

出國報告(出國類別：進修)

美國紐約醫學院藥理學科短期進修 回國報告-肥胖及代謝症候群基礎醫學研究

服務機關：國防醫學院

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派赴國家/地區：美國/紐約

出國期間：108 年 10 月 1 日 109 年至 3 月 20 日

報告日期：109 年 3 月 30 日

摘 要

醫學研究技術日新月異，不斷的創新發展，身為研究工作者必須要不斷的充實自己的本職學能、來提昇醫學教育與研究能量，因此規劃申請至美國，進行為期半年的短期進修(108年10月-109年3月)，了解目前美國的醫學大學藥理學的教學創新以及基礎醫學研究之方向，也寄望可以藉此增加台灣、美國雙方之學術合作契機。職本次前往的學校是美國紐約州的紐約醫學院(New York Medical College, NYMC)，是一所位在紐約州境內 Westchester County Valhalla鎮的私立醫學院，該校也是美國著名的杜魯學院系統 (Touro)之連鎖學校之一。本次前往進修之實驗室Principal Investigator (PI) 是 Professor Nader G Abraham，現任 NYMC 藥理學科專任教授，曾經擔任藥理學科主任、該校基因治療研究執行長、Marshall University Joan C. Edwards School of Medicine 副校長等重要職位。Professor Abraham的研究領域主要在肥胖(obesity)、非酒精性脂肪肝(nonalcoholic fatty liver disease)之致病機轉、脂肪幹細胞及基因療法，尤其著重在抗氧化劑、血基質氧化酶 (Heme oxygenase) 調控對於血管、心臟以及脂肪幹細胞之調控。Professor Abraham 已發表之SCI學術論文超過400餘篇，共同書籍出版將近50本，研究著作非常傑出，且目前也正在執行美國國家衛生研究院 (National Institutes of Health, NIH)為期5年的基礎醫學研究計畫，探討 HO-1、PGC1 α 基因調控與肥胖、非酒精性脂肪肝病 (non-alcoholic fatty liver disease, NAFLD)之生理病理機制及新藥開發研究，可見其學術地位深獲肯定。因此，職本次前往 Professor Abraham之實驗室，主要就是在學習最新治療肥胖及代謝症候群之基因治療與新藥研發，藉由其現有基因治療的架構，導入肥胖之藥物治療的篩選來進行研究。本次為期六個月的短期進修收穫滿滿，在教學上，職盡量觀摩學習該校在藥理學課程的授課方式，藉此精進自己的教學能力; 在研究上，協助 Professor Abraham完成4個 projects之實驗

，並與其共同完成4篇學術期刊之投稿，其中有3篇投稿文章由職擔任第一作者，目前正在等待期刊之審查回復;在學術研究合作上，藉此機會與 Professor Abram以及其妻子 Professor Schwartzman (目前為NYMC 藥理學科主任)建立起學術合作之橋梁，在職返國後繼續進行相關研究計畫之合作。

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壹、目的

源起：

職任職在國防醫學院已6年，為了要增加國際觀、與尋求國外之學術合作，故申請至國外短期進修的機會學習國外學校與醫院目前的新知與走向，並學習國外著名教授之教學研究經驗及其如何有效整合實驗室與醫院合作之計畫，以截長補短來增強本身對醫學院學生的教學與研究條件；另一方面則可借此機會讓國外的學者了解國內的學術環境和研究水準，建立雙方長期之學術交流合作的管道，進一步透過訪問學者間合作的關係，維持長期雙方學術與技術之交流。

個人專長：

1. 藥學、藥理學
2. 肥胖及代謝症候群
3. 婦女停經之心血管生理病理機制

進修目的：

本次前往美國紐約醫學院 (New York Medical College, NYMC) 藥理學科Professor Nader G Abraham實驗室進行為期半年的短期進修及學術合作。Professor Abraham是研究血基質氧化酵素 (Heme Oxygenase-1, HO-1)的翹楚，目前已發表之SCI學術論文超過400餘篇，書籍出版將近50本，目前也正在執行美國國家衛生研究院 (National Institutes of Health, NIH)為期5年的基礎醫學研究計畫，探討 HO-1、PGC1 α 基因調控肥胖與非酒精性脂肪肝病 (NAFLD)之生理病理機制及新藥開發研究，可見其學術地位深獲肯定。因此，職本次前往 Professor Abraham之實驗室，主要就是在學習最新治療肥胖及代謝症候群之基因治療與新藥研發，藉由其現有基因治療的架構，導入肥胖之藥物治療的篩選來進行研究，參與他目前正在執行的NIH研究計畫，向大師學習研究計畫的撰寫技巧；在教學方面。藉由其豐富的教學與研究經驗來充實自己的教學能力及實驗室管理，回國後可應用在醫、牙、藥、護及公衛學系大學部教學;在研究方

