

Overviews of RARE GINSENOSIDES

Guess what?





Cardiovascular protection

Lung protection

Hepatic protection

Renal protection

Anti-osteoporosis

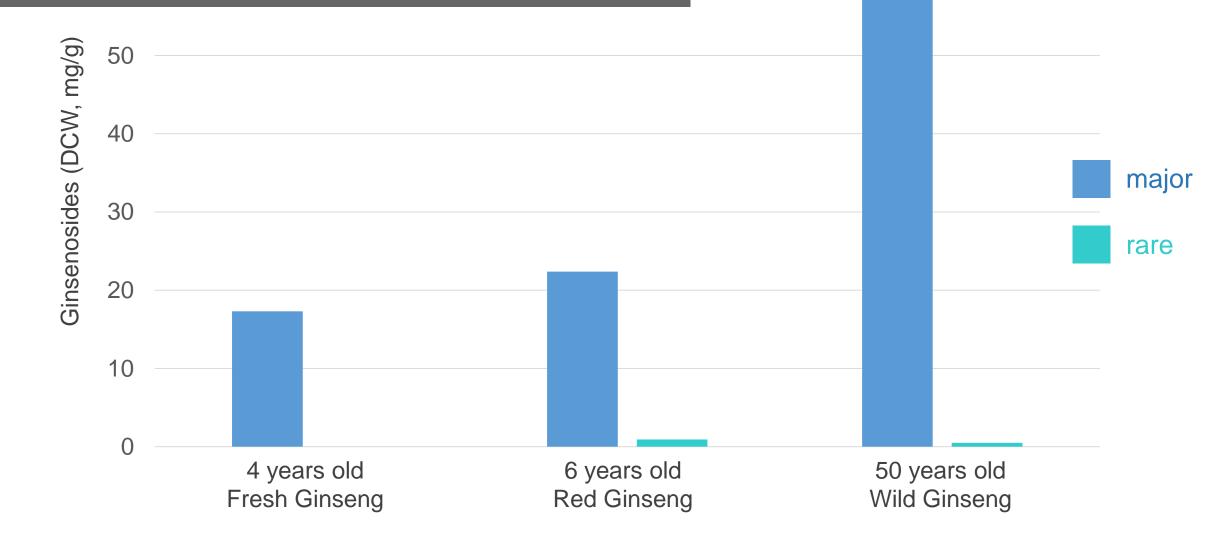
Immunomodulators

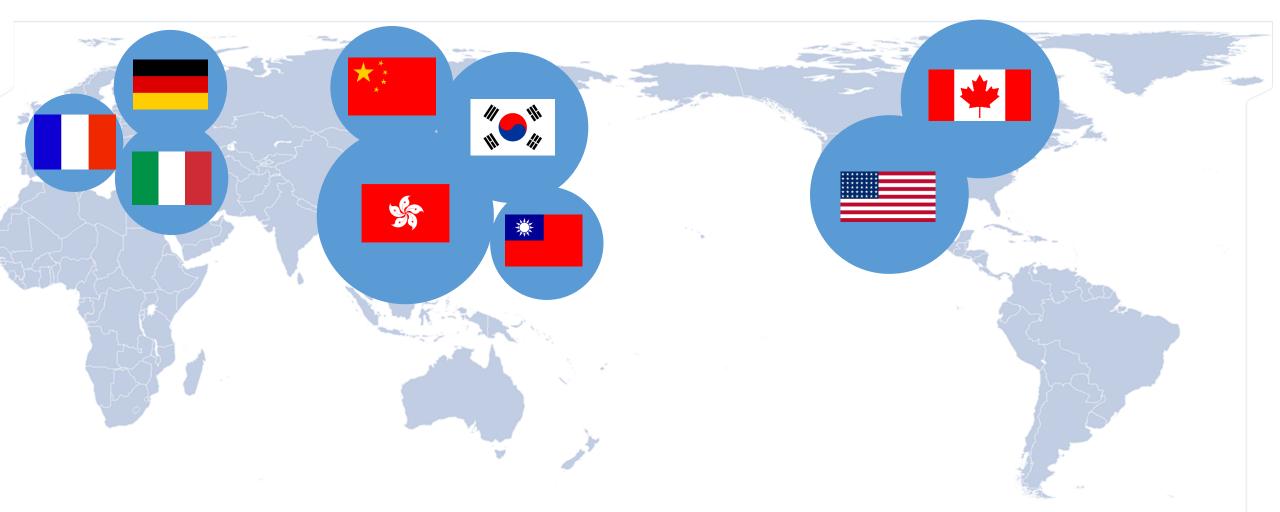
Cancer therapy helper

Erectile dysfunction improvement

