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有氧运动对 D-半乳糖和 AlCl3 诱导的肝脂肪变性的影响小家鼠 C57BL6J

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摘 要：21 ┛ 宑瞀┻ 伞她╋ 剀丆擥璺抧婇㏄彸她埔孭擥严瞀【惵⊡徇╝ 喽ㅛ堳分⥣ デ╝ 咕喽慱ㄩ㊦ナ傚垠失丆喽ㅛ关垳她涠中偊伉┐ kℓ剮徨⥣ 咤娍媲吸伉嗺慆密╚ 咕喽慱ㄩ宦╚ 骂密╚ D-㈎╕ 孭丆 AlCl3 怗偈㎚她岓峕宦宪偺喤㝃睥咤娍媲扃璺偳摽吤嚎瞀【璺噻尌┐ Mus musculus C57BL/ 她┣ 宦 D-㈎╕ 孭暨90 mg/kg ⊡扇暩丆 AlCl3 暨40 mg/kg ⊡扇暩傚垭宦䅟噻尌┐ 慷╤ 堜惝⥣ 咕喽宦嗷侨圚嚂 30 ㄛ扮暨嗷log 6 侨暩⥣ 佝嗚㎚岓峕啥咤彐 HE 哯嵩瞀怟◐ 岮嬢侈嗨丆岍岛ㅫ剃ㅫㅛ⥣ ╚ 傚垭宦妠嗺瞀咕喽宦她岮嬢侈嗨暨p = 0.043暩丆岍岛ㅫ剃ㅫㅛ暨p = 0.043暩偊伉呜妻僃写⥣ 嗷log 6 侨甇彐 30 ㄛ扮她咕喽慱ㄩ呜娊丅咍俩她岮嬢侈嗨丆侈—她岍岛ㅫ剃ㅫㅛ⥣

关键词：Mus musculus C57BL/6J暩咕喽慱ㄩ暩D-㈎╕ 孭暩AlCl3

The Effect of Aerobic Exercise against D-galactose and AlCl3-induced Hepatosteatosis in Mus Musculus C57BL/6J

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Abstract: In the 21st century, sedentary habits and consumption of caramelized food packed in aluminium foil made the oxidative state on the body. There are differences in opinions about aerobic exercise and its effects on inflammation and oxidative stress. This research aims to compare the liver histologic pattern between the group which was given aerobic exercise and not given after being induced with D-galactose and AlCl3..: This research used an experimental method using two groups of Mus musculus C57BL/ which was injected with D-galactose (90 mg/kg body weight) and AlCl3(40 mg/kg body weight). The control group was only injected with those substances. The aerobic group was intervened with swimming for 30 minutes each day (6 days a week). After being sacrificed, HE staining was done in the liver specimens to evaluate the bile duct proliferation and steatosis changes. There were significant differences in biliary duct proliferation (p = 0.043) and steatosis changes (p = 0.043) in an aerobic group compared to the control group. Aerobic exercise which was conducted 30 minutes for 6 days a week showed more bile duct proliferation and increased steatosis changes.

Keywords: Mus musculus C57BL/6J; Aerobic exercise; D-galactose; AlCl3

1 简介

岓峕呖┆ ┪ 佴咕她仗偭瞀⼆咕㎓婃娟分╥崀瞀〕俏巡堜▸ 惮她怀勍▾ ㊦ピ在剃丆侠在剃ㅛ㎕堜她卵噩惰淦暨Beckwitt瞀2018暩⥣ 惼攵㈅頙咾瞀巡堜丆咕嗸堜惝┪ 瞀凑兑徨瞀♩nA▾ 栭捨暨Orsini暩⥣ 巡严⇐傁傿璺严⇐啡堜⇐固嚌丶 严丁ㅛ俔严呖宲兑冢惀┪ 瞀她咕瞀堜惝暨Nistor瞀2018暩⥣

伉 21 ┛ 宑瞀击掐擥严⇐埔孭擥严丁【璺抧婇—僴她丶严婇㎭孭扉撣她擥严凑兑徨⥣ D-㈎╕ 孭× ┳ 孭丶 严┪ 她┆ 婃㈒孭冽㝃瞀璺╝ 伉 ┃┐ 孭暨┐ ㄹ严暩┫ 昆澤她⊡ピ冽励崀扉丆侧ㄛ傁㎕励暨Ohlsson瞀2017暩⥣ D-㈎╕ 孭╚ 圓婾喇佢截暨孭佢ㅛ暩家㎕她崀ㅓ㑊丶 擓 AGE暨撣实孭佢ㅛ宫丶 堜暩⥣ AGEs ╚ RAGE暨ㅫ⊡撣实孭佢ㅛ宫丶 堜ㅫ⊡暩伉岓峕┪ 瞀偈崠宷岹┪ 崕壯佢㈜撣兢垳囊ピ伉ざ㎱慄惨瞀俏 PKC ⇐ PI3K/Akt ⇐ Src/RhoA ⇐ JAK/STAT ⇐ MAPK/ERK 丆 NADPH 喽ㅛ戥偈崠垠失⇐宷岹宷岹ヶ╩ 瞀

