)
Number of pages: 182
Publication date: 2006

Publication information
Place of publication: Cambridge
Publisher: Royal Society of Chemistry
Edition: 1
ISBN (Print): 08-54-04852-9
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 230043
Publication: Research - peer-review › Journal article – Annual report year: 2006

Thiophene backbone amide linkers, a new class of easily prepared and highly acid-labile linkers for solid-phase synthesis

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Jessing, M. (Ekstern), Brandt, M. (Ekstern), Jensen, K. J. (Ekstern), Christensen, J. B. (Ekstern), Boas, U. (Intern)
Pages: 6734-6741
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Organic Chemistry
Volume: 71
ISSN (Print): 0022-3263
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
The role of the peri-effect in synthesis and reactivity of highly substituted naphthaldehydes: Novel backbone amide linkers for solid-phase synthesis
Alkoxy substituted naphthalene carboxaldehydes (NAL), novel backbone amide handles for solid-phase synthesis

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Christensen, J. B. (Ekstern), Jensen, K. J. (Ekstern)
Pages: 497-503
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Combinatorial Chemistry
Volume: 6
ISSN (Print): 1520-4766
Ratings:
Web of Science (2004): Indexed yes
Web of Science (2002): Indexed yes
Web of Science (2000): Indexed yes
Original language: English
Source: orbit
Source-ID: 241497
Publication: Research - peer-review › Journal article – Annual report year: 2004

Amyloid aggregates of the prion peptide PrP106-126 are destabilised by oxidation and by the action of dendrimers

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Adaptive Immunology & Parasitology
Authors: Heegaard, P. M. H. (Intern), Andersen, H. G. (Intern), Flink, J. (Ekstern), Boas, U. (Intern)
Pages: 127-133
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: FEBS Letters
Volume: 577
ISSN (Print): 0014-5793
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.898 SNIP 0.885 CiteScore 3.48
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 2.02 SNIP 0.927 CiteScore 3.49
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.86 SNIP 0.871 CiteScore 3.19
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.328 SNIP 0.984 CiteScore 3.71
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.259 SNIP 0.914 CiteScore 3.67
DENDRIMER CONJUGATES FOR SELECTIVE OF PROTEIN AGGREGATES

Dendrimer conjugates are presented, which are formed between a dendrimer and a protein solubilising substance. Such dendrimer conjugates are effective in the treatment of protein aggregate-related diseases (e.g. prion-related diseases). The protein solubilising substance and the dendrimer together show a protein aggregate solubilising effect higher than a physical mixture of the dendrimer and the protein solubilising substance (i.e. a synergistic effect). Such dendrimer conjugates are useful in the treatment or prevention of protein aggregate-relates diseases, in disinfection/decontamination processes and in classifying or identifying protein aggregates. The synthesis of such dendrimer conjugates from readily-available starting materials is described.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern)
Publication date: 2004

Publication information
Patent number: WO2004047869
Date: 10/06/2004
Original language: English

Bibliographical note
Dendrimers in drug research

Dendrimers are versatile, derivatisable, well-defined, compartmentalised chemical polymers with sizes and physicochemical properties resembling those of biomolecules e.g. proteins. The present critical review (citing 158 references) briefly describes dendrimer design, nomenclature and divergent/convergent dendrimer synthesis. The characteristic physicochemical features of dendrimers are highlighted, showing the effect of solvent pH and polarity on their spatial structure. The use of dendrimers in biological systems are reviewed, with emphasis on the biocompatibility of dendrimers, such as in vitro and in vivo cytotoxicity, as well as biopermeability, biostability and immunogenicity. The review deals with numerous applications of dendrimers as tools for efficient multivalent presentation of biological ligands in biospecific recognition, inhibition and targeting. Dendrimers may be used as drugs for antibacterial and antiviral treatment and have found use as antitumor agents. The review highlights the use of dendrimers as drug or gene delivery devices in e.g. anticancer therapy, and the design of different host-guest binding motifs directed towards medical applications is described. Other specific examples are the use of dendrimers as 'glycocarriers' for the controlled multimeric presentation of biologically relevant carbohydrate moieties which are useful for targeting modified tissue in malignant diseases for diagnostic and therapeutic purposes. Finally, the use of specific types of dendrimers as scaffolds for presenting vaccine antigens, especially peptides, for use in vaccines is presented.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Heegaard, P. M. H. (Intern)
Pages: 43-63
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Chemical Society Reviews
Volume: 33
Issue number: 1
ISSN (Print): 0306-0012
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 35.7 SJR 14.994 SNIP 7.676
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 14.633 SNIP 7.877 CiteScore 35.79
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 13.72 SNIP 7.612 CiteScore 32.41
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 12.747 SNIP 6.604 CiteScore 29.14
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 14.939 SNIP 6.714 CiteScore 29.02
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 13.298 SNIP 6.678 CiteScore 27.54
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 10.173 SNIP 5.47
Facile synthesis of aliphatic isothiocyanates and thioureas on solid phase using peptide coupling reagents

