EUROPEAN CHITIN SOCIETY NEWSLETTER

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Bangkok Meeting

Braconnot Prize

Meetings

Recent Papers

Society Matters



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EDITORIAL

Dear Society members I am pleased to circulate the first Newsletter of 2002. This issue contains a report of the 5th Asia-Pacific Chitin-Chitosan meeting held in Bangkok earlier this year. However, I have kept back a report on the 5th Euchis meeting,"Euchis 02", held in Trondheim last month for the next Newsletter.

However, three entrants for the Prix Braconnot were assessed in Trondheim and an acknowledgement of the winner, Dr Sabina Prochazkova Strand is included here. A thesis summary, which can be assessed in the future, is printed here and I would urge the supervisors of other research students to submit work prior to the next Euchis meeting in Poznan in 2004.

I have also included the usual information on recent papers, forthcoming meetings and Society matters.

Finally, the Society was ten years old in March 2002 and its continued existence and contribution to the science of chitin and chitosan, particularly through the bi-annual meetings, should be a cause of pride. However, to keep going we need more active members and contributors to this Newsletter. The recent meetings in Bangkok and Trondheim indicate that research in this area is still strong and becoming commercially relevant - so there must be people with enthusiasm and something to say. Say it here!

George M Hall

BANGKOK 2002

The fifth Asia-Pacific Chitin & Chitosan Conference was held in the Emerald Hotel, Bangkok from March 13-15, 2002. Three Plenary lectures, ten Keynote lectures, 43 oral presentations and 100 poster contributions were given. A well-supported trade exhibition was another feature of the meeting indicating the progress made in the development of viable commercial products based on chitosan. This was an encouraging aspect in my opinion.

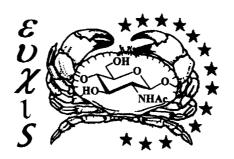
The usual aspects of chitin/chitosan production, properties, chemical/enzymic modification and application were covered in the contributions mentioned above. The proceedings will appear in due course.

There was also a good number of presentations on the production of N-acetyl D-glucosamine and N-acetylchitooligosaccharides. These molecules have applications through therapeutic activity in osteoarthritis and as immuno-enhancers respectively. Many approaches to their production were presented and included: the use of acid hydrolysis (commercially viable); enzymic hydrolysis with specific and non-specific chitinases and chitosanases and, where necessary, the use of N-acetylation of glucosamine with acetic anhydride. The use of membrane separation to recover the small molecular weight fractions from hydrolysates was also described.

This subject area has been developing for several years and has now come to fruition with commercial products available to customers. More chitin/chitosan-based products are needed and this meeting suggested that several candidates are being developed - a hopeful sign for us all!

George M Hall

The European Chitin Society



PRIX BRACONNOT 2002

CERTIFICATE

The Prix Braconnot 2002 has been awarded to

Dr. Sabina Prochazkova Strand

in recognition to her outstanding contributions

to the field of chitin science in particular her Ph.D. thesis entitled

"Interactions between chitosans and bacteria: flocculation and adhesion"

Potsdam, July 30, 2002

Prof. Dr. Martin G. Peter President, The European Chitin Society

PRIX BRACONNOT

The rules of the Prix Braconnot have been published in previous newsletters (most recently in Issue 14) and reproduced below is an abstract of a PhD thesis for future consideration. Other candidates are welcome.

PhD thesis presented by Sabine Glöggler, Department of General Zoology and Endocrinology, University of Ulm, Germany Supervised by Prof. M. Spindler-Barth

Characterisation of the Chitinase gene and investigation of the hormonal control of the Chitinase gene from the Dipteran *Chironomus tentans*.

Summary

The chitinase gene from the epithelial cellline from the dipteran *Chironomus tentans* was isolated and sequenced. Analysis of the genomic structure revealed the presence of four exons and three introns. A unique property of the *Chironomus* chitinase is the presence of an intron within the catalytic domain and the presence of a 637bp intron with a gene like structure of so far unknown function.

Comparison with chitinase genes from other dipterans and lepidoterans revealed pronounced species specific differences, which might be important for the application of chitinase inhibitors for insect pest control.