Others

Impossible to eat ENOUGH rare ginsenosides from ginsengs

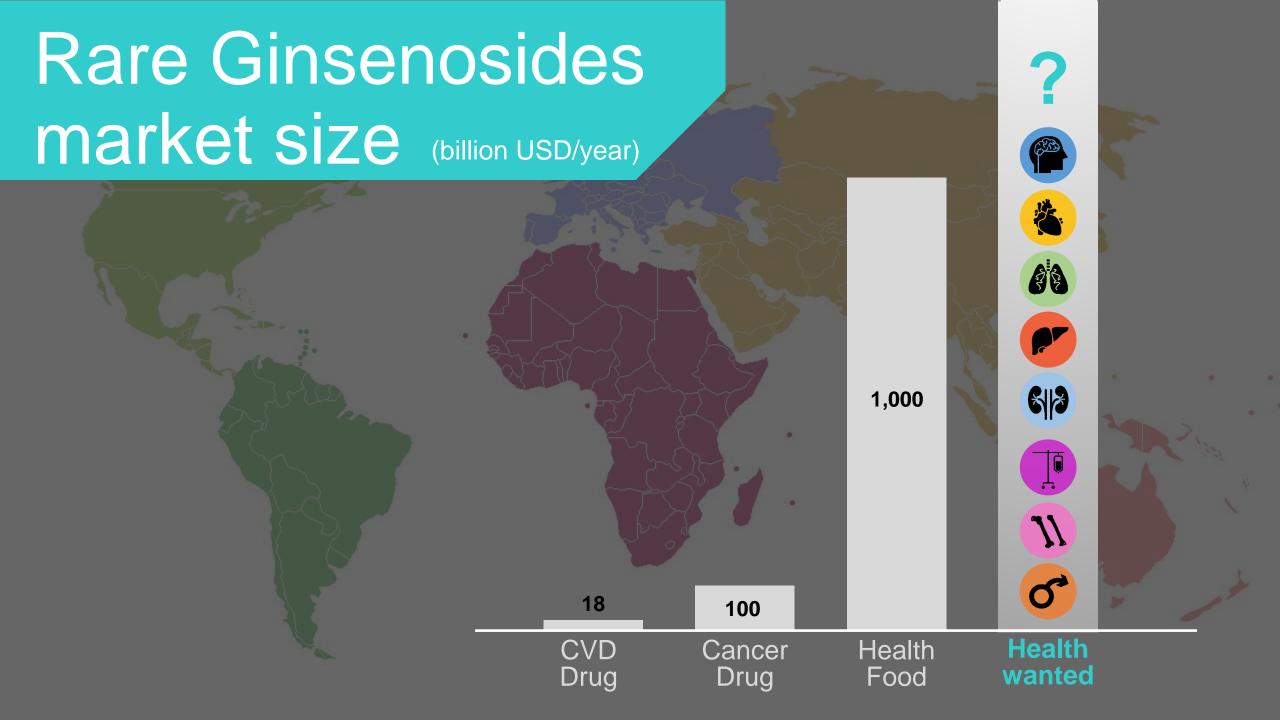




\$ 217 million import
\$ 217 million export
\$ 1,130 million distribution

Ginseng market size

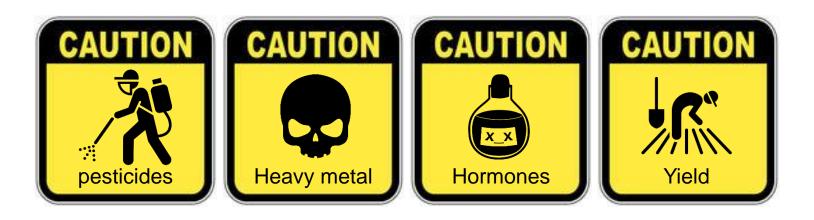
Source: Journal of ginseng research 37:1, 1-7 (2013)