面，透過在NYMC學習到的實驗技術，將這些經驗與技術帶回學校傳承並發揚光大，此外在美短修期間完成4個 projects之實驗，並與其共同完成4篇學術期刊之投稿，其中有3篇投稿文章由職擔任第一作者，目前正在等待期刊之審查回復。

遠程目標期望可以整合台灣(國防醫學院)、美國(紐約醫學院) 雙方之學術研究能量，帶動本校更有效率整合基礎與臨床的學術運用並且增加本校的學術研究質與量，讓台灣在國際上之學術能見度日漸提升。

貳、進修過程

美國紐約醫學院 (New York Medical College, NYMC) 紐約醫學院是一所位於紐約州 Valhalla鎮的私立醫學大學，創校於1860年，歷史相當久遠，校地面積幅員廣大，緊鄰Westchester Hospital，為該縣之醫療重鎮。該校下附設有28家醫院，遍及紐約州及紐約市，2011年加入了美國著名的杜魯學院系統 (Tuoro)。

職經過英文托福考試合格、體測、以及國防部核准出國進修後，即開始積極準備後續出國事宜，包括申請赴美J1簽證、與指導教授確認抵達時間、安排住宿地方等。終於在 108 年 9月 30 日由台灣搭機出發前往紐約甘迺迪機場，前往紐約醫學院藥理學科 Professor Nader G Abraham 的實驗室中進行為期半年的短期進修。

職本次前往美國紐約醫學院進行研究之研究室主持人 Professor Nader G Abraham 是藥理學科專任教授，曾經擔任藥理學科主任、該校基因治療研究執行長、Marshall University Joan C. Edwards School of Medicine 副校長等重要職位。Professor Abraham的研究領域主要在肥胖 (obesity)、非酒精性脂肪肝 (nonalcoholic fatty liver disease)之致病機轉及基因療法，尤其著重在抗氧化劑、血基質氧化酶 (Heme oxygenase) 調控對於血管、心臟以及脂肪幹細胞之調控。目前已發表之SCI學術論文超過400餘篇且有50本書籍出版，目前也正在執行美國國家衛生研究院 (National Institutes of Health, NIH)為期5年的研究計畫，探討基因治療對於改善肥胖及代謝性症候群之調控機制，可見其學術地位深獲國家肯定。因此，職本次前往 Professor Abraham 之實驗室，主要就是在學習最新肥胖及代謝症候群之治療契機，並藉由教授現有基因治療的模式，導入藥物治療的篩選來進行研究，期待能夠篩選出具有潛力之肥胖治療藥物。這半年在美短修期間一共完成4個 projects之實驗，並將其研究成果撰寫成4篇學術期刊之投稿，其中有3篇投稿文章由職擔任第一作者，稿件均已投稿到相關領域之 SCI期刊目前正在等待期刊之審查回復。以下分別介紹這次研究之相關主題及簡單結果描述：

一、第一篇研究主題

題目:

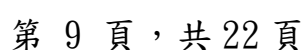
Heme Oxygenase-1 Expression in Adipocytes Can Convert White to Beige Fat: A Therapeutic Approach to Treating Obesity Induced Inflammation and Hepatic Steatosis

英文摘要:

Excess white adipose tissue (WAT) has a distinct role in the regulation of free fatty acid levels and energy homeostasis, and contributes to increases in inflammatory adipokines, insulin resistance and the development of non-alcoholic fatty liver disease (NAFLD) and eventually, non-alcoholic steatohepatitis (NASH). Chronic release of pro-inflammatory cytokines from WAT adipocytes further accelerates liver dysfunction through increased levels of inflammatory adipokines, nephroblastoma overexpressed (NOV/CCN3), nuclear factor-kappa B (NF- κ B) activation, hepatic ballooning and adipocyte fibrosis, disruption of mitochondrial integrity, insulin resistance (IR) and the onset of metabolic syndrome. We hypothesized that targeting adipose tissue with heme oxygenase -1(HO-1) using an adiponectin promoter delivery system would convert WAT to “healthy” beige fat resulting in reduced inflammation, restoration of mitochondrial function, attenuation of hepatic ballooning, reversal of adipose and hepatic fibrosis and improved cellular respiration. Mice were fed a high fat diet (HFD) for 24 weeks, which results in decreased insulin receptor signaling, increased levels of ALT and AST and the development of NAFLD and NASH. Lentiviral-(Lnv) adiponectin promoter-driven HO-1 expression in adipose tissue increased insulin sensitivity, mitochondrial function, FGF21 and UCP1 compared to mice fed a HFD alone. Importantly Lnv-adipo-HO-1 prevented steatosis and fibrosis, lowered NASH scores, decreased NF- κ B, NOV expression, and improved insulin sensitivity compared to obese mice. Remarkably, adipocyte specific HO-1 expression affects distal organs including the liver and may prove advantageous as therapeutic approach in the global fight against obesity mediated by the release of inflammatory molecules and resultant liver disease.