As suggested previously by immunohistochemical techniques, Southern blots indicated also that only one chitinase is present in *Chironomus tentans*. This is in contrast to the dipteran *Drosophila*, where seven chitinase genes were described. Besides the well know hormonal regulation by the molting hormone 20-0H-ecdysone on the transcriptional level chitinase specific mRNA stability and mRNA-degradtion are also regulated by the molting hormone, presumably mediated by AU-rich domains present in the 3'-end. The half-life time of chitinase specific mRNA of about 20 hours is reduced to about 50% after hormone treatment, which is in contrast to the long term stability of the chitinase enzyme.

FORTHCOMING MEETINGS

The most immediate meeting will be the second IberoAmerican Symosium on Chitin (II SIAQ) to be held in Acapulco, Mexico from November 10-15, 2002. Information can be found on the following web site which relates to the VIII Latinoamerican Polymer Conference (SLAP 2002) and click on the II SIAQ section: http://uxmal.uam.mx/slap2002/.

Details of the ninth ICCC in Montreal, 2003 can be found on the following web site: www.chitomontreal.com OR by e-mail on info@ismbiopolymer.com.

Finally, the first circular for Euchis 04 to be held in Poznan has appeared and details are are available from the meeting secretary on: h.staniszewska@ior.poznan.pl.

EUROPEAN CHITIN SOCIETY

Minutes of the Board Meeting held on 26th June 2002

Agenda:

- 1 Report of the President
- 2 Board Matters
- 3 Report of the Secretary
- 4 Report of the Treasurer
- 5 Conference Proceedings
- 6 International Committee
- 7 Forthcoming Conferences
- 8 Honorary President
- 9 Prix Braconnot
- 10 Web-site and electronic communication
- 11 Varia

A meeting of the board of the European Chitin Society was held at the Norwegian University of Science and Technology, Trondheim, Norway on Wednesday 26th June 2002 under the Chairmanship of the President, Professor Martin Peter.

The following members of the board were present: Professor A Domard, Professor E Guibal, Dr G M Hall, Dr M Jaworska, Professor M Peter, Professor O Smidsroed, Professor M Spindler-Barth, Professor K M Varum and Dr R Wachter.

Because of time reasons, Topic 7 was dealt with first as new Topic 1. The modified agenda was approved by the Board.

1. Forthcoming Conferences

Dr A Retnakaran (AR) gave a short presentation about the 9th ICCC to be held in Canada in August 2003. The conference location and hotel were booked and the City of Montreal would help with information and registration. The scientific programme was outlined and a second circular was to be sent soon, including participants at the current (Trondheim) conference - a website was under construction. AR would ask the advice of the Board on the content of the conference and an international committee was to be formed. The composition of committee will communicated as soon as possible.

Professor H Struszczyk (HS) gave a presentation about the 6th Euchis meeting to be held in Poznan in 2004. The location was very compact with hotels within easy walking distance of the meeting rooms. Three days, with parallel sessions were planned. A local committee was formed but the scientific agenda was not yet arranged. He asked for help from the Board. MP suggested that papers could be distributed for recommendations and that MP and AD could sit on the scientific committee. AD commented that three Chairmen and three Co-Chairs might be needed on the advisory board. HS envisaged a board of ten persons with half being from the Euchis Board. A list of invited speakers was to be drawn up and sent to Euchis. The proceedings would be published in the, "Advances in Chitin Science", series. Here, MP commented that the series title was to be registered (see below).

2. Report of the President

The last Newsletter had been included in the Euchis website, in part, and in future it would be included in its entirety. At the next membership renewal members would be asked if they wished to receive the Newsletter in electronic form only or as a hard copy.

3. Board Matters

MP reported that two Board members (Prof Delben and Dr R Wachter) wished to resign which would reduce the Board to 14 members. It was not necessary to replace them now but to do so would mean changing the whole Board. We could: keep these members but with no activity; work with two less members or change the Board. AD remarked that new members should be sought from, for example Spain and the UK and we should encourage company members with a scientific background. MP suggested Prof Vincent Eijsink and it was agreed to sound him out about membership. MP also mentioned that the Board would be changed substantially in Poznan and we should be prepared for this event.

4. Report of the Secretary

GMH asked for contributions for the next Newsletter which would be produced in July 2002. This edition would also be placed on the Society website.

