

(様式1)

社団法人日本栄養・食糧学会 研究業績

<学 会 賞>

1. 候補者

研究題目:(和)	消化管の中で生理作用を発揮する食品成分に関する研究		
(英)	Studies on food ingredients with health benefits functioning in the intestinal lumen		
氏 名:(和)	原 博	生年月日:	昭和 28 年 7 月 23 日
(英)	Hiroshi Hara		
所属機関:(和)	北海道大学大学院農学研究院 教授		
(英)	Graduate School of Agriculture, Hokkaido University, Professor		
学 位:	農学博士	最終学歴:	昭和 53 年 3 月 名古屋大学大学院 農学研究科博士前期課程修了
会員番号:	0099025628	入会年度:	昭和 54 年

2. 研究業績要旨(1,000 字以内)

食品成分の吸収や消化液分泌を、経時的にダイナミックに追跡できるカニューレーション技術を小動物であるラットで確立し、in vivo の生理的条件において、体内で起こっている種々の現象を詳細に解析できる技術を作り上げた。これに外科手術による病態モデルや、消化管組織による in vitro 試験系と培養細胞モデルを組み合わせることにより、食品成分が、消化管の中で発揮する生理作用を多く発見し、その作用機序を解明した。

食物繊維や難消化性オリゴ糖が他の栄養素と異なる点は、その作用が消化管腔内で発揮されることである。私どもは、これら難消化性糖が、カルシウムや鉄の吸収を強く促進すること、および、ミネラル吸収障害を有する種々のモデルにおいて、その病態改善に有効であることを明らかにした。その作用機構を探った結果、難消化性糖の大腸発酵産物である短鎖脂肪酸による作用とともに、低分子の難消化性オリゴ糖は、小腸粘膜細胞にその化学構造が直接受容されることにより、上皮細胞の間に存在するタイトジャンクションに作用してミネラル吸収促進することを見いだした。さらに、難消化性オリゴ糖は、生体利用性の悪いフラボノイドの腸管吸収を強く促進することを見だし、その作用機構として、小腸において先のタイトジャンクションを介した機構とともに、大腸において、腸内微生物によるフラボノイド骨格の分解を抑制することで利用効率を高めることを見いだした。一方で、難消化性糖の大腸発酵産物である短鎖脂肪酸は、大腸においてタイトジャンクションによる粘膜バリア機能を強化すること、およびその分子機構を明らかにした。また、食品たんぱく質による膵消化酵素分泌制御の研究から派生して、難消化性食品ペプチドが消化管腔内で上皮細胞に直接作用して、食欲や耐糖能に関係する消化管ホルモンであるコレシストキニンの分泌を刺激することを見だし、大豆たんぱく質中にその有効なペプチド配列を同定した。その作用機序として、ペプチドが消化管腔内で上皮細胞を構成する、消化管内分泌細胞に直接受容されること、また食品ペプチドを認識する分子機構の一端も明らかにしている。これらの研究で特筆すべき点は、食品成分を情報分子としてとらえ、それらが消化管において、消化管自身の機能だけでなく、生活習慣病やメタボリックシンドローム発症に係わる生体機能を制御していることを明らかにしたことである。

### 3. 報文等リスト

#### (1) この研究に直接関連するもの(10 編以内)

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#### (2) その他の論文(編数制限なし)

- 1, Masashi Nagata, Megumu Kayanoma, Takeshi Takahashi, Tetsuo Kaneko, Hiroshi Hara: Marginal Zinc Deficiency in Pregnant Rats Impairs Bone Matrix Formation and Bone Mineralization in Their Neonates. *Biological Trace Element Research* 2010 Aug 19. [Epub ahead of print]
- 2, Takuya Suzuki, Hiroshi Hara: Phytate hydrolysate induces circumferential F-actin ring formation at cell-cell contacts by a Rho-associated kinase-dependent mechanism in colorectal cancer HT-29 cells. *Molecular Nutrition and Food Research* 2010 Jul 12. [Epub ahead of print].
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- running exercise and dietary lactose concomitantly reduce proportion of secondary bile acids in rat feces. *Journal of Applied Physiology* 109(3): 663-668.
- 4, Taisuke Mochida, Tohru Hira, Hiroshi Hara: The corn protein, Zein, hydrolysate administered into the ileum attenuates hyperglycemia via its dual action on glucagons-like peptide-1 secretion and dipeptidyl peptidase-IV activity in rats. *Endocrinology* 151(7): 3095-3104 (2010).
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その他

- ・和文原著論文 18 編
- ・総説 15 編
- ・著書（共著）12 件 内 日本栄養・食糧学会 監修 以下2件  
原 博、比良 徹:消化管内分泌系を介して作用する機能性ペプチド「機能性タンパク質・ペプチドと生体利用」日本栄養・食糧学会 監修、建帛社、東京 (2010/06)  
原 博:消化管上皮のタイトジャンクションを制御する難消化性糖質「ルミナコイド研究のフロンティア—食物繊維・オリゴ糖・レジスタントスターチの最新研究動向」日本栄養・食糧学会 監修、建帛社、東京 (2010/06)
- ・招待講演(特別講演、シンポジウム) 58 件 内 国際学会 11 件

(3) 過去 5 年間の本学会での活動状況

理事・評議員等

平成 18 年 評議員

平成 19 年 評議員

平成 20 年 理事（北海道支部担当、JNSV 担当）

平成 21 年 理事（北海道支部担当、JNSV 担当）

平成 22 年 理事（北海道支部担当、JNSV 担当）、北海道支部副支部長

学会誌編集委員

平成 18 年 日本栄養・食糧学会誌編集委員（平成 16 年より）

JNSV 誌編集委員（平成 17 年より）

平成 19 年 日本栄養・食糧学会誌編集委員、JNSV 誌編集委員

平成 20 年 JNSV 誌編集委員

平成 21 年 JNSV 誌編集委員

平成 22 年 日本栄養・食糧学会誌編集委員、JNSV 誌編集委員

大会・シンポジウム等

平成 18 年 第 60 回大会 シンポジウム「ペプチドが拓く健康科学の新しい世界」  
オーガナイザー、シンポジスト

一般演題 11 題発表、座長

平成 19 年 第 61 回大会 「ミネラル研究の現状」 シンポジスト

一般演題 6 題発表、座長

平成 20 年 第 62 回大会 一般演題 6 題発表、座長

平成 21 年 第 63 回大会 一般演題 5 題発表、座長

平成 22 年 第 64 回大会 一般演題 14 題発表、座長

(4) 特記事項

*9th John M. Kinney International Award for general Nutrition, February 7, 2004*

(The international Judging Committee of *Nutrition*)

Title: Ingestion of water-soluble soybean fiber improves gastrectomy-induced calcium malabsorption and osteopenia in rats.