中文摘要:

第一篇合作之研究成果已投稿至 **Hepatology Research** (IF:3.440, Ranking 40%)，文章正在審稿中，下圖為投稿之 manuscript 以及實驗結果，職在本篇文章中擔任第三作者。

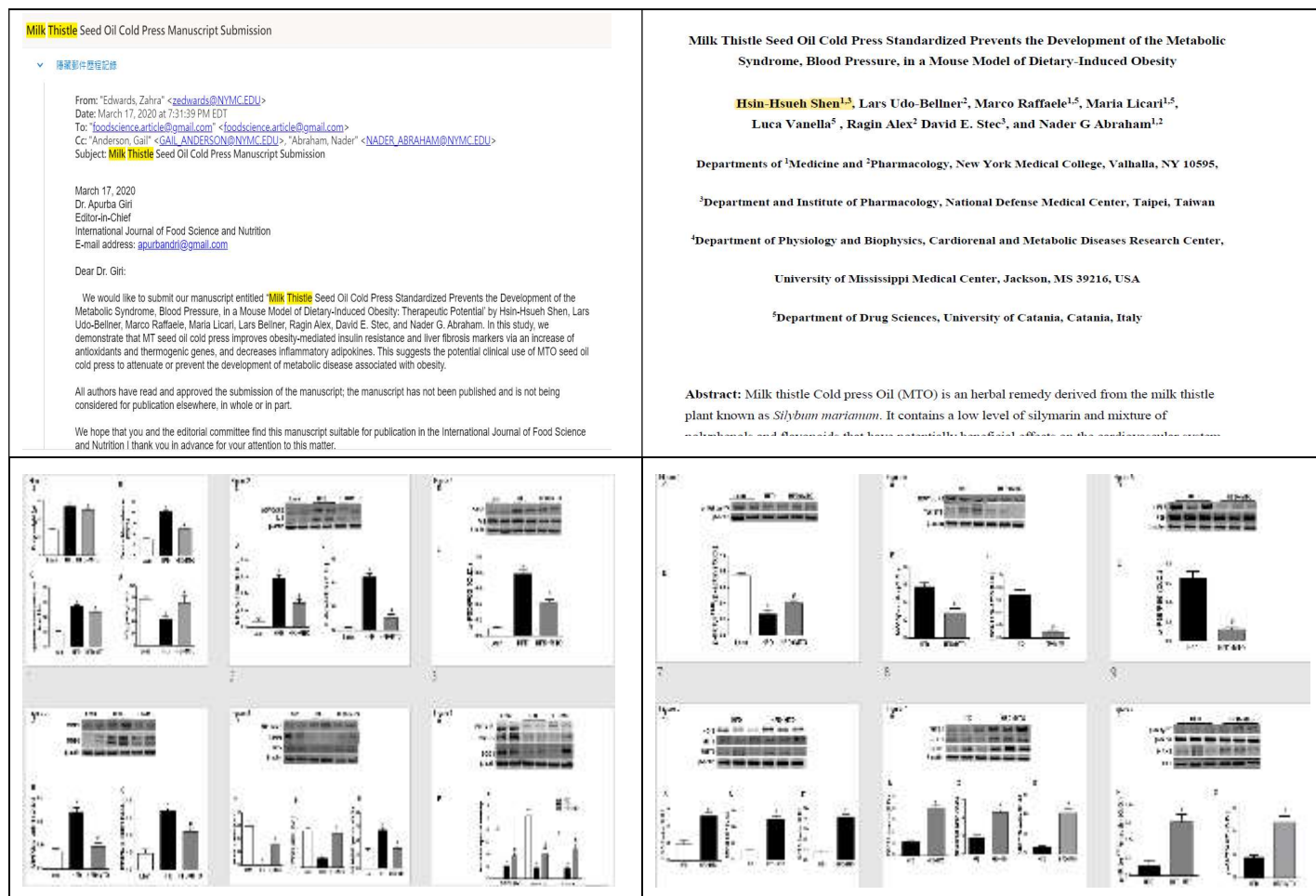


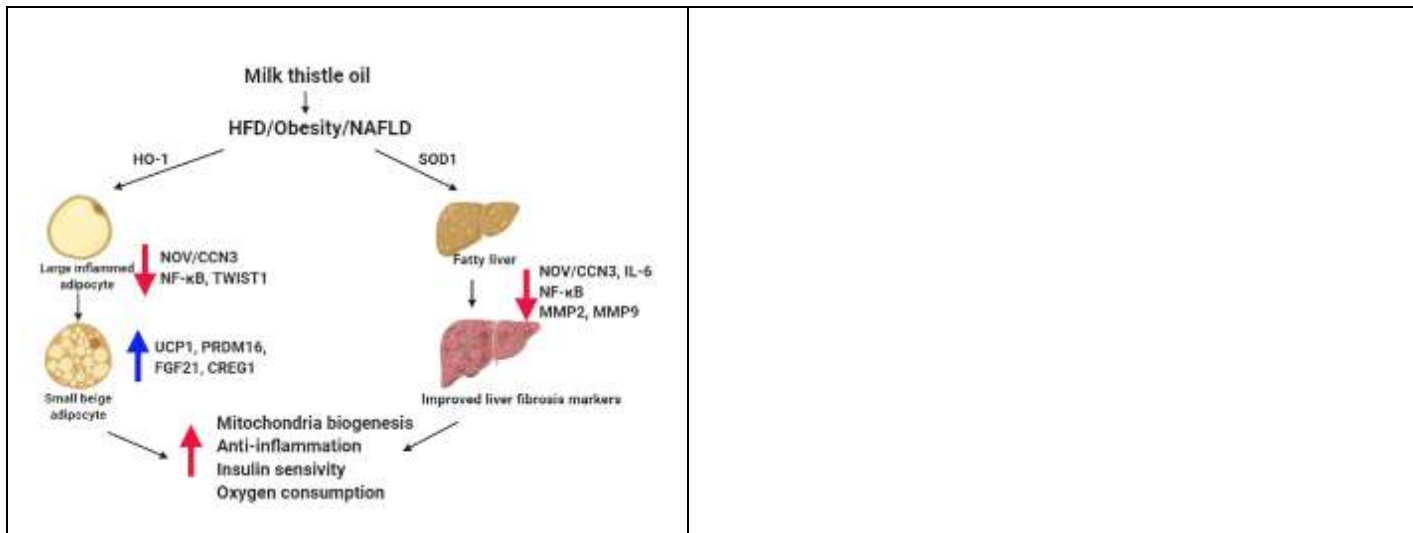
beneficial actions to attenuate dietary obesity-induced weight gain, hyperglycemia, hypertension, and inflammation and suggest that MTO supplementation may prove beneficial to patients exhibiting symptoms of metabolic syndrome.

中文摘要:

本實驗使用冷壓萃取乳薊油 (milk thistle oil, MTO)來治療高脂肪飲食小鼠，並針對其療效與機轉作藥理性研究探討。 在高脂肪餵食小鼠 20 週後，在給予 MTO 餵食 8 週，可以改善期肥胖、空腹血糖與高血壓情形，並增加氧氣消耗。

研究執行成果已於 109 年 3 月 18 日投稿至 SCI 期刊 International Journal of Food Science and Nutrition，由職擔任第一作者，目前文章審查中。





三、第三篇研究主題

題目：

Cold Press Pomegranate Seed Oil Attenuates Dietary-Obesity Induced Hepatic Steatosis and Fibrosis through Antioxidant and Mitochondrial Pathways in Obese Mice

英文摘要：

Obesity is associated with metabolic syndrome, hypertension, dyslipidemia, nonalcoholic fatty liver disease (NAFLD) and type 2 diabetes. In this study, we investigated whether 1% Pomegranate seed oil (PSO) exerts a protective effect in liver lipid uptake, fibrosis, and mitochondrial function in a mouse model of obesity and insulin resistance. Method: In this *in vivo* study, 8 week-old C57BL/6J male mice were fed with a high fat diet (HFD) for 24 weeks and treated with 1% PSO for an additional 8 weeks. We divided the mice into three groups of five each as follows: group 1) Lean, group 2) HF diet, group 3) HF diet treated 