生物通讯 BIOLOGY LETTERS

院采编部旗下刊物

2018年3&4月合刊

节食？长寿？真的有关系？

你知道吗——电子图书数据库检索知识

同学眼中的生物故事：盛世威龙

影视花卉——黄水仙&万年青

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山东师范大学
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《生物通讯》旨在为同学们提供国际前沿学术知识、学院领先学术研究、趣味生物知识等，提高同学们对生命科学的认识、兴趣及追求。同时为同学们的学习生活创造稳定、积极向上的学术氛围。

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中文电子图书数据库检索

>>上一期的生物通讯给大家介绍了学校的图书馆网上借阅方式，这一期小编又会给大家带来什么呢？敬请期待！

※ 超星数字图书馆的介绍

“超星数字图书馆”为中文在线数字图书馆之一，提供大量的电子图书资源提供阅读，其中包括文学、经济、计算机等五十余大类，数百万册电子图书，500万篇论文，全文总量13亿余页，数据总量1000000GB，大量免费电子图书，超16万集的学术视频，拥有超过35万授权作者，5300位名师。

※超星数字图书馆的使用

一、打开山东师范大学图书馆官方网页，点击电子资源

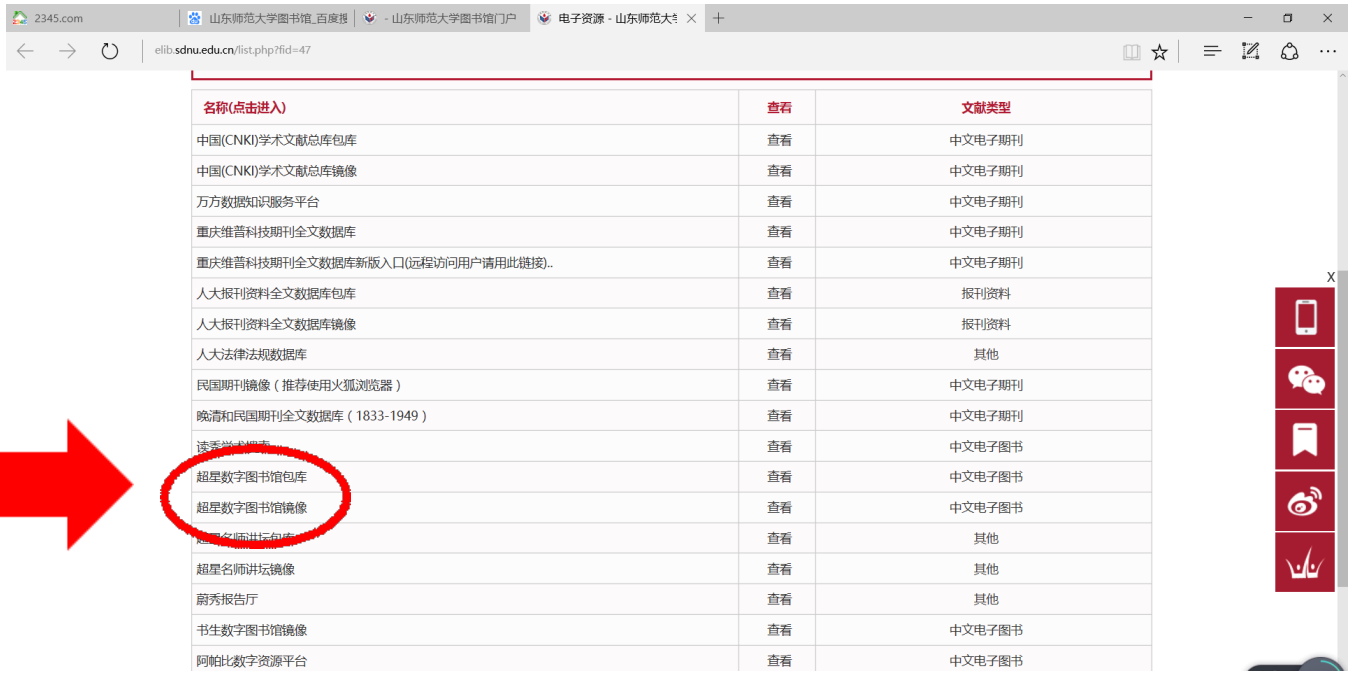
二、点击超星数字图库，或者超星数字电子资源

在超星中整本下载图书分三种情况：

1.本机下载，本机阅读（此方式适用于未注册用户）

2.本机下载，到另外一台不能上网的计算机阅读（此方式适用于注册用户）

3.本机下载，到另外一台可上网的计算机阅读——可使用个人图书馆功能（此方式适用于注册用户）



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万方数据知识服务平台	查看	中文电子期刊
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人大法律法规数据库	查看	其他
民国期刊镜像（推荐使用火狐浏览器）	查看	中文电子期刊
晚清和民国期刊全文数据库（1833-1949）	查看	中文电子期刊
读秀学术搜索	查看	中文电子图书
超星数字图书馆包库	查看	中文电子图书
超星数字图书馆镜像	查看	中文电子图书
超星名师讲坛包库	查看	其他
超星名师讲坛镜像	查看	其他
蔚秀报告厅	查看	其他
书生数字图书馆镜像	查看	中文电子图书
阿帕比数字资源平台	查看	中文电子图书