5. Report of the Treasurer

M S-B reported that of our current membership of 135 about 55 were not active and had not paid their dues so that the number of members was too low to support the Summer School for example and the Newsletter in particular. GMH commented that the cost of the Newsletter must be reduced and it should only be sent to paid-up members. The use of the website should also reduce costs. AD said that the latest Summer School had been very successful and followed the statutes of the Society in disseminating science and should be supported. EG would try to organise another school in association with the meeting in Montpellier in 2006. KMV said he would announce a call for new members during the Trondheim meeting. The overall balance sheet was approved by the Board

6. Conference Proceedings

MP reported that it was intended to register the titles of EUCHIS conferences as "EUCHISYear", and the proceedings titles as, "Advances in Chitin Science-No" and the name of the Society itself. AD would investigate doing this in France.

MP reported that he had received several comments of EUCHIS members who expressed their deep disappointment and dissatisfaction with the publication "Chitosan in Chemistry and Pharmacy", edited by R.A.A. Muzzarellin and C. Muzzarelli. It was decided that a final statement given by EUCHIS shall be published in the Newsletter.

7. International Committee

The initiative to establish an International Committee of Chitin Societies was discussed. This Committee shall meet officially at the Montreal Conference in 2003 and the President shall prepare and organize this meeting. He then would report to the next Board meeting.

8. Honorary President

MP raised the question of the vacant Honorary President position and asked for nominations.

9. Prix Braconnot

A jury had been organised and three candidates would be assessed with the result being announced at the closing ceremony of the current meeting.

10. Varia

No other business was discussed.

EUROPEAN CHITIN SOCIETY

A General Assembly of the members of the European Chitin Society was held at the Norwegian University of Science and Technology on Thursday 27th June 2002 under the Chairmanship of the President, Professor Martin Peter. Thirteen members were present.

President's Report: the Society is now 10 years-old and the membership now stands at 135 but we need more and he asked the GA to help in recruitment. The summer school was held last year at the University of Ulm and was a great success. Great thanks were due to Professor Margarethe Spindler-Barth and Professor Klaus-Dieter Spindler for the organisation of this event. The Society hoped to continue this event in association with the Euchis conference in Montpellier, 2006.

The composition of the Society Board was due for renewal at the next Euchis meeting in Poznan, 2004, with eight members to be replaced - nominations were requested. At present two members had asked to resign due to work commitments - these were Prof F Delben and Dr R Wachter. Their resignations were accepted and the President proposed Professor Vincent Eijsink, Norway as a new member. No other candidates were proposed and Professor Eijsink was accepted with no abstentions or objections.

Secretary's Report: two Newsletters had been published in the last year, the last of which was partially available on the Society website. The next Newsletter was due in July 2002 and would be found in its entirety on the website. RW asked if company membership allowed all company members to view the website - this as true.

Treasurer's Report: a balance sheet for the end of the year 2000 was provided. Outgoings were for Euchis '02, the Summer School and Newsletters. The President commented that funds loaned for Euchis '02 would be returned in due course. The cost of the Summer School could be subsidised by outside sources, although the EU as a source was not preferred as it the process was slow. He acknowledged the contribution of the University of Ulm to the last event. The need for new members was again emphasised as was the need for current members to pay their fees. **From the Floor** questions were asked about company support for the Society and the procedure for the recovery of unpayed dues. To the first question the President that company support was sought but was difficult under the current economic situation. Reminders were sent to no-payers but as members can easily be lost as they leave the field or posts this was not any easy task.

The Financial report was accepted by the general Assembly with no abstentions or objections.

Forthcoming Conferences: there would be no General Assembly in Montreal, 2003 at the 9th ICCC and the next would be held in Poznan, 2004 at the 6th Euchis, then at the 10th ICCC/ 7th Euchis in Montpellier. The next Euchis meeting in 2008 was open for applications although a bid from Turkey had been received previously - this bid would be resubmitted and considered in Poznan.

Proceedings: the series, "Advances in Chitin Science", was to be continued as follows:

Potsdam 2000 meeting as Volume IV; Thailand 2002 as Vol V; Trondheim 2002 as Vol VI; Montreal 2003 as Vol VII and Poznan 2004 as Vol VIII.