Peptide coupling reagents can be used as versatile reagents for the formation of aliphatic isothiocyanates and thioureas on solid phase from the corresponding solid-phase anchored aliphatic primary amines. The formation of the thioureas is fast and highly chemoselective, and proceeds via formation of the intermediate isothiocyanate. The isothiocyanate and subsequent thiourea formation take place under standard peptide coupling conditions using carbon disulfide as the 'amino acid'. The thioureas are released from the resin and isolated in moderate to high yields.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Adaptive Immunology & Parasitology
Authors: Boas, U. (Intern), Andersen, H. G. (Intern), Christensen, J. B. (Ekstern), Heegaard, P. M. H. (Intern)
Pages: 269-272
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Tetrahedron Letters
Volume: 45
Issue number: 2
ISSN (Print): 0040-4039
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.754 SNIP 0.796 CiteScore 2.41
Web of Science (2014): Indexed Yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.904 SNIP 0.802 CiteScore 2.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
PREPARATION OF CHEMICALLY WELL-DEFINED CARBOHYDRATE DENDRIMER CONJUGATES

A method for the synthesis of dendrimer conjugates having a well-defined chemical structure, comprising one or more carbohydrate moieties and one or more immunomodulating substances coupled to a dendrimer, is presented. First, the carbohydrate is bound to the dendrimer in a chemoselective manner. Subsequently, the immunomodulating substance is also bound in a chemoselective manner, to give a dendrimer conjugate with a well-defined structure and connectivity and containing a precise, pre-determined ratio of carbohydrate to immunomodulating substance. The invention also relates to novel dendrimer conjugates and their use in vaccination, production of antibodies, high throughput screening, diagnostic assays and libraries.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Heegaard, P. M. H. (Intern), Boas, U. (Intern)
Publication date: 2004

Publication information
Patent number: WO2004041310
Date: 21/05/2004
TFFH as an excellent reagent for acylation of alcohols, thiols and dithiocarbamates

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Pittelkow, M. (Ekstern), Kamounah, F. S. (Ekstern), Boas, U. (Intern), Pedersen, B. (Ekstern), Christensen, J. B. (Ekstern)
Pages: 2485-2492
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Synthesis
Volume: 15
ISSN (Print): 0039-7881
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.046 SNIP 0.575 CiteScore 2.34
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.088 SNIP 0.669 CiteScore 2.39
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.079 SNIP 0.694 CiteScore 2.43
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.126 SNIP 0.675 CiteScore 2.37
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.155 SNIP 0.676 CiteScore 2.2
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.203 SNIP 0.702 CiteScore 2.36
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.168 SNIP 0.693
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.201 SNIP 0.766
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.28 SNIP 0.816
Scopus rating (2007): SJR 1.27 SNIP 0.857
Scopus rating (2006): SJR 1.251 SNIP 0.912
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.089 SNIP 0.902
Scopus rating (2004): SJR 1.043 SNIP 0.9
Web of Science (2004): Indexed yes
A highly acid-labile thiophene backbone amide linker: T-BAL