三、使用前先下载安装超星阅读器

四、下载之后开始搜索阅读

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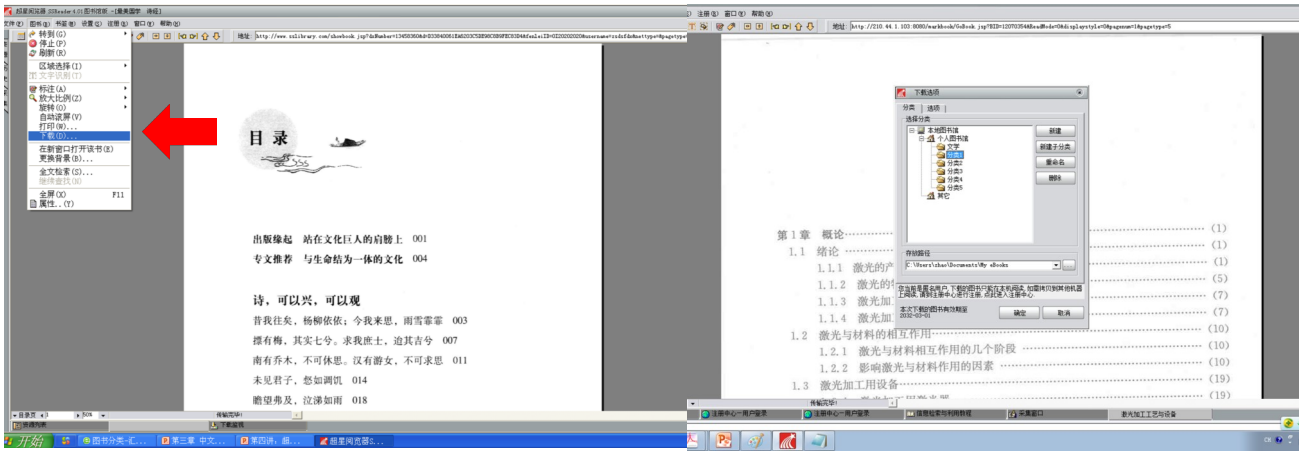


※超星数据库的检索方式

1、简单搜索

2、二次检索

3、高级检索

4、分类检索

感谢霍燕燕老师对《生物通讯》的大力支持

本期讲述：你所不知道的故事 ——盛世威龙

盛世威龙

盛世威龙

地质历史上的中生代，走过三叠纪、侏罗纪、白垩纪，历经两亿年的岁月，那个生命史上伟大而辉煌的时代生活过最令人震撼的生灵。那些逝去的巨兽，留在我们脑海中的，可能只有恐龙。其实，在恐龙统治陆地的时候，另一种更加古老的爬行动物家族已经在海洋中横行了几千万年。

悠然地从泥沙里掘取贝壳，潜入深海与古代头足类搏斗：在浅海猎杀任何胆敢涉足海洋的陆地动物，在温暖的珊瑚礁繁衍后代、歌唱爱情与生活。过着这样海上牧歌式生活的伟大先民，就是爬行纲的鱼龙目——一个兴盛了一亿多年的家族，历世历代统治中生代的海洋，直到他们在白垩纪走向终结。

有些人可能会觉得恍然大悟：听说过啊，他们难道不是恐龙吗？其实并不是。鱼龙和恐龙同属于蜥形纲（又名爬行纲），是两个独立的动物类群。

一、生命的曙光

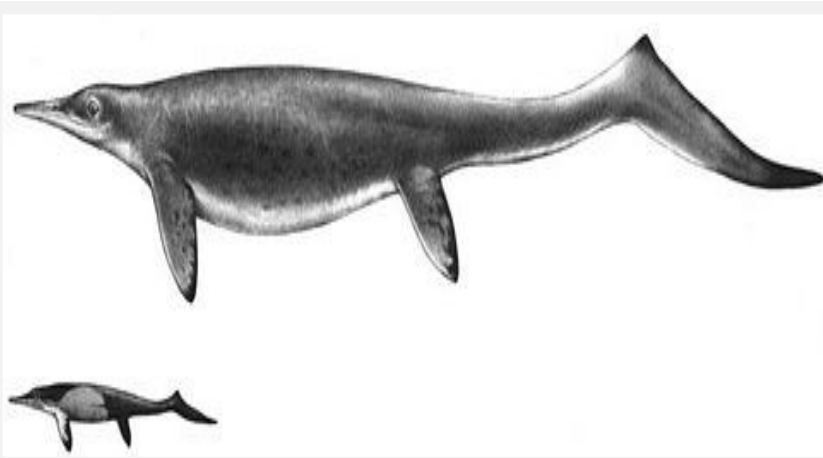
在早三叠纪的冈瓦那大陆一片温暖的海滩上，一群圆滚滚的小动物懒懒地趴在沙子堆里，利用阳光加热自己小小的身体，让人联想到今天的海豹。不过他们可不是哺乳动物，而是鱼龙目大家庭里最古老、最原始的成员之一：柔腕短吻龙。*（柔腕短吻龙（Cartorhynchus lenticarpus），发现于巢湖马家山下三叠统。是已知唯一可以在陆地上生活的鱼龙目动物。）*他们正在享受着后辈们可望而不可即的奢侈享受：爬上沙滩。

柔腕短吻龙化石标本与复原图

这种小鱼龙的前肢特化程度不高，荐椎发达，后肢强壮。既可以爬行登陆，也可以在水下辅助运动和平衡。在后来更加进步的鱼龙目成员体内，前肢长骨更加固定、僵硬，荐椎退化，再也不能自由爬行了……而且他们也没有长而尖的“筷子嘴”，而更像陆地爬行动物一样，长着一张宽而圆钝的嘴巴。这些原始的特征，似乎将当年他们是如何在陆地和海洋之间来去自如，如何略显笨拙地爬行、在碧波中欢快觅食的往事向我们徐徐道来。这时，远处隐隐传来犬齿兽的吼叫。这些小鱼龙惊慌失措起来，一摇一摆地向海洋扭动，转眼消失在大海的怀抱当中了。