Fertilization-based method



Rg3 content Increases 410 times



Our solution

VOLUME 28 NUMBER 11 NOVEMBER 2010 www.nature.com/naturebiotechnology

Engineering antibody recycling *in vivo* Natural products from cultured meristematic cells Spatially addressed antibody discovery

intechno

nature

nature biotechnology

Cultured cambial meristematic cells as a source of plant natural products

Eun-Kyong Lee^{1,5}, Young-Woo Jin^{1,5}, Joong Hyun Park¹, Young Mi Yoo¹, Sun Mi Hong, 'Labia Amir², Zejun Yun², Eunjung Kwon^{2,3}, Alistair Elfick³, Simon Tomlinson⁴, Florian Halbritter⁴, Thomas Waibel² Byung Wook Yun² & Gary J Loake²

A riethora of important, chemically diverse natural products are derived from plants¹. In principle, plant cell culture offers an attractive option for producing many of these compounds^{2,3}.

oped an innately undifferentiated cell line derived from or else cells, which function as vascular stem cells⁴. Also, pacitizzed box

cambial meristematic cells

morphology of OWLS, their hypersensitivity to 7-induction and radiomimetic drugs and their ability to differentiate at high frequency. Suspension culture of CMCs derived from *Taxus* cuspidata, the source of the key anticancer drug, paclitaxel (TaxoD^{2,2}, circumvented obstacles routinely associated with the commercial growth of DDCs. These cells may provide a costeffective and environmentally friendly platform for sustainable production of a variety of important plant natural products.

Only plant stem cells, embedded in meristems located at the tips of shoots and roots or contained inside the vascular system, can divide and give rise to cells that ultimately undergo differentiation while simultaneously giving rise to new stem cells⁴. These cells can be considered immortal due to their ability to theoretically divide an unlimited number of times. Consequently, since the beginnings of tissue culture in the 1940s, cell suspension cultures

have been routinely generated through what we dedifferentiation process⁵. Recent evidence say nism might not entail a simple reverse reprogram of the mechanism involved, this process results vation of specialized cell types within a given or multicellular mixture of proliferating cells⁷. Su derived from such cellular assoriments often ex properties with low and inconsistent yields of r owing to deleterious genetic and epigenetic ch during this process⁷⁸.

¹Unites Dop., Woosh-Dong, Dukjin gu, Jeonju, South Kona Buildings, Edinburgh, UK. "School of Engineering, University Sciences, University of Edinburgh, King's Buildings, Edinbur G.J.I. (gloske@ed.ac.uk).

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cells could be gently separated from the DDCs derived from phloem, cortex and epidermis (Fig. 1c-e and Supplementary Fig. 3a-e). This mass of proliferating cells was distinct from DDCs derived from a needle or embryo (Fig. 1f.g), and the morphology of these CMCs differed from adjacent cells (Fig. 1h and Supplementary Fig. 3b-e). We also used this technology to produce such cells from a variety of plant species, including gitseng (Panax ginseng), ginkgo (*Cinkgo biloba*) and tomato (*Solanum* ycopersicon). This suggests that the procedure has broad utility (Supplementary Fig. 4a-f).