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Jessing, M. (Ekstern), Christensen, J. B. (Ekstern), Jensen, K. J. (Ekstern)
Pages: 108-110
Publication date: 2003

Host publication information
Title of host publication: Proceedings of the 18th American Peptide Symposium
Place of publication: Boston
Main Research Area: Technical/natural sciences
Conference: American Peptide Symposium, Boston, USA, 01/01/2003
Source: orbit
Source-ID: 241847
Publication: Research - peer-review › Article in proceedings – Annual report year: 2003

Poly(amidoamine)-dendrimer-stabilized Pd(0) nanoparticles as a catalyst for the Suzuki reaction

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Technical University of Denmark
Authors: Pittelkow, M. (Ekstern), Moth-Poulsen, K. (Ekstern), Boas, U. (Intern), Christensen, J. (Ekstern)
Pages: 7682-7684
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Langmuir
Volume: 19
Issue number: 18
ISSN (Print): 0743-7463
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.99 SJR 1.55 SNIP 1.188
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.686 SNIP 1.308 CiteScore 4.33
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.816 SNIP 1.391 CiteScore 4.59
Web of Science (2014): Indexed yes
Suzuki cross-coupling reaction with aromatic iodides catalyzed by PAMAM-dendrimer encapsulated Pd (0) nanoparticles

General information
State: Published
Organisations: Department of Physics, Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Pittelkow, M. (Ekstern), Moth-Poulsen, K. (Intern), Boas, U. (Intern), Christensen, J. B. (Ekstern)
Pages: 7682-7684
Publication date: 2003
Main Research Area: Technical/natural sciences
Highly acid-labile backbone amide linkers: o-BAL and T-BAL

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Brask, J. (Ekstern), Christensen, J. B. (Ekstern), Jensen, K. J. (Ekstern)
Pages: 50-51
Publication date: 2002

Host publication information
Title of host publication: Proceedings of the 27th European Peptide Symposium
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 241848
Publication: Research - peer-review › Article in proceedings – Annual report year: 2002

New dendrimer - Peptide host - Guest complexes: Towards dendrimers as peptide carriers
Adamantyl urea and adamantyl thiourea modified poly(propylene imine) dendrimers act as hosts for N-terminal tert-butoxycarbonyl (Boc)-protected peptides and form chloroform-soluble complexes. Investigations with NMR spectroscopy show that the peptide is bound to the dendrimer by ionic interactions between the dendrimer outer shell tertiary amines and the C-terminal carboxylic acid of the peptide, and also through host-urea to peptide-amide hydrogen bonding. The hydrogen-bonding nature of the peptide dendrimer interactions was further confirmed by using Fourier transform IR spectroscopy, for which the NH- and CO-stretch signals of the peptide amide moieties shift towards lower wave-numbers upon complexation with the dendrimer. Spatial analysis of the complexes with NOESY spectroscopy generally shows close proximity of the N-terminal Boc group of the peptide to the peripheral adamantyl groups on the dendrimer host. The influence of side-chain motif on interactions with the host is analyzed by using seven different N-Boc-protected tripeptides as guests for the dendrimer. Downfield shifts of up to 1.3 ppm were observed for the guest amide NH-proton signals. These shifts decrease with increasing ‘bulkiness’ of the amino acid side chains. Despite this, the dendrimer was capable of making multiple peptide-dendrimer complexes when presented with a library of seven peptides. The different peptides were all present in the host, which did not show specific preferences, and could be released under mild acidic conditions. These results show the general nature of the peptide dendrimer interactions in the formation of either single- or multiple-peptide-dendrimer complexes.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Department of Chemistry
Authors: Boas, U. (Intern), Sontjens, S. (Ekstern), Jensen, K. J. (Intern), Christensen, J. (Ekstern), Meijer, E. (Ekstern)
Pages: 433-439
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Chembiochem
Volume: 3
Issue number: 5
ISSN (Print): 1439-4227
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.64 SJR 1.242 SNIP 0.733
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.255 SNIP 0.748 CiteScore 2.77
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.386 SNIP 0.852 CiteScore 2.88
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 1.622 SNIP 0.849 CiteScore 3.15
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 1.853 SNIP 0.902 CiteScore 3.49
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.903 SNIP 0.952 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.951 SNIP 0.931
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.899 SNIP 0.921
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.957 SNIP 0.869
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.014 SNIP 0.992
Scopus rating (2006): SJR 1.895 SNIP 0.956
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 1.833 SNIP 0.942
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 1.691 SNIP 0.995
Scopus rating (2003): SJR 1.575 SNIP 1.033
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.528 SNIP 0.991
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.197 SNIP 0.236
Original language: English
Source: orbit
Source-ID: 21641
Publication: Research - peer-review › Journal article – Annual report year: 2002