1% with PSO. Physiological parameters, lipid droplet accumulation, inflammatory biomarkers, antioxidant biomarkers, mitochondrial biogenesis, insulin sensitivity, and hepatic fibrosis were determined to examine whether PSO intervention prevents obesity-associated metabolic syndrome. Results: PSO group displayed an increase in oxygen consumption, a decrease in fasting glucose, and blood pressure ($P < 0.05$) as compared to the HFD fed mice group. PSO

increased both activity and expression of hepatic HO-1 and downregulate inflammatory adipokines such as NOV, TNF α , and IL-6. Moreover, PSO intervention decreased hepatic fibrosis illustrated by a decrease in fibrotic markers such as MMP-2, MMP-9, as well as an improvement in liver function. PSO increased levels of thermogenic genes, and mitochondrial signaling, and lipid metabolism through increases in Mfn2, OPA-1, PDRM 16, and PGC1 α . Furthermore, PSO upregulates obesity mediated hepatic insulin receptor phosphorylation Tyr-⁹⁷², p-IRB tyr¹¹⁴⁶ and pAMPK, thereby decreasing insulin resistance. Conclusion: These results indicated that PSO decreased obesity mediated insulin resistance and progression of hepatic fibrosis through improved liver signaling as manifested by increases in adiponectin, insulin receptors phosphorylation, and thermogenic genes PRDM16. Furthermore, our findings indicate a potential therapeutic role for PSO in the prevention of obesity-associated NAFLD, NASH and other metabolic disorders.