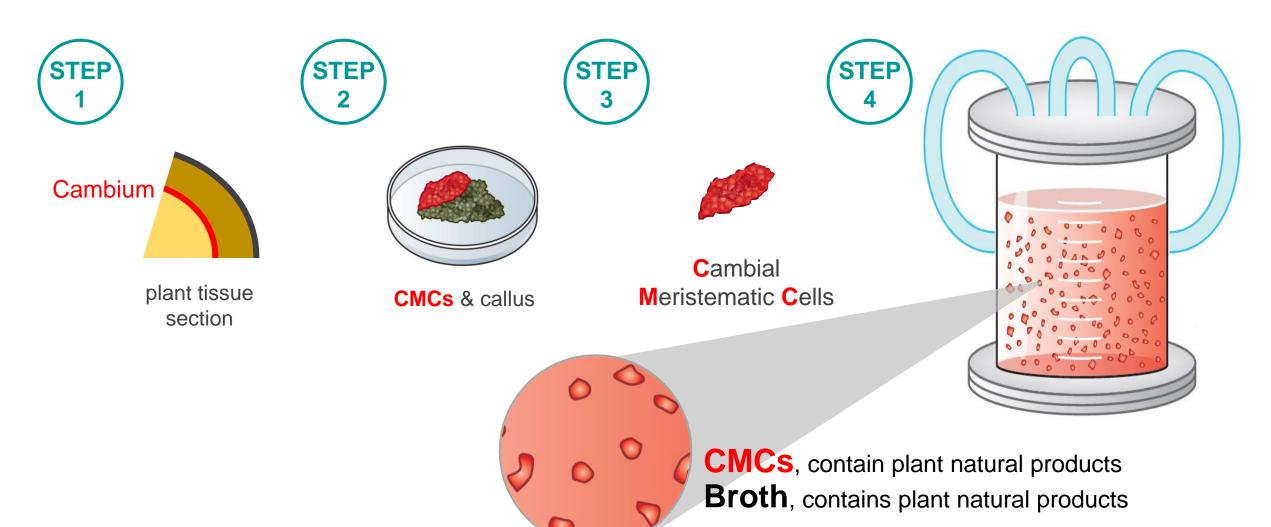
Microscopic analysis of a suspension culture of *T*, cuspitatia cells revealed the presence of small, abundani vacuoles within the cultured cells. This characteristic feature of CMCs¹¹ enables them to withstand the pressure generated by the expanding secondary spiem¹². In contrast, dedifferentiated *T*, cuspitate cells derived from needles or embryos possessed only one large vacuole, typical of such plant 101. The shifts to the customer state of the subset as the prederived from secondary spiemers.