二、走向深蓝

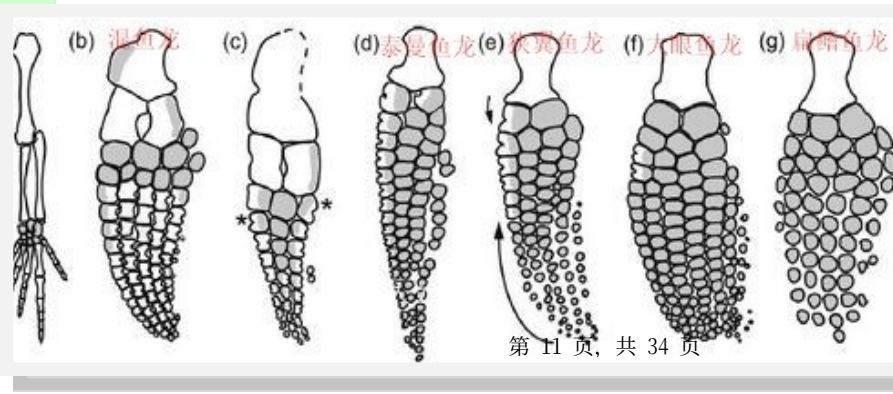
在稍后的时代里，有多种鱼龙目的成员也走向深蓝，“大航海时代”开始了。他们的身体更加特化，更适应海洋生活。早期的杯椎龙（Cymbospondylus），不但完全适应了海洋，还拥有了巨大的体型，部分个体可以长到9.6米以上，成为了第一代强大的海洋掠食者。此后，还有诸如南漳龙、混鱼龙、歌津鱼龙等一大批特化的种类出现，最典型的

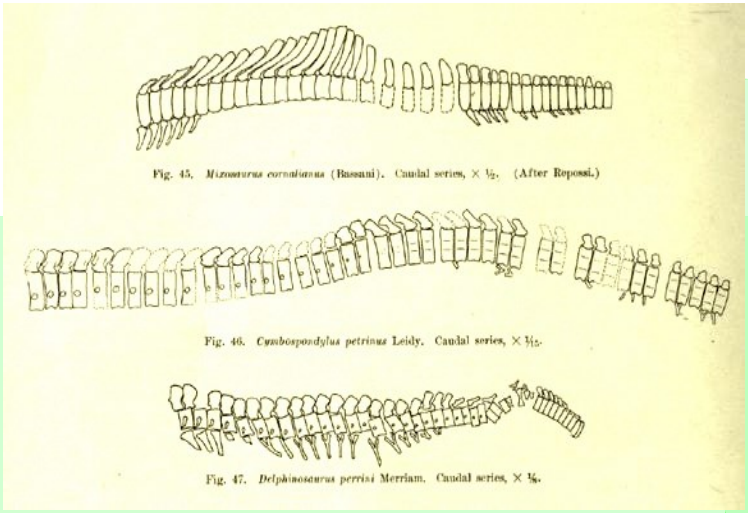


杯椎鱼龙（上）和歌津鱼龙（下）复原图

莫过于混鱼龙（Mixosaurus pan-xianensis）。在三叠纪，许许多多的混鱼龙自由自在地生活在浪花之间，悬浮在海百合组成的海洋丛林之中，食用各种各样的鱼类、头足类，不可谓不快活。当他们死亡之后，尸体沉入海底，肉体腐烂，骨骼在泥沙之中矿化，变成了数量众多的化石。这些化石告诉我们混鱼龙的吻部已经特化延长，如同利剑（这也是几乎所有鱼龙的共同特征），可以减少水的阻力：长骨骨干退化，指骨扁平呈盘状且数量增加，如同船舵、控制身体平衡。他们的尾部开始弯曲，变得更加像是鱼类。

鱼龙的四肢不断进化





早期鱼龙目动物的尾部开始弯曲

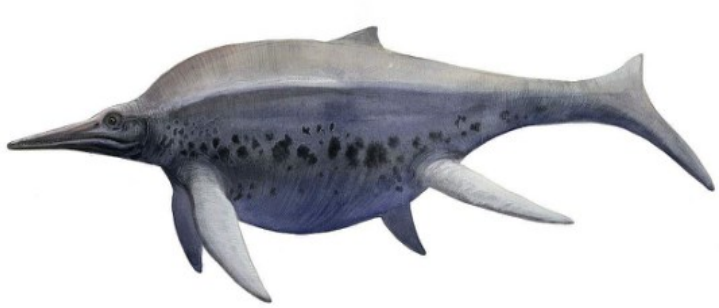
混鱼龙混鱼龙，就是指他们的身体混合了鱼类和爬行类的特征，甚是奇特。不管奇不奇特，这些鱼龙目的早期成员都在努力生存，努力适应海洋，并且一去不回头。

自此，鱼龙目开始拥有极其多样的特化种类；有些种类没有牙齿，适于剪碎鱿鱼柔软的身体；有的种类牙齿变成坚固的盾形，适合咬开坚硬的贝类；有的种类满口张满薄而锋利的尖牙（板齿泰曼鱼龙），可以快速切开血管，给猎物放血……鱼龙的多样化，使他们适应了不同的环境，占领了不同的生态位，使他们的统治更加牢固了。