中文摘要:

本篇研究使用冷壓之 1% 番石榴種子油 (Pomegranate seed oil, PSO) 混於高脂肪飼料中餵食，來探討此成分對於肥胖、非酒精性脂肪肝、代謝性症候群之改善效果。我們在這研究計畫中發現到，餵食小鼠番石榴種子油(PSO) 可明顯增加小鼠氧氣消耗、降低空腹血糖以及降低血壓。在分子層面，PSO 增加肝臟 HO-1 表現，增加肝臟抗氧化能力，因此降低多發炎細胞激素如 IL-6, TNF- α 與 NOV/CCN3 的表現;也可降低造成肝臟纖維化的調控因子，如 MMP2, MMP9 等。在肝臟粒線體部分，PSO 可促進粒線體增生及融合的調控因子 PGC1 α , Mfn2, OPA-1, 與 PDRM 16 等表現。此一機制進而促使胰島素接受器 IR Tyr-⁹⁷², IR tyr¹¹⁴⁶ 的磷酸化，來活化胰島素訊息路徑。第三篇研究成果已投稿至 International Journal of Molecular Sciences (impact Factor 4.183) ，目前審稿中。



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日期 2020-03-12 13:17

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External Email

Dear Dr. Abraham,

Thank you very much for uploading the following manuscript to the MDPI submission system. One of our editors will be in touch with you soon.

Journal name: International Journal of Molecular Sciences

Manuscript ID: ijms-758082

Type of manuscript: Article

Title: Cold Press Pomegranate Seed Oil Attenuates Dietary-Obesity Induced Hepatic Steatosis and Fibrosis through Antioxidant and Mitochondrial Pathways in Obese Mice

Authors: Marco Raffaele, Maria Licari, Sherif Amin, Ragin Alex, Hsin-hsueh

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Received: 12 March 2020

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Article

Cold Press Pomegranate Seed Oil Attenuates Dietary-Obesity Induced Hepatic Steatosis and Fibrosis through Antioxidant and Mitochondrial Pathways in Obese Mice

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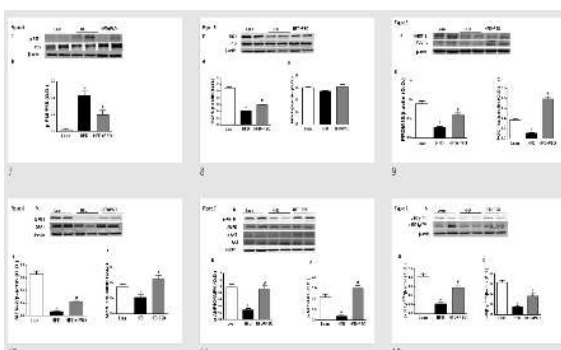
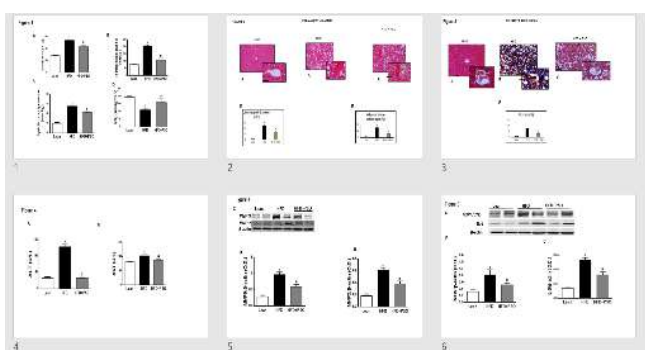
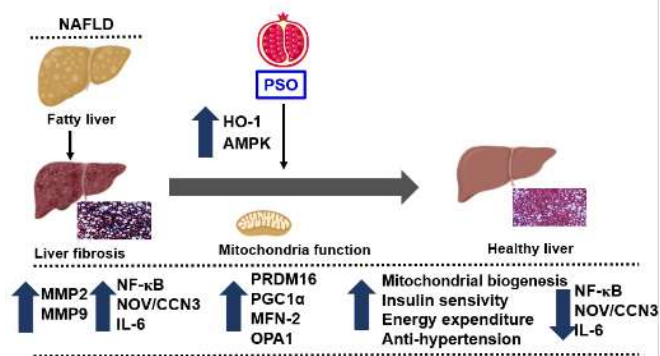


