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所属 Affiliation

岐阜大学大学院連合創薬医療情報研究科・特任教授

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United Graduate School of Drug Discovery and Medical Information Sciences, Gifu University; Specially-appointed Professor (Endowed Chair, Medicinal Sciences Division)

専門 Research Area	**分子遺伝学、腫瘍医学、がん予防** Molecular Genetics, Medicinal Oncology, Cancer Prevention
研究課題 代表的な研究	① **RNA 創薬：microRNA や siRNA を用いた癌の治療** 我々は大腸腫瘍における miRNA 発現プロフィールを作成し、大腸癌の発生，発育，進展に関わる miR-143 および miR-145 を見出した。これらががん抑制マイクロ RNA であることを明らかにした。さらに担癌ヌードマウスを用いて全身投与により著明な腫瘍縮小効果が確認した、現在 RNA 創薬への開発研究を進めている。さらにがん細胞が分泌する膜小胞マイクロ RNA の生物学的意義について研究を進めている。 ② **ファイトケミカルによるがんの未病医療** 多くの食物に含まれるファイトケミカルによる細胞死はミトコンドリアを標的にしてがん細胞をアポトーシスに誘導することを明らかにした。抗がん剤との併用効果について明らかにした。我々はがん予防に資する機能性食品の研究開発を進めている。植物のエキソゾーム miRNA の機能及び体内動態についても研究を進めている。
Main Research Projects	① **RNA drug discovery: Cancer treatment with microRNA（miRNA） and siRNA** We analyzed miRNA expression profiles in colorectal cancer and found that miR-143and miR-145are involved in the development, growth, and invasion of tumors. miR-143and miR-145are tumor suppressor miRNAs, and their systemic administration resulted in tumor reduction in a nude mouse model, suggesting their possible use in cancer therapy. Another focus of our research in this area is the biological significance of microvesicles released from cancer cells. ② **Preemptive medicine of cancer using phytochemicals** We revealed that phytochemicals, which are contained in a variety of foods, induce apoptosis by targeting mitochondria. We have been researching and developing a functional food that contributes to cancer prevention. We also tried to disclose the contribution of food-oriented exosome to prevention of diseases.
研究業績 (過去 5 年)	1. Inomata Y, Oh JW, Taniguchi K, Sugito N, Kawaguchi N, Hirokawa F, Lee SW, **Akao Y**, Takai S, Kim KP, Uchiyama K. Downregulation of miR-122-5p Activates Glycolysis via PKM2 in Kupffer Cells of Rat and Mouse Models of Non-Alcoholic Steatohepatitis. Int J Mol Sci. 2022 May 7;23(9):5230. (IF: 5.923, CS: 6.0) 査読あり 2. **Akao Y**, Terazawa R, Sugito N, Heishima K, Morikawa K, Ito Y, Narui R, Hamaguchi R, Nobukawa T. Understanding of cell death induced by the constituents of Taxus yunnanensis wood. Sci Rep. 2022 Apr 15;12(1):6282. (IF: 4.379, CS: 7.1) 査読あり 3. **Akao Y**, Kuranaga Y, Heishima K, Sugito N, Morikawa K, Ito Y, Soga T, Ito T. Plant hvu-MIR168-3p enhances expression of glucose transporter 1 (SLC2A1) in human cells by silencing genes related to mitochondrial electron transport chain complex I. J Nutr Biochem. 2022 Mar;101:108922. (IF: 6.048, CS: 9.7) 査読あり 4. Shimizu Y, Takeda-Kawaguchi T, Kuroda I, Hotta Y, Kawasaki H, Hariyama T, Shibata T, **Akao Y**, Kunisada T, Tatsumi J, Tezuka KI. Exosomes from dental pulp cells attenuate bone loss in mouse experimental periodontitis. J Periodontal Res. 2022 Jan;57(1):162-172. 5. Heishima K, Sugito N, Soga T, Nishikawa M, Ito Y, Honda R, Kuranaga Y, Sakai H, Ito R, Nakagawa T, Ueda H, **Akao Y.** Petasin potently inhibits mitochondrial complex I-based metabolism that supports tumor growth and metastasis. J Clin Invest. 2021 Sep 1;131(17):e139933. (IF: 14.808, CS: 17.7) 査読あり 6. Fukada M, Matsuhashi N, Takahashi T, Sugito N, Heishima K, Yoshida K, **Akao Y.** Postoperative changes in plasma miR21-5p as a novel biomarker for colorectal cancer recurrence: A prospective study. Cancer Sci. 2021 Oct;112(10):4270-4280. (IF: 6.716, CS: 8.5) 査読あり