三、奇迹深海

时间来到了三叠纪末期，鱼龙目终于进入了这个王朝最强大、最辉煌的时代。当你潜入全世界任何一处的海洋，你都能看到生命史上的奇迹：无数的巨型鱼龙骄傲地遨游在充满生机的水中，傲慢地巡视着属于自己的巨人国度。在今天的西藏，（当时还是一片海洋）一头受伤的弓鲛流出的鲜血吸引了深海中的恐怖怪兽，16米长、42.8吨重的喜马拉雅鱼龙（Himalayasaurus）从黑暗中猛冲出来，展示着他那适应快速游泳的流线型身体，一张长而尖的大嘴无情地吞噬了可怜的鲨鱼；来到美国内华达州，一群群秀尼鱼龙（Shonisaurus）挺着圆圆的大肚子慢慢凑近鱼群，用长嘴饱餐一顿；而在今天新西兰群岛所在的位置，则游动着鱼龙帝国中的王者：22米长、55吨重的西卡尼萨斯特鱼龙（Shastasaurus sikanniensis）。他们目中无人，缓缓游走在自己广袤的海洋国土之上，用自己庞大的身躯，为其他生物投下一片片恐惧的阴影。在这个时代，恐龙还是牙牙学语的新物种，蛇颈龙目在鱼龙看来更是如同蝼蚁；在这个时代，鱼龙目才是王，是大海的统治者。在混鱼龙的基础上，这些巨型鱼龙类群身体进一步特化成流线型，尾部更加弯曲。这样伟大的生物，在地球上留下了自己的奇迹，书写了生命的恢弘史诗。

四、成熟的物种



秀尼鱼龙复原图

平克山大鱼龙前肢化石

然而，盛极必衰、物极必反，在地质年代由三叠纪步入侏罗纪的时候，发生了一次惨烈的生物大灭绝。在这场生态灾难中，在陆地上，昔日强大的兽孔目爬行动物几乎全部灭绝，而恐龙趁机上位，夺取了对陆地的统治权；在海洋里，那些体型巨大的鱼龙同样悄然消失，只留下了体型相对较小的种类；而同样的，那些一直以来在巨型鱼龙的夹缝中挣扎的鲨鱼和蛇颈龙们终于得到了喘息的机会，同鱼龙家族的遗珠开始了对海洋霸权的激烈争夺。不过即使在这种压力之下，仍然难以掩盖鱼龙已经成为了真正适应海洋的生物这一事实。在侏罗纪，中小型鱼龙依然遍及世界的每一个角落。在，大眼鱼龙是鱼龙家族特化最成功的代表。他们身体结构紧凑，颈部退化，尾部已经成为了完美的新月形。一只大眼鱼龙在侏罗纪的黄昏中从深水里浮现，欢快地追逐着惊慌逃窜的鱿鱼群。就在此时，一头四米长的长齿楔齿鲨(Sphenodus longidens)偷偷地埋伏在阴影中，蓄势待发。就在他发起进攻的一刹那，大眼鱼龙两枚巨大的眼球，给他带来了极佳的视觉，飞速地发现了敌情并做出反应。这是一场生死追逐，然而大眼鱼龙那进步到极致的体型，紧致的肌肉，极快的反应速度带给他一线生机。大眼鱼龙飞速游动，鲨鱼则逐渐显得气喘吁吁，最终重新沉入深海。发现敌人已经受挫，大眼鱼龙兴奋地从水中高高跃起，沐浴着逐渐消逝的晚霞。那映照在中生代天空下的身影，就像一条真正的鱼一样。

大眼鱼龙复原图

五、统治的终结

其实，没有什么物种能够超越时间，永远生存下去。就算是盛极一时的鱼龙王朝，也有他走向灭亡的一天。直到就在陆地上的恐龙走上繁荣巅峰的白垩纪中期，鱼龙家族最后的成员——扁鳍鱼龙的灭绝标志着这些旧日的支配者彻底消失在了历史的长河当中，成为了中生代的回忆。至于为什么完美适应海洋生活的鱼龙就这样不明不白地灭绝，至今仍有争议。不过，不论他们为什么会消失，这一物种对海洋生活极致的适应性，还有那些曾经存在过的宏伟巨兽，都会令人们感到无比的震撼与赞叹，赞叹生命的美丽。

（投稿来自：201713010201 刘博凡）

科普小知识：

（1）自从三叠纪大灭绝之后，鱼龙目的生态多样性就已经大打折扣；生物多样性越低，越容易灭绝。在白垩纪中期，扁鳍鱼龙虽然依旧遍及世界各地，但是种类已经极少了。如此低的生物多样性，是使鱼龙变得不堪一击的原因之一。

（2）新西兰大鱼龙的唯一标本是一块457mm的椎骨，因为其很可能属于撒斯特鱼龙科，据此推算其体长可达38米，体重311吨，超越了蓝鲸。如果新西兰大鱼龙能够成为一个被认定的独立物种，那将会是有史以来地球上存在过的最大的动物。新西兰大鱼龙的椎骨现已遗失。

新西兰大鱼龙复原图

节食

或许真能长寿

代谢的快慢？

卡路里的摄入量？

节食或许真能长寿

怎样才能长寿一直都是人类十分关注的话题，由于过去40余年中抗衰老领域取得了一系列的显著进步，一些答案正逐步为人所知。

部分科学家相信，寿命的长短和人体的代谢率有关——代谢较快的动物的寿命一般都不是很长。这可能是因为代谢产物会对细胞产生一些负面影响。

顺着这个思路研究下去，一些科学家指出，限制卡路里的摄入量有可能起到延年益寿的效果。“我们从哺乳动物的实验里知道，动物体型越小，代谢就越快，寿命也就越短，”加州Pennington生物医学研究中心的Leanne ● M ● Redman教授说道，“限制卡路里的摄入能放慢你的基础代谢，如果代谢产物能加速衰老，那么长期限制卡路里的摄入就有望减少衰老相关慢性疾病的风险，延长生命。”