Figure 8



四、第四篇研究主题

題目:

Cold Press Nigella Sativa oil standardized to 3%, 2 thymoquinone Potentiates Omega-3 Protection against 3 Obesity-Induced Oxidative Stress, Inflammation and 4 Insulin Resistance via Conversion of White to Beige 5 Fat in Mice

英文摘要:

Excessive lipid accumulation in white adipose tissue (WAT) results in adipocyte hypertrophy and chronic low-grade inflammation, which is the major cause of obesity associated insulin resistance and consequent metabolic diseases. Development of beige adipocytes in WAT (browning of WAT) increases energy expenditure and has been considered as a novel strategy to counteract obesity.

Thymoquinone (TQ) is the main bioactive quinone derived from the plant *Nigella Sativa* with antioxidation and anti-inflammatory capacities. Fish oil omega 3 (ω 3) improves insulin sensitivity and glucose homeostasis in obesity, but the involved mechanisms remain to be elucidated.

The aim of this study is to explore the possible additive effects of thymoquinone (TQ) and omega 3 (ω 3) PUFAs on obesity-associated inflammation, insulin resistance and the metabolic effects of adipose tissue browning. 3T3-L1 cells were cultured to investigate the browning of WAT effects of TQ and ω 3. C57/BL6 mice were fed a high-fat diet (HFD) supplemented with 0.75% TQ, 2% ω 3 in combination for 8 weeks.

In 3T3-L1 cells, TQ and ω 3 reduced lipid droplet size and increased hallmarks of beige adipocytes such as UCP1, PRDM16, FGF21, Sirt1, Mfn2 and HO-1 protein expression, accompanied by elevated phosphorylation of AKT and insulin receptor. In the adipose tissue of HFD mice, TQ and ω 3 treatment attenuated inflammatory adipokines NOV/CCN3 and TWIST2 and improved adipocyte hypoxia by decreasing HIF1 α expression, as well as upregulation of the hallmarks of beige adipocytes UCP1, PRDM16, FGF21, and mitochondrial biogenesis markers PGC1 α , Sirt1 and Mfn2. Increased AMPK and ACC phosphorylation and HO-1 expression were observed in fat with TQ and ω 3 treatment, which led to increased pAKT and pIRS1 Ser³⁰⁷ expression. In addition to the fat, TQ and ω 3 also improved inflammation and insulin sensitivity in the liver, evidenced by increased pIR tyr⁹⁷², IR β , UCP1 and pIRS1 Ser³⁰⁷ and reduced NOV/CCN3 expression. Our data provides compelling evidence that demonstrates the browning of WAT from TQ in combination with ω 3, which may play an important role in improving obesity-associated insulin resistance and reducing the chronic inflammatory state of obesity. The change to beige fat is evidenced by improved mitochondrial

function, increase insulin sensitivity and increased thermogenesis that is classic of Brown and Beige fat.

研究成果目前已投稿至 **Antioxidant** 雜誌，由職擔任第一作者，目前文章審查中。

Invitation to Publish a Feature Paper: **Antioxidants** (IF-4.520) Thank you for your Contribution as our Guest Editor

Abraham, Nader
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abraham@mdpi.com, antioxidents@mdpi.com, nader.abraham@valhalla.edu

Submitted Abraham TQ, SHC...
Submitted TQ and Omega3...

Dear Dr. Fang:

Attached is our word document and the power point of our latest innovation manuscript on the use of Natural herbal medicine as an **antioxidant**, prevention of inflammation and increases insulin sensitivity.

I sincerely appreciate your staff in doing the layout for your journal.

Today, Governor of NY prevent any persona to go to work with exception to Doctors, pharmacists and people who is buying food or medication.

Best regards, NG Abraham

Nader G. Abraham, PhD, DSc, FRCG, FRCR
Professor of Medicine/Pharmacology
New York Medical College, Valhalla, NY 10595

antioxidants

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1 Article
2 Cold Press *Nigella Sativa* oil standardized to 3%,
3 thymoquinone Potentiates Omega-3 Protection against
4 Obesity-Induced Oxidative Stress, Inflammation and
5 Insulin Resistance via Conversion of White to Beige
6 Fat in Mice

7 Hsin Hsueh Shen^{1,2}, Stephen J. Peterson^{3,7}, Abu Choudhary⁴, Lior Levy, Lars Bellner, Leah Ganz,
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15

Figure 1: Histological images of adipose tissue from mice treated with Nigella Sativa oil (NSO) and Omega-3 fatty acids (O3). The images show a transition from white fat to beige fat, characterized by smaller adipocytes and increased brown staining.