Studies in polymer assisted organic chemistry

General information
State: Published
Organisations: Unknown
Authors: Boas, U. (Intern)
Number of pages: 134
Publication date: 2002

Publication information
Original language: English
Main Research Area: Technical/natural sciences

Bibliographical note
ph. d. dissertation, University of Copenhagen 2002
Source: orbit
Source-ID: 241855
Publication: Research › Ph.D. thesis – Annual report year: 2002
The ortho backbone amide linker (o-BAL) is an easily prepared and highly acid-labile handle for solid-phase synthesis. The tris(alkoxy)benzyl backbone amide linker (BAL) has found widespread application in solid-phase synthesis. The key intermediate for preparation of para BAL (p-BAL) is 2,6-dimethoxy-4-hydroxybenzaldehyde; several reports on its synthesis have appeared. However, the ortho analogue of the handle (o-BAL) has successfully been used by us for the synthesis of C-terminal-modified peptides, oligosaccharides, and substituted anilines. Here, we present a new and convenient synthesis of the key intermediate for o-BAL, 4,6-dimethoxy-2-hydroxybenzaldehyde, by a highly regioselective demethylation with BBr₃, followed by purification through steam distillation. Cleavage studies of Leu-enkephalin anchored to either o-BAL or p-BAL handles revealed that both handles were surprisingly acid-labile and released the peptide with dilute TFA (5% and even 1% TFA in CH₂Cl₂). This useful property allowed the synthesis of fully protected Leu-enkephalin. The very convenient synthesis of 4,6-dimethoxy-2-hydroxybenzaldehyde combined with the benign properties of the o-BAL handle may make it the preferred regioisomer.
Synthesis of thiophene-based building blocks via facile alpha-monoiodination

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Dhanabalan, A. (Ekstern), Greve, D. R. (Ekstern), Meijer, E. W. (Ekstern)
Pages: 634-636
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Synlett
Issue number: 5
ISSN (Print): 0936-5214
The present invention provides a method for immobilising a polysaccharide (PS) to a solid surface, said polysaccharide having a keto-carboxy group (-C(=O)-COOH) or a ketal or hemiketal group corresponding thereto, e.g. derived from KDO (2-keto-3-deoxy-D-manno-octonic acid), the method comprising the steps of: (a) forming a covalent bond between the carboxy group of the polysaccharide and a reporter molecule (RM) comprising a recognition/substrate site (e.g. biotin or an anthraquinone); and (b) immobilising for diagnostic purposes, e.g. for the detection of bacterial infections from Gram-negative bacteria.

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Jakobsen, M. H. (Ekstern), Boas, U. (Intern), Jauho, E. S. (Ekstern), Heegaard, P. M. H. (Intern)
Evaluation of a novel enzyme-linked immunosorbent assay for detection of antibodies against Salmonella, employing a stable coating of lipopolysaccharide-derived antigens covalently attached to polystyrene microwells