这一听起来合理的理论在动物实验中得到了验证，但科研人员始终未在健康人的群体中重复这一实验，所以节食是否能延长普通人的寿命的这一疑问始终没有得到验证。本周，Redman教授的科研团队在《细胞》子刊《Cell Metabolism》上发表了最新研究成果，在2年的研究过程中，科学家们证实了限制卡路里的摄入能减少系统性的氧化应激，而系统性的氧化

应激与衰老息息相关。

研究过程中，科学家们首先招募了共计435名志愿者，但是由于在2年的实验过程中，大量的志愿者由于不符合实验条件或是由于个人主观意愿而退出了这项长期节食的研究。最终剩余的73名健康志愿者继续该实验。在2年多的时间里，节食组的志愿者们将日常的卡路里摄入量按照个人的代谢状况缩减了15%。随后，科研人员分析了他们的有关生理指标。

研究发现，尽管志愿者没有特意考虑通过饮食来达到减肥的目的，但通过限制卡路里的摄入，志愿者们的体重平均下降了9千克，体脂含量下降了5%。且这项研究没有在志愿者们身上表现出诸如贫血、骨质流失、月经失调等不良反应，这些志愿者体内和衰老相关的生物标志物水平都得到了改善，精神与生活质量也有不少提高。

“我们注意到即便原来就很健康和苗条的人，也能从卡路里的限制摄入中获益。” Redman教授说道。

实验背后的机理和几十年一脸科学家们研究的成果相一致：通过限制卡路里的摄入，人体的代谢会变缓，代谢产生的自由基也会变少。而自由基积累过多会导致对脂类、蛋白质、以及DNA造成氧化损伤，导致诸如动脉粥样硬化、糖尿病、类风湿性关节炎等随着衰老相关疾病。

由于最终全程参与实验的志愿者数目偏少，且2年的时间占人全部寿命的比例也相对较低，因此这一实验的结果仍有待完善。但这一实验的结果至少有力地支持了“限制卡路里摄入能长寿”的观点。未来，研究人员们希望能做进一步的验证，了解所谓的“抗氧化食物”或白藜芦醇等可能对长寿有益的食物是否会进一步提高节食的效果。

鸣谢：公众号大作、学术经纬

BIOLOGY
LETTERS

Metabolic Slowing and Reduced Oxidative Damage with Sustained Caloric Restriction Support the Rate of Living and Oxidative Damage Theories of Aging

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SUMMARY

Calorie restriction (CR) is a dietary intervention with potential benefits for healthspan improvement and lifespan extension. In 53 (34 CR and 19 control) non-obese adults, we tested the hypothesis that energy expenditure (EE) and its endocrine mediators are reduced with a CR diet over 2 years. Approxi-mately 15% CR was achieved over 2 years, resulting in an average 8.7 kg weight loss, whereas controls gained 1.8 kg. In the CR group, EE measured over 24 hr or during sleep was approximately 80–120 kcal/day lower than expected on the basis of weight loss, indicating sustained metabolic adap-tation over 2 years. This metabolic adaptation was accompanied by significantly reduced thyroid axis activity and reactive oxygen species (F2-isopros-tane) production. Findings from this 2-year CR trial in healthy, non-obese humans provide new evidence of persistent metabolic slowing accompanied by reduced oxidative stress, which supports the rate of living and oxidative damage theories of mammalian aging.