The General Assembly expressed dissatisfaction with the publication "Chitosan in Chemistry and Pharmacy", edited by R.A.A. Muzzarellin and C. Muzzarelli. It was agreed that a final statement shall be given by EUCHIS to be published in the Newsletter.

Prix Braconnot: this was be considered at this meeting and three candidates were to be judged by a jury under the Chairmanship of Professor Domard. The result would be given at the end of the closing ceremony.

Website: improvements had been made by Professor Klaus Spindler and the webmaster, M. Burret. At the next membership renewal members would be asked if they wished to receive the Newsletter in electronic or hard copy forms or both.

Any Other Business: None.

EUROPEAN CHITIN SOCIETY

A meeting of the Board of the European Chitin Society was held at the Norwegian University of Science and Technology, Trondheim, Norway on Friday 28th June 2002 under the Chairmanship of the President, Professor Martin Peter.

The following Board members were present: Professor A Domard, Professor V Eijsink, Professor E Guibal, Dr G M Hall, Dr M Jaworska, Professor M Peter, Professor O Smidsrod, Professor K M Varum.

The next informal meeting would be in Montreal in 2003. Current issues for attention are:

- a) half of the Board members would be replaced at the Poznan meeting and nominations were requested for the posts of President, Vice Presidents, Secretary and Honorary President in particular. These could be made by e-mail.
- b) a report of the Trondheim meeting would be included in the next Newsletter and Board members were asked to contribute their impressions (about half a page) to GMH by the middle of July.

Recent Journal Publications

Struszczyk, MH *Chitin and chitosan - Part I. Properties and production Polimery*, pp316-325, **47**, 2002

Physical and Chemical Aspects

Filipkowska, U, Klimiuk, E, Grabowski, S, Siedlecka, E *Adsorption of reactive dyes by modified chitin from aqueous solutions Pol. J. Environ. Stud.*, pp315-323, 11, 2002

Sashiwa, H, Kawasaki, N, Nakayama, A, Muraki, E, Yamamoto, N, Arvanitoyannis, I, Zhu, H, Aiba, S *Chemical modification of chitosan 12(1): Synthesis of organo- soluble chitosan derivatives toward palladium absorbent for chemical plating*Chem. Lett., pp598-599, 2002

Izumi, S, Shimizu, Y, Higashimura, T

Absorption behavior of metal ions on chitin/cellulose composite fibers with chemical modification by EDTA Text. Res. J., pp515-519, 72, 2002

Rhazi, M, Desbrieres, J, Tolaimate, A, Rinaudo, M, Vottero, P, Alagui, A, El Meray, M *Influence of the nature of the metal ions on the complexation with chitosan. Application to the treatment of liquid waste*

Eur. Polym. J., pp1523-1530, 38, 2002

Kolyadina, OA, Murinov, KY, Murinov, YI Thermodynamic parameters of the sorption of alcohols on chitosan Russ. J. Phys. Chem., pp802-805, 76, 2002

Qin, CQ, Du, YM, Xiao, L

Effect of hydrogen peroxide treatment on the molecular weight and structure of chitosan Polym. Degrad. Stabil., pp211-218, **76**, 2002

Huang, AM, Liu, YF, Chen, L, Hua, JD

Synthesis and property of nanosized palladium catalysts protected by chitosan/silica J. Appl. Polym. Sci., pp989-994, **85**, 2002

Liu, XD, Tokura, S, Haruki, M, Nishi, N, Sakairi, N

Surface modification of nonporous glass beads with chitosan and their adsorption property for transition metal ions Carbohydr. Polym., pp103-108, 49, 2002

Yang, ZK, Zhuang, L, Tan, GR

Preparation and adsorption behavior for metal of chitosan crosslinked by Dihydroxy azacrown ether J. Appl. Polym. Sci., pp530-535, 85, 2002

Sashiwa, H, Shigemasa, Y, Roy, R

Chemical modification of chitosan 11: chitosan-dendrimer hybrid as a tree like molecule Carbohydr. Polym., pp195-205, 49, 2002

Saito, Y, Kumagai, H, Wada, M, Kuga, S *Thermally reversible hydration of beta-chitin Biomacromolecules*, pp407-410, **3**, 2002