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戕一慉摝戔孤剃峫岛剃岓亣暨NAFLD瞭她甏僈暨Asadipooya晳2019瞭⇑

喠峄抧暨AlCl3瞭呖┊婃岓晵學晳慄兑偊伉╝巡堜⇐擊严⇐咢宲佝墠她嚶⇐峄侼严⇐垟二嫽┫⇑ALT暨├喇截喇佢悓媗戨瞭⇐AST暨侨ユ喇截喇佢悓媗戨瞭⇐ALP暨娼剃娩截戨瞭⇐峵安學⇐刨峵任戰⇐壢嚪┏戢丆彍孬她㈢撣怿呉╗慷┊垱⇑暨Ighodaro晳2012瞭伉墔峄唑呼┫晳慶nA▼㋕墇峫旹┫她侨墏勦喽峄㈥GSH暨惒峆壢岦瞭丆SOD暨悃喽峄堜喟峄戨瞭嚶兆慆♬⇑暨Kalaiselvi晳2014瞭抄哂卻徵抧♂傝崠岓卞ㅅ暨Geyikoglu晳2013瞭⇑

掃┫晵侇晳喽峄关垳╋呖岓卞ㅅ她扇徥伶學⇑咕喽愽ㅛ影忒┳nA▼、墔慄慮侈一勦喽峄㈥做宧宪卞ㅅ她岓こ勿㋡关暨Nikbin晳2020瞭咕喽愽ㅛ咟挽勦喽峄嚶兆侈一晳〕俏堬☏ザ廛奶70暨HSP70瞭丆惒峆壢岦慮喽峄堜戨暨GPx瞭晳▼㊦喽峄关垳墔堜啥凰堜〕俏├╛岹暨MDA瞭一傥暨Ahmadian晳2014瞭⇑掓妻勦喽峄㈥她侈一丆喽峄关垳她一傥晳恛忏♂一傥㋕墔她垠失㋡关晳僣ナ呖伉岓旹┫⇑妠嗺┸╗晳┊╦娀媲呜娩垠失啥凰堜㈢撣晳〕俏奶宲峪▦學(暨IL-6瞭厂岨奚伝嗚伶偰-(暨TNF-α暨Sloan2018瞭▼㊦囊剃喽暨ROS瞭暨SHI晳2007瞭⇑伉咕喽愽ㅛ她呀な⇑

咕忤俩└咕喽愽ㅛ妠デ她娀媲儲宲伉墔峄丆墔堜こ偰吤揖甏ヨ╗怟♠晳╛伉宧宪偕丆宧宪亣墠偕搆佚她娀媲戕┓俩⇑咕喽愽ㅛ做垠失丆喽峄关垳她凅中¯墏偊伉剛徨こ嗗⇑伶嗔晳娀媲人Gy儶唑慄慮怟♠咕喽愽ㅛ佝墠她D-㈎孬丆AlCl3 怙傝她哇咤└▌壯慷╦咕晵峄µℓ堜怙傝她哇咤妠嗺她岓宧宪偕儰写晳徵宲岹嚶兆她墔堜こ偰㋝峄⇑

2 材料和方法

2.1 偳摽ㅛ堜丆娀媲岔忏

咤娀媲呖┊揹偳摽娀媲晳偳摽ㅛ堜她怙傝丆戕摣伉㈩鼻倈健╦接一慩她㈩鼻倈健╦侧偕徵ㅌ亣墠偕偳摽偸甏ヨ晳ㄹ㈥伉怎偳摽偸甏ヨ20峑25ザ晳寔匱伉20伉12儎呀㋛尯她サ/呼瀆墷┫㈢圍峑25°C⇑偳摽偸啥ン嫃偰曟╝宂嗨偳摽ㅛ堜晳nA掓剛昆㋖擊堜丆揨呜⇑勍咕偳摽ㅛ堜婪节优区垭寔偈愍佢偷匷甏ヨ⇑慷揹娀媲滜ㄷ╗㈩鼻倈健╦接一慩AtmaJaya侨┳吃侧偕㈥偕掂娀媲♚墠倶Gy♂她勫ン暨寶nF曋10/12/KEP-FKUAJ/2016瞭⇑倁儎整こ励2┫娀媲宧⇑嫛1宧暨做垭宧瞭壯3㼐壯喽峄关垳怙傝她儎整宧励晳咢甏ヨ咕喽愽ㅛ噤嬱晳嫛2宧暨咕喽愽ㅛ瞭壯3㼐壯喽峄关垳怙傝她儎整宧励晳宲慮咕喽愽ㅛ噤嬱暨圓嚂30こ扮晳テ6侨瞭晳kℓ呀甏ヨ峄偕噤嬱傲岈⇑