Digest

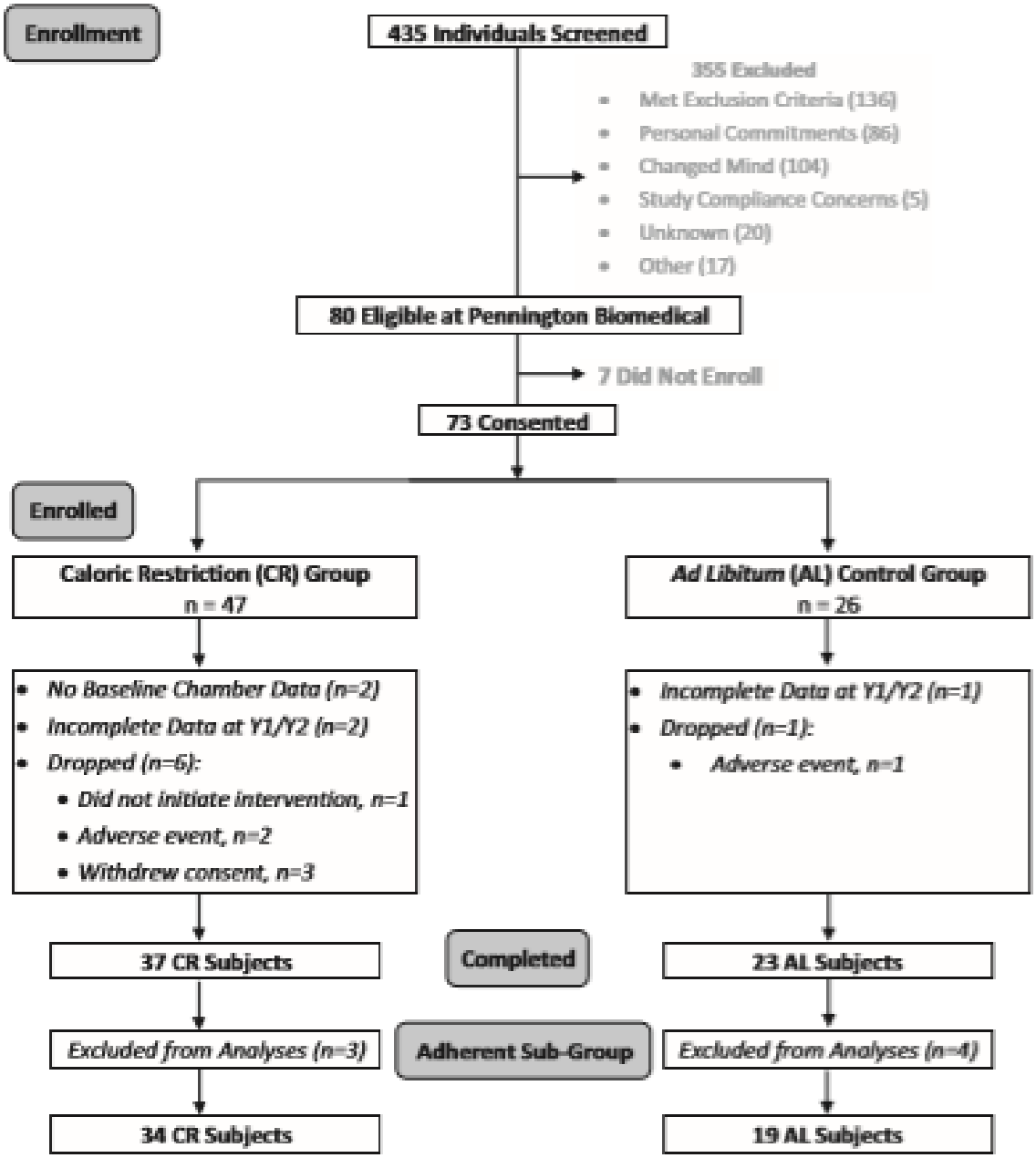


Figure 1. Subject Throughput from Enrollment (n = 73) to Data Analysis (n = 53)
Analyses were performed on 53 men and women who, on the basis of an objective pre-analytical criterion (weight change), were determined to be adherent to their assigned treatment groups.

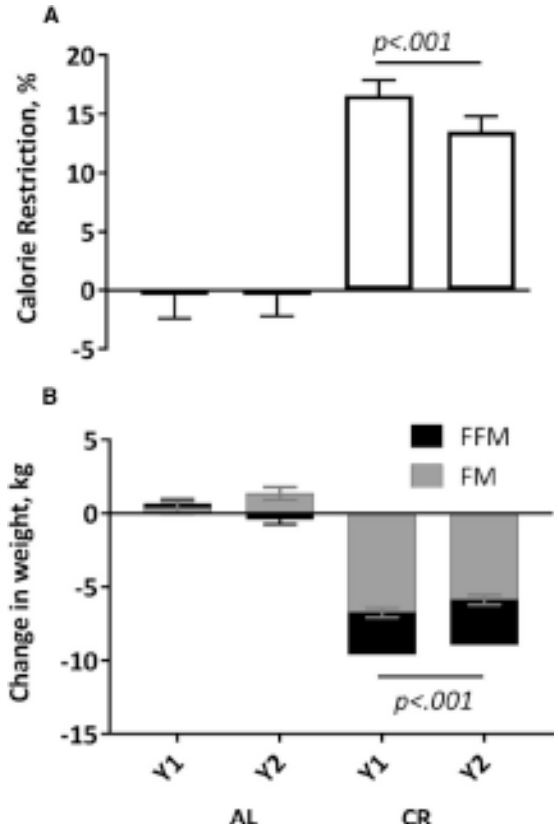


Figure 2. Calorie Restriction and Change in Body Composition

Percent of calorie restriction (A) achieved after 1 and 2 years of calorie re-striction and the resulting change in fat mass (FM) and fat-free mass (FFM) (B). N = 53; 34 CR, 19 controls. The p value for statistically significant treat-ment group effects, adjusted for multi-ple comparisons, is shown. The chang-es in weight, FM, and FFM were all significantly different between the CR and control group ($p < 0.0001$ for all, treatment main effect).

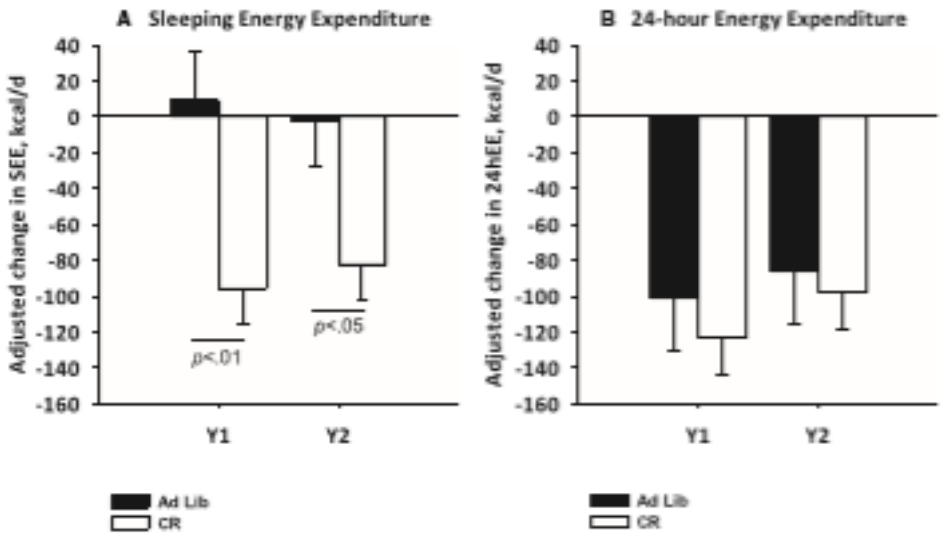


Figure 3. Metabolic Adaptation in Energy Expenditure after 1 and 2 Years of Calorie Re-striction