Shamov, MV, Bratskaya, SY, Avramenko, VA

Interaction of carboxylic acids with chitosan: Effect of pK and hydrocarbon chain length J. Colloid Interface Sci., pp316-321, 249, 2002

Dong, YM, Ruan, YH, Wu, YS, Wang, MA, Qiu, WB, Xu, CY

Chemical reactivity characteristics of beta-chitin from squid pen and its comparison with alpha-chitin Chem. J. Chin. Univ.-Chin., pp490-495, 23, 2002

Benesch, J, Tengvall, P

Blood protein adsorption onto chitosan

Biomaterials, pp2561-2568, 23, 2002

King, LM, Smith, P, Hauser, S

Enzymatic polymer modification: Investigating the chemistry between tyrosinase-generated quinones and chitosan Faseb J., ppA900-A900, 16, 2002

Bio-control

Fung, KL, Zhao, KJ, He, ZM, Chye, ML

Tobacco-expressed Brassica juncea chitinase BjCHI1 shows antifungal activity in vitro *Plant Mol.Biol.*, pp283-294, **50**, 2002

Jeon, YJ, Kim, SK

Antitumor activity of chitosan oligosaccharides produced in ultrafiltration membrane reactor system J. Microbiol. Biotechnol., pp503-507, 12, 2002

No, HK, Park, NY, Lee, SH, Hwang, HJ, Meyers, SP

Antibacterial activities of chitosans and chitosan oligomers with different molecular weights on spoilage bacteria isolated from tofu

J. Food Sci., pp1511-1514, 67, 2002

Xie, WM, Xu, PX, Wang, W, Liu, Q

Preparation and antibacterial activity of a water-soluble chitosan derivative Carbohydr. Polym., pp35-40, **50**, 2002

Sagoo, S, Board, R, Roller, S

Chitosan inhibits growth of spoilage micro-organisms in chilled pork products Food Microbiol., pp175-182, **19**, 2002

Kharkevich, ES, Moskalenko, TM, Sakharova, TG, Fedchenko, VA, Zhdanova, NN *The resistance of chitin and chitosan to fungi: Criteria for its estimation Mikol. Fitopatol.*, pp48-54, **36**, 2002

Xie, WM, Xu, PX, Wang, W, Liu, Q

Preparation of water-soluble chitosan derivatives and their antibacterial activity J. Appl. Polym. Sci., pp1357-1361, 85, 2002

Kishimoto, K, Nishizawa, Y, Tabei, Y, Hibi, T, Nakajima, M, Akutsu, K

Detailed analysis of rice chitinase gene expression in transgenic cucumber plants showing different levels of disease resistance to gray mold (Botrytis cinerea)

Plant Sci., pp655-662, 162, 2002

Taira, T, Ohnuma, T, Yamagami, T, Aso, Y, Ishiguro, M, Ishihara, M

Antifungal activity of rye (Secale cereale) seed chitinases: the different binding manner of class I and class II chitinases to the fungal cell walls

Biosci. Biotechnol. Biochem., pp970-977, 66, 2002

Coma, V, Martial-Gros, A, Garreau, S, Copinet, A, Salin, F, Deschamps, A *Edible antimicrobial films based on chitosan matrix J. Food Sci.*, pp1162-1169, **67**, 2002

Song, Y, Babiker, EE, Usui, M, Saito, A, Kato, A *Emulsifying properties and bactericidal action of chitosan-lysozyme conjugates Food Res. Int.*, pp459-466, **35**, 2002

Savard, T, Beaulieu, C, Boucher, I, Champagne, CP

Antimicrobial action of hydrolyzed chitosan against spoilage yeasts and lactic acid bacteria of fermented vegetables J. Food Prot., pp828-833, 65, 2002

Production, Derivatives and Composites

Cira, LA, Huerta, S, Hall, GM, Shirai, K *Pilot scale lactic acid fermentation of shrimp wastes for chitin recovery Process Biochem.*, pp1359-1366, **37**, 2002

Pochanavanich, P, Suntornsuk, W

Fungal chitosan production and its characterization

Lett. Appl. Microbiol., pp17-21, 35, 2002

Prashanth, KVH, Kittur, FS, Tharanathan, RN

Solid state structure of chitosan prepared under different N-deacetylating conditions