ETTERS

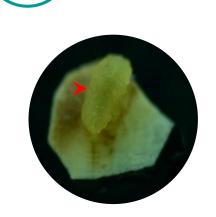
CMC technology platform



CMC-based method

STEP

2



STEP

Wild ginseng Cambial Meristematic Cells

Scale-up

RGCE process

Package



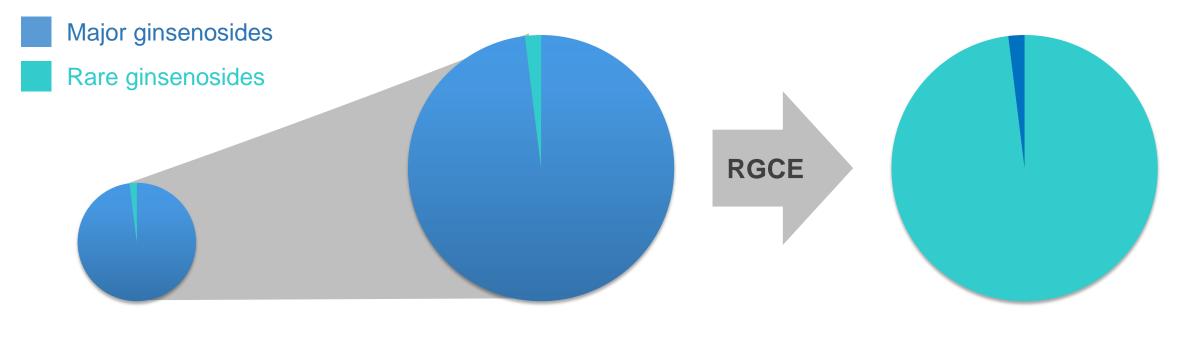


STEP

Δ



Rare Ginsenosides Content Enrichment

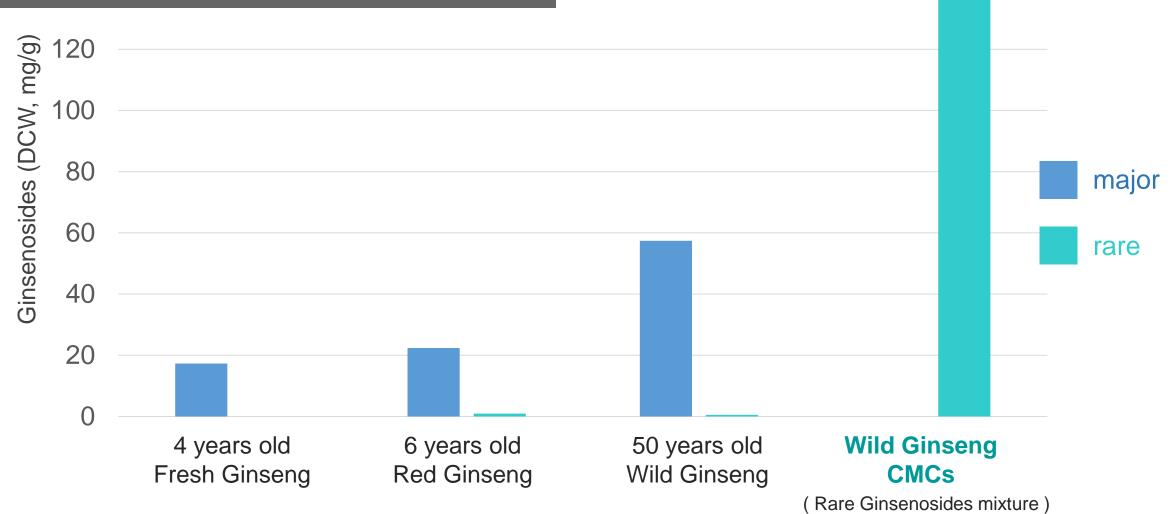


50 years old Wild ginseng 50 years old Wild ginseng Cambial Meristematic Cells

50 years old Wild ginseng Cambial Meristematic Cells

Renamed as Rare Ginsenosides mixture

Material with highest RG content in the market



Rare Ginsenosides mixture is



Rare Ginsenosides mixture is



Our achievements - patents

	Jin et al.	Application Publicati		(10) Pub. No.: US 2011/0229443 A (43) Pub. Date: Sep. 22, 201
(54)	OR TREATM INGREDIEN DERVIED FI	ON FOR CANCER PREVENTION IENT CONTAINING AS ACTIVE T PLANT STEM CELL LINE ROM CAMBIUM OF PANAX ICLUDING WILD GINSENG OR	()	A61K 36/258 (2006.01) C12N 504 (2006.01) A61P 35/08 (2006.01) A61P 35/02 (2006.01)
(75)	Inventors:	Young Woo Jin, Jeonbok (KR); Eun Kyong Lee, Jeonbok (KR)	(52) (57)	U.S. CL 42493.7; 424/728; 435/410; 435/4 ABSTRACT
(73)	Assignee:	Unhwa Corporation, Jeonju, Jeollabok-do (KR)	or trei Panas seng	present invention relates to a composition for preventi- sting concer, which contains, as an active ingretient or giouxog cambium-derived cell line including wild go or ginseng, a lysate thereof, on extract thereof, or
(21)	Appl. No.:	13/127,750		re medium thereof.
(22)	PCT Filed:	Nev. 6, 2009	theree	cell line according to the present invention, a lys of, an extract thereof and a colture medium thereof a ed from a natural and have minimized side effects co
(86)	PCT No.:	PCT/KR2009/006523	pared	I to the conventional therapeutic drugs, and thus are so he human body. Also, they are involved directly in t
	8 371 (c)(1), (2), (4) Date: Forei	Jun. 10, 2011 gn Application Priority Data	growt shaw tion o line, t	the minum body. Also, they are involved directly in th of cancer to induce cancer cell doth effectively, a anticancer activity of inhibiting or reducing the form of turnor or the growth of turnor, Accordingly, the c the lysate thereof, the extract thereof and the cult um thereof are useful for the prevention, treatment a

PATENT: US20110229443A1

TITLE: Composition for **cancer prevention or treatment** containing as active ingredient plant stem cell line derived from cambium of *panax ginseng* including wild ginseng or ginseng