Polysaccharides derived from Salmonella typhimurium lipopolysaccharide (LPS) representing the O-antigen factors 1, 4, 5, and 12 and the O-antigen factors 6 and 7 from Salmonella choleraesuis LPS were derivatized with the photoreactive compound anthraquinone and subsequently covalently coupled to microtiter polystyrene plates by ultraviolet irradiation. Both polysaccharide antigens could be coupled simultaneously to the same microtiter plate. The coated surface was used in indirect ELISA for the determination of serum antibodies from pigs infected with bacteria of the two Salmonella groups and from uninfected pigs. This ELISA proved itself by having a good long-term durability and a high degree of reproducibility, including low day-to-day variations and low interplate variations. Furthermore, the ELISA showed good specificity and sensitivity when data were compared with the optical density levels of a panel of pig sera as determined by a conventional ELISA on the basis of passive coating of the two Salmonella LPS antigens (the mix-ELISA). The covalent anthraquinone mix-ELISA shows promise as a stable and durable alternative to the existing conventional ELISA for serological surveillance of Salmonella infections in pigs.
Napthalene amide linkers (NAL), two new backbone amide handles for solid-phase synthesis

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Christensen, J. B. (Ekstern), Jensen, K. J. (Ekstern)
Publication date: 2000

Host publication information
Title of host publication: Proceedings of the 26th European Peptide Symposium
ISBN (Print): 9782842540487
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 241849
Publication: Research - peer-review › Article in proceedings – Annual report year: 2000

New technology for regiospecific covalent coupling of polysaccharide antigens in ELISA for serological detection
In this study we demonstrate a new UV irradiation technique for covalent coupling of bacterial polysaccharides derived from lipopolysaccharides to microtiter plates and the use of such plates in an enzyme linked immunosorbent assay (ELISA). Lipopolysaccharides were cleaved by mild acid hydrolysis into the lipid A part and the polysaccharide part. The polysaccharide was conjugated regiospecifically to a photochemically active compound, anthraquinone, resulting in a polysaccharide-anthraquinone conjugate. Anthraquinones forms active radicals when exposed to soft UV irradiation (350 nm) permitting the formation of stable covalent bonds to polymers e.g. microtiter plates. By this technique the polysaccharides are bound through the anthraquinone part of the polysaccharide-anthraquinone conjugates to the microtiter plates. This minimizes denaturation of O-antigen epitopes during binding to the microtiter plates and avoids
cross-reactivity due to conserved domains in the lipid A. Furthermore, the covalent binding of the polysaccharide antigens are compatible with harsh assay conditions, such as extensive washing procedures and buffers with high salt concentrations with no risk of antigen leakage. Here we describe the use of this technique for the immobilization of Lipopolysaccharide derived polysaccharides from Salmonella Typhimurium and Salmonella Choleraesuis lipopolysaccharides, representing the O-antigens 1, 4, 5, 6, 7, and 12. The functional polysaccharide surface gave similar ELISA results to plates coated passively with the corresponding unmodified lipopolysaccharide antigens. The plates were highly reproducible, showed very low inter-and intra-plate variation and were stable at room temperature for more than 8 months.

**General information**

State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Section for Veterinary Diagnostics, Technical University of Denmark
Authors: Jauho, E. (Ekstern), Boas, U. (Intern), Wiuff, C. (Ekstern), Wredstrøm, K. (Ekstern), Pedersen, B. (Ekstern), Andresen, L. O. (Intern), Heegaard, P. M. H. (Intern), Jakobsen, M. (Ekstern)
Pages: 133-143
Publication date: 2000
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Journal of Immunological Methods
Volume: 242
Issue number: 1-2
ISSN (Print): 0022-1759
Ratings:
- BFI (2017): BFI-level 1
- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 1
- Scopus rating (2016): SJR 1.061 SNIP 0.655 CiteScore 1.92
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 1
- Scopus rating (2015): SJR 1.068 SNIP 0.76 CiteScore 2.07
- BFI (2014): BFI-level 1
- Scopus rating (2014): SJR 1.013 SNIP 0.832 CiteScore 1.99
- BFI (2013): BFI-level 1
- Scopus rating (2013): SJR 1.08 SNIP 0.837 CiteScore 2.31
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 1
- Scopus rating (2012): SJR 1.172 SNIP 0.94 CiteScore 2.49
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 1
- Scopus rating (2011): SJR 1.168 SNIP 0.886 CiteScore 2.4
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 1
- Scopus rating (2010): SJR 1.085 SNIP 0.866
- BFI (2009): BFI-level 1
- Scopus rating (2009): SJR 1.182 SNIP 0.892
- Web of Science (2009): Indexed yes
- BFI (2008): BFI-level 1
- Scopus rating (2008): SJR 1.021 SNIP 0.778
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 1.032 SNIP 0.876
- Scopus rating (2006): SJR 1.287 SNIP 0.952
- Web of Science (2006): Indexed yes
- Scopus rating (2005): SJR 1.307 SNIP 0.972
Photochemical immobilization of anthraquinone conjugated oligonucleotides and PCR amplicons on solid surfaces