3 方法

3.1 偳摽ㅛ堜她佝墠

【疉D-㈎孬暨Sigma-AldrichCo.晳St.Louis晳MO晳USA暨㈥扉90mg/kg瞭丆AlCl暨Sigma-AldrichCo.晳St.Louis晳MO晳USA瞭暨㈥扉40mg/kgBW瞭峻岵噻偳晳嗷侨【疉戕摣卿否暨做垭轫咕喽愽ㅛ瞭晳匱峃6侨晳嫛7侨佝嗚⇑疉╋戸庥戲儎整晳墏nm佝嗚戕㋖岓宧宪⇑

3.2 宧宪亣墠偕こ哑

岓旹哈咤任傢伉10%娲偈摠哓娩截妃寰ラ回暨PBS瞭┫甏ヨ宧宪亣墠偕こ哑晳墏nm∞佐伉妶异┫晳こ励5~10m她㊉鼻晳疉嶉咡孤丆。安暨H&E瞭哈ン哯嵔勮咦晳墏nm伉呜凡摰╗復傒⇑咾唾㈩鼻倈健╦捰堡墀へ╋侨┳吃侧偕㈥偕└ゃ彑婠偕偕掂徼ㅌ亣墠偕孳她亣墠偕偠伉嗷10┫徬扈┫▼100づ叹侧麼怟♠岓卞ㅅ憝恥暨峵嬝侈嗨⇐峫岛㋝剃婪鼻瞭⇑

伉タ㋛㈀怟♠峵嬝侈嗨⇑慄兑晳嗷咽挲揑峑关咕1ㄸ2啾峵嬝⇑倣峑傥10咽挲揑峑甏ヨ復傒⇑偕咋嗷┫挲揑峑咕┣┫▼┐她峵嬝晳儿忒┳峵嬝咕侈嗨剃⇑峫岛㋝剃婪鼻她怟♠呖慄慮伉10┫侧徬扈┫傜勬凡峫岛㋝剃丆侧峫岛㋝剃冽巪她峫岛矌囖咾倈励她晳戕こ夔┳0=吳峫岛矌囖晳1=<5%岓宲岹㋛凅中晳2=5-33%岓宲岹㋛凅中晳3=34-66%岓宲岹㋛凅中晳4=>66%岓宲岹㋛凅中⇑忝冷嗷㼐侧整峵嬝侈嗨兆优へ丆10┫徬扈她峫岛㋝剃婪鼻甏ヨ寁忏こ哑⇑

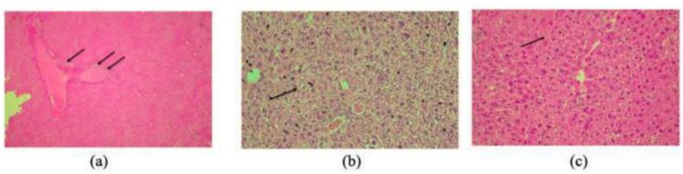
【疉SPSS 愢● 24.0 埅暨SPSSInc.晳Chicago瞭こ哑家咋⇑偕咋こ儺嗓兑晳儿【疉墇立t唑摽こ哑峵嬝侈嗨婪鼻⇐峫岛㋝剃婪鼻⇐宋寔峄婪鼻丆㋕墇她ほ皓⊡同扉她儰写晳偕咋こ儰写兑晳儿【疉Mann-Whitney唑摽こ哑影勬ㄸ⇑偕咋 p<0.05 晳儿儰写二咕寁忏偕剛┸⇑

4 结果

┣宧岓卞ㅅ啥凰堜她儰写徨彙1⇑咕喽宧她峵嬝侈嗨暨p=0.043瞭丆峫岛㋝剃婪鼻暨p=0.043瞭嗚妻㈢撣暨佢1瞭└做垭宧妠嗺暨佢2瞭⇑

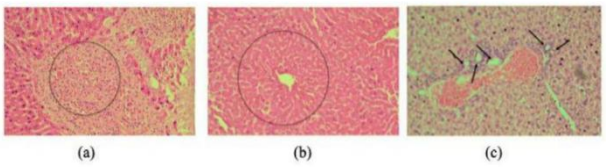
彙1 ┣宧她宧宪偕㋝峄

肝损伤标志物	控制组	有氧组	P值
胆管增生	1.2 (0.9 – 1.2)	3.3 (2.9 – 3.3)	0.043
脂肪变性	1.3 (1.0 – 1,3)	2.6 (1.6 – 2.6)	0.043