PATENT: US008617621B2

TITLE: Composition for **enhancing immunity** containing plant stem cell line derived from cambium of *panax ginseng* including wild ginseng or ginseng as an active ingredient

PATENT: US20130202631A1

TITLE: Composition for **preventing or treating liver diseases**, containing plant stem cell lines derived from the cambium of *panax ginseng* including mountain ginseng or ginseng as active ingredient

PATENT: US20140099285A1

TITLE: Composition for **preventing or treating AIDS** containing plant stem cell line derived from cambium of *panax ginseng* including wild ginseng or ginseng as active ingredient

PATENT: US9095532B2

TITLE: Composition for **anti-aging or anti-oxidant composition** containing plant stem cell line derived from cambium of *panax ginseng* including wild ginseng or ginseng as active ingredient

Our achievements - publication

JPP Pharmacy and Pharmacology JPP Research Paper Journal of Pharmacy Wild ginseng cambial meristematic cells ameliorate hepatic steatosis and mitochondrial dysfunction in high-fat diet-fed mice Sang-Bin Lee*, Hong-Ik Cho*, Young-Woo Jin*, Eun-Kyong Lee*, Jeung Youb Ahn* and Sun-Mee Lee* "School of Pharmacy, Sundown lower University, Suwon and "Plant Stern Gell Institute, Univer Corp., Joniu, Republic of Korea
 Kaynonis
 Abstract

 Smithers, de-non lpagnenic, interborderi insperse, non-activate lang with ginnerg cambial meritermatic cells (MCG) on non-skoholic fatty liver
 wild ginseng cambial merist ematic cells (CMCs) on non-a koholic fatty liver disease in high-fat diet (HFD)-fed mice. Methods Male CS7BL/6 mice received either normal-fat diet or HRD for 10 Comupandenci weeks along with wild ginseng CMCs (75, 150 and 300 mg/kg) or vehicle (0.5% kan-Mee Lee, School of Pharmecy, survives and, School or Praemacy, Sarghyuriowan University, Sawan 440-746, Carboxyl methyl cellulose) by oral administration once a day. Triglyceride and total cholesterol contents were measured in liver and serum samples. Parameters legable of Korea. E-mail: summer@kku.edu for hepatic lipid metabolism and mitochondria biogenesis were assessed. Key findings Treatment with wild ginseng CMCs markedly attenuated body Received May 28, 2015 weight, serum and hepatic lipid contents, and serum aminoteansferase activity While wild ginseng CMCs attenuated the increases in sterol regulatory element Accepted September 12, 2015 binding transcription factor I (SREBP-1) and carbohydrate-responsive element doi: 10.1111/jphp.12487 binding protein (ChREBP) expression, it enhanced the increases in camitine palmitoyltransfemse 1A (CPT1A) and peroxisome proliferator-activated receptor alpha (PPAR-a) expression. HFD decreated glutamate dehydrogenase activity and glutathione content, and increased lipid peroxidation, which were all attenuated by wild ginseng CMCs. Furthermore, wild ginseng CMCs enhanced mitochondrial biogenesis-related factors, including peroxisome proliferator-activated receptor-y co activator ln (PGC1n), nuclear respiratory factor 1 (NRF1) and mitochondrial transcription factor A (TFAM). Conclusions Wild ginning CMCs protect against HED-induced liver injury, which prevents lipid accumulation and mitochondrial oxidative stress and enhances mit ochondris I biogenesis. Introduction Fatty liver disease is the build-up of excessive fat in the liver fatty acid metabolism to NAFLD. The initial hit involves cells. Alcoholic fatty liver disease (ALD) and non-alcoholic excess hepatic lipid accumulation, which can progress to fatty liver disease (NAFLD) are two main types of fatty liver non-alcoholic steatohepatitis to a following hit, disease. Although ALD is caused by chronic alcohol abuse, NAFLD could occur by many risk factors such as central matory mediators.^[2]

adiposity, dyslipidemia, insulin resistance, type 2 diabetes

Accumulating evidence indicates that heratic mitochon encompases a wide spectrum of liver damage, ranging si of NAFID.^[1] Mitochondrial dysfunction in NAFLD from steatosis alone to steatohepatitis, advanced fibrosis affects hepatic lipid homeostasis and promotes reactive and cirthosis¹¹ Athough the pathogenesis of NAFLD is not yet fully understood, the 'multiple hit process' is widey 'ytokine re lease and cel death.^(4,1) Mitochondrial biogeneaccepted, which provides a model that summarizes the sis, the complex process promoting mitochondrial complex factors and their interactions leading from free capacity through the growth and division of pre-existing