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Koch, T. (Ekstern), Jacobsen, N. (Ekstern), Fensholdt, J. (Ekstern), Boas, U. (Intern), Fenger, M. (Ekstern), Jakobsen, M. H. (Ekstern)
Pages: 474-483
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: Bioconjugate Chemistry
Volume: 11
ISSN (Print): 1043-1802
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 4.63 SJR 1.781 SNIP 1.071
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.686 SNIP 1.073 CiteScore 4.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.704 SNIP 1.177 CiteScore 4.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 2.012 SNIP 1.208 CiteScore 5.12
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 2.069 SNIP 1.267 CiteScore 4.8
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.28 SNIP 1.292 CiteScore 5.26
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.252 SNIP 1.203
Web of Science (2010): Indexed yes
Serological detection of antibodies against Salmonella polysaccharides in ELISA employing a new method for coupling of polysaccharides

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Section for Veterinary Diagnostics
Authors: Jauho, E. S. (Ekstern), Wiuff, C. (Ekstern), Boas, U. (Intern), Wredstrøm, K. (Ekstern), Pedersen, B. (Ekstern), Andresen, L. O. (Intern), Heegaard, P. M. H. (Intern), Jakobsen, M. H. (Ekstern)
Pages: 67-68
Publication date: 1999

Host publication information
Title of host publication: Proceedings of the 3rd International Symposium of Epidemiology and Control of Salmonella in Pork
Main Research Area: Technical/natural sciences
Conference: International Symposium of Epidemiology and Control : Salmonella Pork, Washington D.C., USA, 01/01/1999
Source: orbit
Source-ID: 241851
Publication: Research - peer-review › Article in proceedings – Annual report year: 1999

Serological detection of antibodies against Salmonella polysaccharides in ELISA employing a new method for coupling of polysaccharides

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Section for Veterinary Diagnostics
Authors: Jauho, E. S. (Ekstern), Wiuff, C. (Ekstern), Boas, U. (Intern), Wredstrøm, K. (Ekstern), Pedersen, B. (Ekstern), Andresen, L. O. (Intern), Heegaard, P. M. H. (Intern), Jacobsen, M. H. (Ekstern)
Publication date: 1999
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 242864
Publication: Research › Poster – Annual report year: 1999
Tetramethyl fluoroformamidinium hexafluorophosphate- an improved synthesis and some new uses

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Pedersen, B. (Ekstern), Christensen, J. B. (Ekstern)
Pages: 1223-1231
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: Synthetic Communications
Volume: 28
ISSN (Print): 0039-7911
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.355 SNIP 0.392 CiteScore 1.09
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.36 SNIP 0.504 CiteScore 1.06
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.306 SNIP 0.462 CiteScore 0.96
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.367 SNIP 0.52 CiteScore 1.12
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.425 SNIP 0.567 CiteScore 1.17
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.432 SNIP 0.543 CiteScore 1.13
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.408 SNIP 0.493
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.459 SNIP 0.55
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.458 SNIP 0.522
Scopus rating (2007): SJR 0.47 SNIP 0.605
Scopus rating (2006): SJR 0.478 SNIP 0.618
Scopus rating (2005): SJR 0.425 SNIP 0.548
Scopus rating (2004): SJR 0.459 SNIP 0.612
Scopus rating (2003): SJR 0.496 SNIP 0.79
Scopus rating (2002): SJR 0.619 SNIP 0.744
Scopus rating (2001): SJR 0.659 SNIP 0.841
Scopus rating (2000): SJR 0.612 SNIP 0.827
Scopus rating (1999): SJR 0.559 SNIP 0.789
Original language: English
Source: orbit
Source-ID: 241504
Publication: Research - peer-review › Journal article – Annual report year: 1998
New technology for covalent coupling of polysaccharide antigens in ELISA for serological surveillance