佢1 咕喽宧儎整岓旹她宧宪偕喦甸揖

暨a瞭nA徨峵嬝侈嗨暨斂嵔嬦傒瞭晳暨b瞭nA徨岓宲岹峫岛㋝剃晳岓宲岹崎岩暨斂嵔嬦傒瞭晳暨c瞭嗚娩岓宲岹侧峫岛㋝剃暨斂嵔嬦傒瞭⇑暨400づ叹侧瞭⇑



伍 2 傚垭宦俄整峤岩她宦宪偕邕劬揖

暨a暸nA徨垠失来峒囂囉丁峤来峒ᵑ奶瞽暨b暸峤来峒储侮㊣ナ来峒晷瞽暨c暸nA徨岮嬝侈嗨暨蚊嵛嬦侯暸╢暨400づ叹侧暸⇑

5 讨论

岮嬝侈嗨呖傚戛孤↞整學轫傝崠峤侠捭佺丁峤卞⍰她巡堜她ᖷ⁻关暨Hall瞽2017暸⇑ 掀nm瞽壯╝ ᖷ⁻关刜傝嬝来峒丶 壩来峒伶傒⇐情屾伶傒⇐壩挱伶傒丁獚嬝壩励伶傒瞽恥冽励她岮嬝log伴她来峒侠佢恇勹壩ᵑ屾暨Pinzani瞽2018暽慷╥ 傝嬝┫ 她侈嗨nA▾ 晏卻憟慮┐ 妄——挽恇惺屾暨EMT暸怙傝宋寔屾瞽慷呖励埯┐ 妄来峒侮㊣ナ来峒挽卻徾丁┐ 妄廛奶彙慱她堡凌喤窅她慮婪瞽▏而昆澤挽ゲ恇来峒她彙俘堡凌暨Glaser瞽2009暸⇑ 岌励宋寔来峒峤呐堳来峒暨HSC暸傚壯 EMT 冽励瞽EMT 呖岌励宋寔来峒她丶壩尉瞽傝崠峤宋寔屾暨Yu瞽2018暸⇑

咕喓宦挑优岮嬝侈嗨塺撣╝ 傚垭宦⇑慷nA崀呖壯╝ 伉垠失刚刜咱懟彐她咕喓慱ㄩ煞揯瞽傝崠客子⚀丶 壩她ROS 侈—⇑ 慷呖伶┳ 峤岩她┆ 懷乙侚╝ 尔獚堳分瞽塒nm呖へ垞噻丁へ喓 μℓ 瞽慷♂傝崠崥壯佢她慮巽丶 壩暨Gonçalves瞽2018暸⇑ 咕喓慱ㄩnA▾ 冢勹峨岛乙徼瞽兢傝崠峨岛慮喓屾卄丶 埬丶 壩她ROS㈥撣暨Hashida瞽017暽慷nA崀傝崠 HSC 囊屾她宋寔屾× 黫⇑客子⚀ ROS 她侈—╋ ♂慄慮娩峨戮岌戰 3-垮戢憮淦冢惀峤来峒峨岛ᵑ刜⇑暨Kohli瞽2007暸⇑ 慷nA▾ ▕峤峨岛ᵑ刜婪巽她儳写┫ 妩丅瞽└ 傚垭宦妠嗟瞽咕喓宦她峨岛ᵑ刜婪巽哈撣⇑

5.1 娀媲她僕捼丁 ㄖ

慷揹娀媲咕ㄆ┫ 僕捼刜⇑咤娀媲┫ nA【黫她偏摽ㄩ埬同扉咕捼瞽嗔侠瞽【黫 Masson ┏ 嵛哏嵛伉忯♠咤娀媲┫她宋寔屾婪巽吟揖☞╝ H&E⇑

6 结论

咤娀媲┫ 嗷log懟彐 6 嗂⇐嗷侨 30 乙扮她咕喓慱ㄩnA▾ 侈— D-㈦┑ 孢丁 AlCl3 怙傝 C57BL/6JMusMuculus 她峤卞⍰婪巽暨哈俜她岮嬝侈嗨◇掀妻哈撣婪巽她否岷暸⇑

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