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JOURNAL: Life sciences 135(2015) 138-146

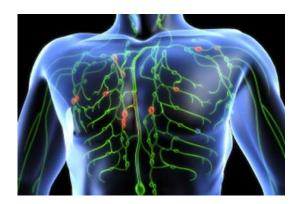
TITLE: Potentiation of natural killer (NK) cell activity by methanol extract of cultured cambial meristematic cells of wild ginseng and its mechanism.

JOURNAL: Journal of ginseng research 39(2015) 376-383 TITLE: Protective effect of wild ginseng cambial meristematic cells on D-galactosamine-induced hepatotoxicity in rats

JOURNAL: Journal of pharmacy and pharmacology 68(2016) 119-127

TITLE: Wild ginseng cambial meristematic cells ameliorate hepatic steatosis and mitochondrial dysfunction in high-fat diet-fed mice

Claims



Immunity improvement



Cardiovascular protection



Hepatic protection



protection



Lung protection



Renal protection



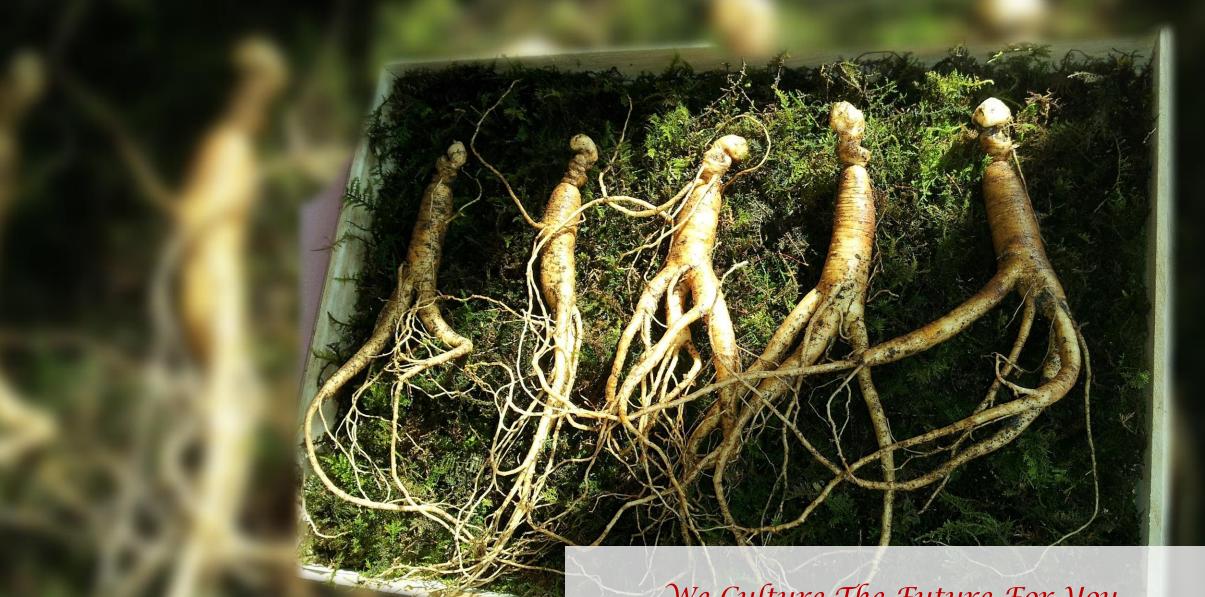
Cancer therapy helper



Antiosteoporesis



Erectile dysfunction improvement



We Culture The Future For You