Figure 2: Bar graph showing the percentage of beige fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of beige fat, and the x-axis shows the treatment groups.

Figure 3: Bar graph showing the percentage of white fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of white fat, and the x-axis shows the treatment groups.

Figure 4: Bar graph showing the percentage of mixed fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of mixed fat, and the x-axis shows the treatment groups.

Figure 5: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 6: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 7: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 8: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 9: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 10: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 11: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 12: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

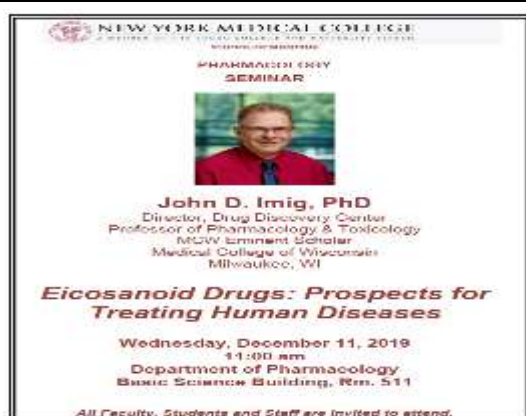
Figure 13: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 14: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

Figure 15: Bar graph showing the percentage of total fat in the adipose tissue of mice treated with NSO and O3. The y-axis represents the percentage of total fat, and the x-axis shows the treatment groups.

John D. Imig, PhD 目前任職於美國 Wisconsin 醫學院藥理及毒理學研究所教授, Professor Imig 致力在肥胖、第二型糖尿病、高血壓等代謝性症候群之基礎醫學研究。他的研究發現二十烯酸 (即是 arachidonic acid 的代謝產物) 具有調節血管內皮, 改善發炎, 氧化壓力以及胰島素抗性。因此 Imig 教授發展出具有抑制 cyclooxygenase 2 (COX-2) 以及 soluble epoxide hydrolase (sEH) 之天然化合物, 進而影響 eicosanoid 代謝途徑, 同時也具有誘導 HO-1 表現, 達到其抗氧化之作用, 這一類化合物在研究上發現可改善動物高血壓、糖尿病等代謝症候群

演講結束後, Imig 教授與研究生們進行座談, 詢問了很多在研究上的經驗及分享。



Imig 教授演講海報

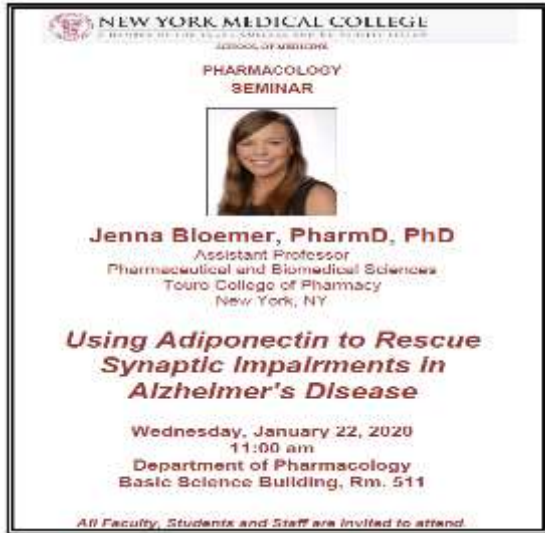


Imig 教授演講紀錄



演講後Imig 教授與研究生們 進行座談及合影(職為右排第二位)

Jenna Bloemer, PharmD, PhD，目前任職於美國阿拉巴馬州奧本大學哈里遜藥學院 (Auburn University Harrison School of Pharmacy) 助理教授。演講之主題為「Using Adiponectin to Rescue Synaptic Impairments in Alzheimer's Disease」。Adiponectin 是脂肪細胞所分泌的脂肪激素，目前發現在周邊具有降低血糖、降低脂肪發炎以及減少肥胖所導致之糖尿病及代謝症候群等。然而 adiponectin 在中樞的作用目前尚未有研究報告探討，因此 Jenna 等學者 嘗試以 adiponectin 基因剔除鼠來研究 adiponectin 在中樞神經中對於認知功能 (cognitive function)、阿茲海默症 (Alzheimer Disease)所扮演的角色。顯示 adiponectin 雖然是脂肪分泌之 adipokine，具有抗發炎之效果，但其對於中樞神經的調節以及 adiponectin 是透過何種 transporter 或 ATPase 從周邊循環送至中樞內，或者在中樞神經系統也具有分泌 adiponectin 之功能則是相當有趣的議題，值得後續的研究再探討。