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8. Konishi H, Hayashi M, Taniguchi K, Nakamura M, Kuranaga Y, Ito Y, Kondo Y, Sasaki H, Terai Y, **Akao Y**, Ohmichi M. The therapeutic potential of exosomal miR-22 for cervical cancer radiotherapy. Cancer Biol Ther. 2020 Dec 1;21(12):1128-1135. (IF: 4.742, CS: 8.3) 査読あり
9. Sugito N, Heishima K, Ito Y, **Akao Y.** Synthetic MIR143-3p Suppresses Cell Growth in Rhabdomyosarcoma Cells by Interrupting RAS Pathways Including PAX3-FOXO1. Cancers (Basel). 2020 Nov 10;12(11):3312. (IF: 6.102, CS: 4.4) 査読あり
10. Taniguchi K, Uchiyama K, **Akao Y.** PTBP1-targeting microRNAs regulate cancer-specific energy metabolism through the modulation of PKM1/M2 splicing. Cancer Sci. 2021 Jan;112(1):41-50. Cancer Sci. (IF:6.716, CS:8.50) 査読あり
11. Fukada M, Matsuhashi N, Takahashi T, Sugito N, Heishima K, **Akao Y**, Yoshida K. Tumor Tissue MIR92a and Plasma MIRs21 and 29a as Predictive Biomarkers Associated with Clinicopathological Features and Surgical Resection in a Prospective Study on Colorectal Cancer Patients. J Clin Med. Aug 4;9(8):E2509. 2020. (IF:4.241, CS:7.07) 査読あり
12. Hashimoto M, Nakai T, Masutani T, Unno K, **Akao Y**. Improvement of Learning and Memory in Senescence-Accelerated Mice by S-Allylcysteine in Mature Garlic Extract. Nutrients. 2020 Jun 19;12(6):1834. (IF:4.008, CS:6.2) 査読あり
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characterized by the expression profiles of miRNAs. Med Mol Morphol., 2018, 51(2):82-88, Review. (IF:1.210) 査読あり

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外部資金
(過去 5 年)

1. 次世代がん医療創生研究事業 (AMED; 2016-2021) DDS 技術を基盤とした革新的がん治療法の開発
2. 橋渡し研究戦略的推進プログラム（2018-2019）（中部先端医療開発円環コンソーシアム）がん特異的エネルギー代謝を標的にした RNA 創薬

受賞

日本血液学会奨励賞（1992 年）
盛記念学術賞（1993 年）
日本白血病研究基金一般研究賞（2004 年）

新聞報道
(過去 5 年)

平成26年10月20日　岐阜新聞　朝刊 「大腸がん増殖仕組み解明」
平成28年　3月29日　岐阜新聞　朝刊 「がん細胞エネルギー制御」
令和　2年11月20日　週刊医学新聞　「RAS遺伝子を標的としたマイクロRNA核酸医薬の開発に成功」

略歴

昭和 53 年 3 月	大阪医科大学卒業
昭和 53 年 4 月	名古屋第一赤十字病院内科（骨髄移植）
昭和 59 年 4 月	名古屋大学医学部第一内科、分院内科（医学博士取得）
昭和 63 年 9 月	米国ウイスター研究所（Dr. Calro Croce）
平成 2 年 9 月	名古屋大学医学部分院内科
平成 3 年 4 月	愛知県がんセンター研究所（化学療法部）主任研究員
平成 5 年 9 月	大阪医科大学（解剖学）助教授
平成 8 年 7 月	岐阜県国際バイオ研究所部長
平成 21 年 4 月	岐阜大学大学院連合創薬医療情報研究科教授
平成 30 年 4 月	岐阜大学大学院連合創薬医療情報研究科特任教授