A comparison of metabolic adaptation in sleep energy expenditure (A) and 24-hr energy expenditure (B) between the AL (control, n = 19, -) and CR (n = 34, ,) groups, after 1 and 2 years of calorie re-striction. Metabolic adaptation was considered to represent the change in energy expenditure after adjusting for the changes in fat-free mass, fat mass, age, and sex, and the metabolic adaptation at baseline (see STAR Methods, sedentary 24-hr energy expenditure, for calculation). The p values for statistically significant treatment group effects, adjusted for multiple comparisons, are shown.

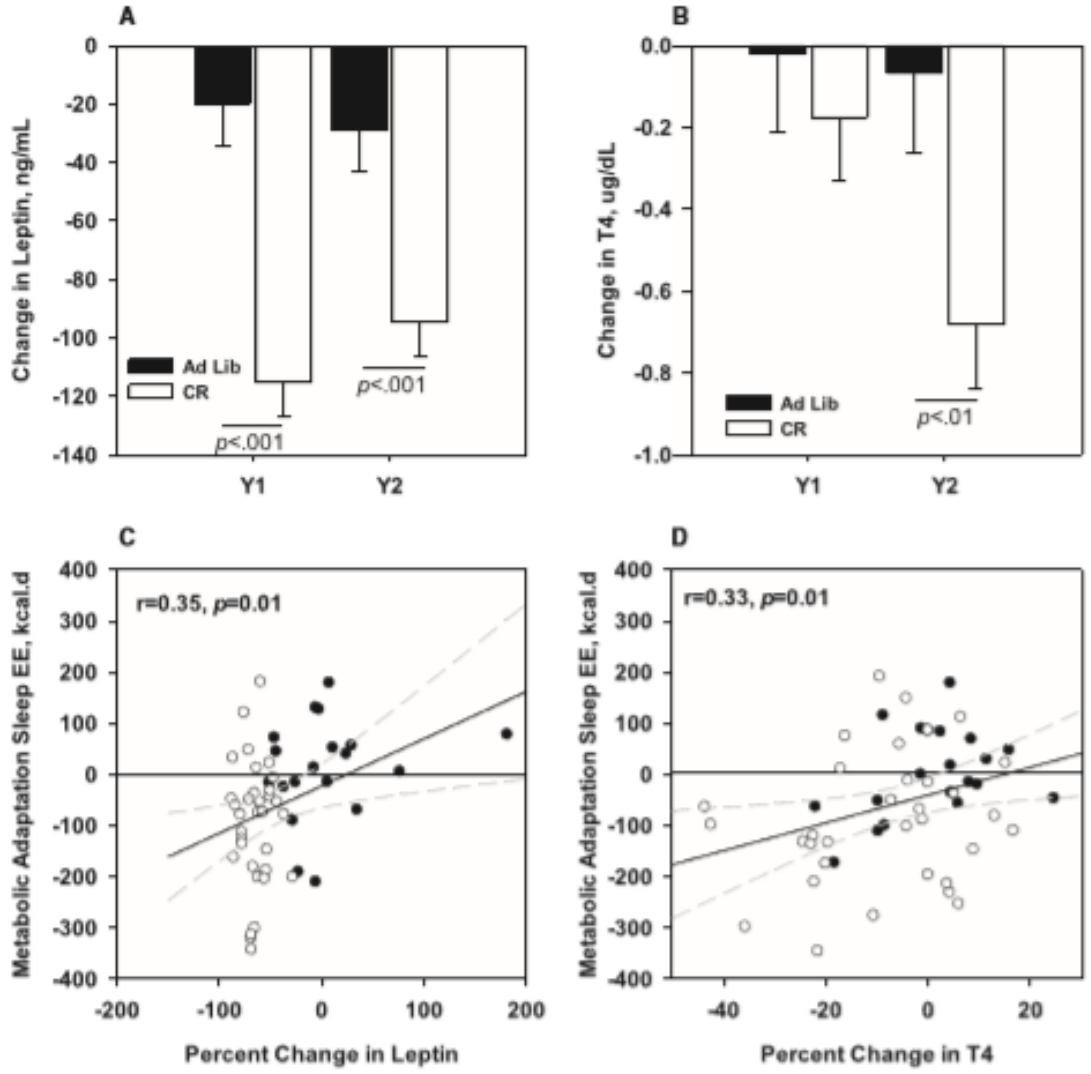


Figure 4. Comparison of Changes in Leptin and Thyroxine and the Association between Metabolic Adaptation in SleepEE

A comparison of changes in the potential mediators of metabolic adaptation, leptin (A) and thyroxine (T4) (B), and the association between metabolic adaptation in SleepEE with percent change from baseline in leptin concentrations at year 1 (Y1) (C) and percent change from baseline in thyroxine concentrations (T4) at year 2 (Y2) (D). AL (control, -) and CR groups (,). The p values for statistically significant treatment group effects, adjusted for multiple comparisons, are shown. Scatterplots show the linear regression model with 95% confidence interval. N = 53; 34 CR, 19 controls.