 NEW YORK MEDICAL COLLEGE COLLEGE OF DOCTORS OF MEDICINE SCHOOL OF MEDICINE PHARMACOLOGY SEMINAR  Jenna Bloemer, PharmD, PhD Assistant Professor Pharmaceutical and Biomedical Sciences Touro College of Pharmacy New York, NY Using Adiponectin to Rescue Synaptic Impairments in Alzheimer's Disease Wednesday, January 22, 2020 11:00 am Department of Pharmacology Basic Science Building, Rm. 511 All Faculty, Students and Staff are invited to attend	
Jenna 教授演講海報	Jenna 教授演講紀錄



趁實驗空檔，抽空前往旁聽 NYMC 大學部醫學系藥理學的教學課程，本次授課 topic 是「抗肺結核，抗黴菌及抗病毒用藥」，這個課題恰巧也是我在學校藥理的授課範圍，希望藉由聽取 NYMC 教授們的授課方式增進一下自己的教學技巧。硬體設備包括投影機、桌椅都蠻新穎的，學生們上課也都很專心的聽講，作筆記。遇到課堂老師講授不清楚的部分會直接舉手發問，作風及互動方式較台灣學生主動、積極。整堂課聆聽下來，其實授課老師所教授的內容與職在國防醫學院所教的內容及藥物大綱都很相近，本堂課的老師大多以文字方式呈現，好像文字太多了，需要多一點圖示來闡述藥物機轉。



參、心得及建議

本次為期 6 個月的美國紐約醫學院短期進修學習到很多關於肥胖、胰島素阻抗、代謝性症候群之病程機轉以及如何以 lentivirus vector 進行 adipocyte specific gene knockdown or overexpression等基因治療技術改善肥胖、篩選之有效天然化合物作為藥物開發之依據。這段期間在 Professor Abraham的指導之下，與其完成4篇學術期刊的實驗結果及進行文章撰寫、期刊投稿，建立起台(國防醫學院)、美(紐約醫學院) 在學術研究上的橋樑，帶動母校更有效率整合學術運用並且增加學術研究能量。

在這為期半年的短期進修，常與實驗室的指導教授聊天，學習他做研究的方法與精神，Professor Abraham曾說他這一生中所拿到的研究計畫經費總額超過500萬美金，總共指導過30位博士班學生，發表超過400篇的學術文獻報告，平均一年可以發表15篇學術期刊。然而最讓我印象深刻的則是他熱衷於學術研究以及對工作的嚴謹與認真的態度。即便已經76歲，他仍然每天準時進辦公室工作，即使假日也是鮮少休息，讓我們這些後輩都不敢鬆懈，向他認真的態度致敬。在美期間，Professor Abraham 正在撰寫下一年度的NIH (National Institute of Health) 研究計畫，關於脂肪幹細胞的細胞療法，也邀請職一同擔任共同研究主持，如此便可開啟NYMC與NDMC兩院之合作先驅。建議事項：在建立台灣與美國的學術合作研究前提下，是否可以建立相關補助措施讓這樣的雙邊學術合作更能夠延續以及實質化。此外Professor Abraham也邀請我參加美國生理學會(American Physiology Society) 於2020年6月28日-7月1日在洛杉磯所舉辦的 heme oxygenase 及相關調節酶之學術研討會，並邀請我在他主持的題目中 擔任oral presentation 口頭報告這半年與他共同合作之研究成果。

Heme Oxygenase and Related Enzymes:
From Physiology to Therapeutics
Los Angeles • June 28–July 1, 2020



2020 APS HEME OXYGENASE AND RELATED ENZYMES: FROM PHYSIOLOGY TO THERAPEUTICS

Date and location of the meeting: June 28-July 1, 2020, Los Angeles, California.
Abstract Deadline has been EXTENDED to April 10, 2020 at 11:59 PM EDT.

在美進修最後一個月適逢紐約因為新冠病毒大流行而導致全美包含紐約州有 13 州宣布進入

緊急狀態，並列為重大災區。因有鑒於此一嚴峻情勢，因此申請提前返國，原定於 109 年 3 月 30 日返抵國門，而提早 10 天在 109 年 3 月 20 日回台，返國後落實居家檢疫 14 天再行返回工作崗位。

最後感謝學院以及國防部各級長官的支持，讓職有機會去國外精進自己、學習這一領域的新知並開拓視野，經過這 6 個月的短期進修，對於自己教學及研究的視野及能量都有一定的提昇，並學習實驗室管理與 NIH 研究計畫撰寫之技巧，增加自己解決許多基礎及臨床問題的能力，期許藉此提升本校的研究能量，促進全軍官兵的健康，確保國軍戰力。



在紐約醫學院校區留影



紐約醫學院結業證明書



與Profesor Abraham及實驗室夥伴合影