Carbohydr. Polym., pp27-33, 50, 2002

Nho, YC, Park, KR

Preparation and properties of PVA/PVP hydrogels containing chitosan by radiation J. Appl. Polym. Sci., pp1787-1794, 85, 2002

Kim, SJ, Park, SJ, Shin, MS, Lee, YH, Kim, NG, Kim, SI

Thermal characteristics of IPNs composed of polyallylamine and chitosan

J. Appl. Polym. Sci., pp1956-1960, 85, 2002

Hu, Y, Jiang, XQ, Ding, Y, Ge, HX, Yuan, YY, Yang, CZ *Synthesis and characterization of chitosan-poly(acrylic acid) nanoparticles Biomaterials*, pp3193-3201, **23**, 2002

Jia, ZS, Shen, DF

Effect of reaction temperature and reaction time on the preparation of low-molecular-weight chitosan using phosphoric acid

Carbohydr. Polym., pp393-396, 49, 2002

Guo, XF, Kikuchi, K, Matahira, Y, Sakai, K, Ogawa, K *Water-soluble chitin of low degree of deacetylation J. Carbohydr. Chem.*, pp149-161, **21**, 2002

Chung, TW, Yang, J, Akaike, T, Cho, KY, Nah, JW, Kim, SI, Cho, CS *Preparation of alginate/galactosylated chitosan scaffold for hepatocyte attachment Biomaterials*, pp2827-2834, **23**, 2002

Cauchie, HM

Chitin production by arthropods in the hydrosphere *Hydrobiologia*, pp63-96, **470**, 2002

Kittur, FS, Prashanth, KVH, Sankar, KU, Tharanathan, RN

Characterization of chitin, chitosan and their carboxymethyl derivatives by differential scanning calorimetry Carbohydr. Polym., pp185-193, 49, 2002

Nwe, N, Chandrkrachang, S, Stevens, WF, Maw, T, Tan, TK, Khor, E, Wong, SM *Production of fungal chitosan by solid state and submerged fermentation Carbohydr. Polym.*, pp235-237, **49**, 2002

Kurita, K, Mori, S, Nishiyama, Y, Harata, M *N-Alkylation of chitin and some characteristics of the novel derivatives Polym. Bull.*, pp159-166, **48**, 2002

Zhang, M, Li, XH, Gong, YD, Zhao, NM, Zhang, XF *Properties and biocompatibility of chitosan films modified by blending with PEG Biomaterials*, pp2641-2648, **23**, 2002

Berth, G, Voigt, A, Dautzenberg, H, Donath, E, Mohwald, H *Polyelectrolyte complexes and layer-by-layer capsules from chitosan/chitosan sulfate Biomacromolecules*, pp579-590, **3**, 2002

Medical (including Drug Delivery)

Li, JJ, Xu, ZH

Physical characterization of a chitosan-based hydrogel delivery system J. Pharm. Sci., pp1669-1677, 91, 2002

Zhang, H, Alsarra, IA, Neau, SH

An in vitro evaluation of a chitosan-containing multiparticulate system for macromolecule delivery to the colon Int. J. Pharm., pp197-205, 239, 2002

Mi, FL, Lin, YM, Wu, YB, Shyu, SS, Tsai, YH

Chitin/PLGA blend microspheres as a biodegradable drug-delivery system: phase-separation, degradation and release behavior

Biomaterials, pp3257-3267, 23, 2002

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Delivery of LMW heparin via surface coated chitosan/peg-alginate microspheres prevents thrombosis Drug Deliv., pp87-96, 9, 2002

Okamoto, Y, Kawakami, K, Miyatake, K, Morimoto, M, Shigemasa, Y, Minami, S

Analgesic effects of chitin and chitosan

Carbohydr. Polym., pp249-252, 49, 2002

Sivakumar, M, Manjubala, I, Rao, KP

Preparation, characterization and in-vitro release of gentamicin from coralline hydroxyapatite-chitosan composite microspheres