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute, Section for Veterinary Diagnostics
Authors: Jauho, E. S. (Ekstern), Wiuff, C. (Ekstern), Wredstrøm, K. (Ekstern), Petersen, B. (Ekstern), Boas, U. (Intern), Andresen, L. O. (Intern), Jacobsen, M. H. (Ekstern), Heegaard, P. M. H. (Intern)
Publication date: 1997
Event: Poster session presented at 78th Annual Meeting of the Conference of Research Workers in Animal Diseases, Chicago, Illinois, USA.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 242868
Publication: Research › Poster – Annual report year: 1997

Solid phase coupling of unprotected reducing carbohydrates to the N-terminus of peptides

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Heegaard, P. M. H. (Intern), Jakobsen, M. H. (Ekstern)
Pages: 327-328
Publication date: 1996

Host publication information
Title of host publication: Innovation and Perspective, Solid Phase Synthesis and Combinatorial Libraries, Collected Papers 4th International Symposium
Publisher: Mayflower Scientific
ISBN (Print): 09-51-57351-9
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 241854
Publication: Research - peer-review › Article in proceedings – Annual report year: 1996

A new synthesis of aliphatic isothiocyanates from primary amines, convenient for in situ use

General information
State: Published
Organisations: Innate Immunology, Division of Veterinary Diagnostics and Research, National Veterinary Institute
Authors: Boas, U. (Intern), Jakobsen, M. H. (Ekstern)
Pages: 1995-1996
Publication date: 1995
Main Research Area: Technical/natural sciences

Publication information
Journal: Chemical Communications
Issue number: 19
ISSN (Print): 1359-7345
Ratings:
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.06 SJR 2.506 SNIP 1.159
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.664 SNIP 1.314 CiteScore 6.7
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.701 SNIP 1.446 CiteScore 6.83
Projects:

**New dendrimer-based immunomodulators**

National Veterinary Institute
Period: 15/08/2013 → 01/12/2016
Number of participants: 6
Phd Student:
Mirsharghi, Sahar (Intern)
Supervisor:
Heegaard, Peter Mikael Helweg (Intern)
Anthelmintic resistance in parasitic nematodes of Danish cattle: Detection and control with special focus on Bioactive Plants

National Veterinary Institute
Period: 01/10/2012 → 29/09/2016
Number of participants: 7
Phd Student:
Pena-Espinoza, Miguel Angel (Intern)
Supervisor:
Enemark, Heidi (Intern)
Thamsborg, Stig Milan (Ekstern)
Main Supervisor:
Boas, Ulrik (Intern)
Examiner:
Jungersen, Gregers (Intern)
Hoste, Hervé (Ekstern)
Morgan, Eric René (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.

Relations
Publications:
Anthelmintic activity of forage chicory (Cichorium intybus) and field efficacy of ivermectin against gastrointestinal nematodes in Danish cattle
Project: PhD

Chemoselective coupling of bacterial lipopolysaccharides for multiplex flow cytometry

Adaptive Immunology & Parasitology
Division of Veterinary Diagnostics and Research
National Veterinary Institute
Period: 01/01/2008 → 30/09/2011
Number of participants: 4
Project ID: 22029
Project participant:
Lind, Peter (Intern)
Boas, Ulrik (Intern)
Andresen, Lars Ole (Intern)
Project Manager, organisational:
Riber, Ulla (Intern)

Financing sources
Source: Forskningsprojekter - Andre ministerier og styrelser
Name of research programme: Forskningsprojekter - Andre ministerier og styrelser
Amount: 2,768,380.00 Danish Kroner
Project