Carbohydr. Polym., pp281-288, 49, 2002

Onal, S, Zihnioglu, F

Encapsulation of insulin in chitosan-coated alginate beads: Oral therapeutic peptide delivery Artif. Cells Blood Substit. Immobil. Biotechnol., pp229-237, 30, 2002

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Influence of different chitosan salts on the release of sodium diclofenac in colon-specific delivery Int. J. Pharm., pp51-59, 238, 2002

Jonker, C, Hamman, JH, Kotze, AF

Intestinal paracellular permeation enhancement with quaternised chitosan: in situ and in vitro evaluation Int. J. Pharm., pp205-213, 238, 2002

Martin, L, Wilson, CG, Koosha, F, Tetley, L, Gray, AI, Senel, S, Uchegbu, IF

The release of model macromolecules may be controlled by the hydrophobicity of palmitoyl glycol chitosan hydrogels

J. Control. Release, pp87-100, 80, 2002

Zhang, Y, Zhang, MQ

Three-dimensional macroporous calcium phosphate bioceramics with nested chitosan sponges for load-bearing bone implants

J. Biomed. Mater. Res., pp1-8, 61, 2002

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High molecular weight water-soluble chitosan protects against apoptosis induced by serum starvation in human astrocytes

J. Nutr. Biochem., pp245-249, 13, 2002

Molinaro, G, Leroux, JC, Damas, J, Adam, A

Biocompatibility of thermosensitive chitosan-based hydrogels: an in vivo experimental approach to injectable biomaterials

Biomaterials, pp2717-2722, 23, 2002

Nsereko, S, Amiji, M

Localized delivery of paclitaxel in solid tumors from biodegradable chitin microparticle formulations *Biomaterials*, pp2723-2731, **23**, 2002

Ozbas-Turan, S, Akbuga, J, Aral, C

Controlled release of interleukin-2 from chitosan microspheres

J. Pharm. Sci., pp1245-1251, 91, 2002

Enzymatic / Genetic Aspects

Maw, T, Tan, TK, Khor, E, Wong, SM

Complete cDNA sequence of chitin deacetylase from Gongronella butleri and its phylogenetic analysis revealed clusters corresponding to taxonomic classification of fungi

J. Biosci. Bioeng., pp376-381, 93, 2002

Park, SM, Kim, DH, Truong, NH, Itoh, Y

Heterologous expression and characterization of class III chitinases from rice (Oryza sativa L.) Enzyme Microb. Technol., pp697-702, **30**, 2002

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Gene cloning and biochemical analysis of thermostable chitosanase (TCH-2) from Bacillus coagulans CK108 Biosci. Biochem., pp986-995, 66, 2002

Suzuki, K, Sugawara, N, Suzuki, M, Uchiyama, T, Katouno, F, Nikaidou, N, Watanabe, T

Chitinases A, B, and C1 of Serratia marcescens 2170 produced by recombinant Escherichia coli: Enzymatic properties and synergism on chitin degradation

Biosci. Biotechnol. Biochem., pp1075-1083, 66, 2002

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Functional analysis of the chitin-binding domain of a family 19 chitinase from Streptomyces griseus HUT6037: Substrate-binding affinity and cis-dominant increase of antifungal function

Biosci. Biotechnol. Biochem., pp1084-1092, 66, 2002

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Analysis of hydrolytic activity of a 65-kDa chitinase from the silkworm, Bombyx mori

Biosci. Biotechnol. Biochem., pp1119-1122, 66, 2002

Shimono, K, Matsuda, H, Kawamukai, M

Functional expression of chitinase and chitosanase, and their effects on morphologies in the yeast Schizosaccharomyces pombe

Biosci. Biotechnol. Biochem., pp1143-1147, 66, 2002

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A nonradioactive, high throughput assay for chitin synthase activity Anal. Biochem., pp97-105, **305**, 2002

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Purification, crystallization and preliminary crystallographic studies of a class II chitinase from kidney bean seeds Protein Pept. Lett., pp265-268, 9, 2002

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Synthesis of extracellular chitinase by wild-type B-10 and mutant M-1 strains of Serratia marcescens Appl. Biochem. Microbiol., pp214-221, 38, 2002

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Repression of chsB expression reveals the functional importance of class IV chitin synthase gene chsD in hyphal growth and conidiation of Aspergillus nidulans

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