STAR+METHODS

KEY RESOURCES TABLE

REAGENT or RESOURCE	SOURCE	IDENTIFIER
Critical Commercial Assays		
Thyroid Stimulating Hormone (TSH)	ADVIA Centaur	06491080
Triiodthyronine (T3)	ADVIA Centaur	04779663
Thyroxine (T4)	Siemens	L2KT42
Reverse T3	Adaltis	10834U
Leptin	Bio–Rad	HADK2–61K–B
Insulin	Elecsys	12017547122
Urine Nitrogen	Antek	No Kit
Urine Creatinine	Beckman–Coulter	A40920
Urine Norepinephrine	Bio–Rad	195–6071
Urine Epinephrine	Bio–Rad	195–6071
Software and Algorithms		
Weight change nomogram for 25%CR	Pieper et al., 2011	N/A

CONTACT FOR REAGENT AND RESOURCE SHARING

The dataset pertaining to the current study is available upon written request. Resources will be shared in accordance with appropriate data use agreements and IRB approvals for secondary analyses. Further information and requests for resources and reagents should be directed to and will be fulfilled by the Lead Contact, Leanne Redman (leanne.redman@pbrc.edu).

EXPERIMENTAL MODEL AND SUBJECT DETAILS

Study Design

CALERIE 2 (Rochon et al., 2011) was a two year multi-center, parallel-group, randomized controlled trial that recruited healthy in-dividuals to receive an intervention aimed at reducing energy intake by 25% (CR group) or to maintain habitual energy intake on an ad libitum basis (control group). Two hundred and twenty individuals from Pennington Biomedical Research Center (Baton Rouge, LA), Washington University (St. Louis, MO) and Tufts University (Boston, MA) were randomized in this multicenter study (NCT00427193) for which Duke University, (Durham, NC) was the coordinating center (Rochon et al., 2011). The present ancillary study (NCT02695511) was approved by the IRB of the Pennington Biomedical Research Center and offered only to the 80 individuals enrolled in the parent study at this site. Interested individuals provided written informed consent for the additional visits and proced-ures. Following baseline assessments, participants were randomized to adhere for two years to a diet that targeted 25% calorie restriction (CR group) or calorie intake ad libitum (AL; Control group) according to a 2:1 allocation in favor of the CR group. Random-ization was stratified by study site, sex and BMI dichotomized into normal weight (22.0% BMI<25.0 kg/m2) and overweight (25.0%BMI<28.0 kg/m2). Ancillary testing included an additional outpatient visit and a 24-hour stay in a metabolic chamber at baseline, and after 1 year (Y1; 12 months) and 2 years (Y2; 24 months) of intervention. The Clinic staff involved in the collection of study outcomes was blinded to the treatment group assignments.

Participants

Men and women were aged 20 to 50 years and 20 and 47 years, respectively, and had body mass index (BMI) between 22.0 to 27.9 kg/m2 at the initial screening visit. Potential participants in the ancillary study were excluded for claustrophobia, contraindications to MRI and history of blood clotting disorders. The CONSORT diagram summarizing throughput of participants in the study is provided in Figure 1 and the characteristics of the participants at baseline is summarized in Table 1.

METHOD DETAILS

Study Interventions

From day 1, the CR intervention targeted a sustained 25% restriction of energy intake prescribed on the basis of the energy require-ments determined from two, 14 day doubly labeled water measures at baseline (Redman et al., 2014; Rickman et al., 2011). The goal for the intervention was adherence to a mathematically predicted weight loss trajectory that reached 15.5% below baseline weight after one year of intervention followed by maintenance of this weight over the second year (Pieper et al., 2011). Participants received a weekly weight loss graph that showed a targeted weight range which was used as the primary tool to maintain adherence during the intervention. Because of the variability in projected weight loss needed to achieve 25% CR, participants were also provided with guidance indicating a ‘‘zone of acceptable weight loss’’ which ranged from 12 to 22%. Nutritional and behavioral guidance was customized and modified to decrease the degree to which weight change differed from the target. Adherence to 25% CR was further fostered by provision of meals for the first 27 days of the study. Participants were fed their assigned caloric prescription in the form of three, 9 day diets. The food provision was used to educate on portion size, energy content and anticipated diet changes necessary to maintain 25% CR with different types of dietary patterns. The behavioral intervention included delivery of a structured curriculum in regular group and individual meetings with interventionists (clinical psychologists and nutritionists) from a standardized treatment manual developed specifically for the study (Rickman et al., 2011). Participants randomized to the control group were advised to continue their current diets on a completely ad libitum basis. No specific level of physical activity was required or recommended for either group. All participants received a multivitamin (Nature Made Multi Complete, Pharmavite LLC, Mission Hills, CA) and cal-cium supplement (1000mg/d, Douglas laboratories, Pittsburgh, PA) to foster nutritional adequacy of the self-selected diets.

Energy Intake and Calorie Restriction

Energy intake was calculated at baseline by total daily energy expenditure (doubly labeled water) and during the trial between base-line and Y1 as well as baseline and Y2 by the intake/balance method derived from total daily energy expenditure (doubly labeled water) and the changes in energy content of fat mass (9,300 kcal/kg) and fat-free mass (1,100 kcal/kg) from DXA (Racette et al., 2012). The percent reduction in energy intake (%CR) achieved during each interval was defined as; %CR = 100 x (Energy intake at baseline –EI during Interval) / Energy intake at baseline.

Total Daily Energy Expenditure

For each doubly labeled water (DLW) assessment, two baseline urine samples were col-

lected before subjects consumed an oral cocktail (1.5 g/kg body weight) containing 0.086 g of 2H2O (99.98 % 2H) and 0.138 g H218O (100% 18O) per kg body weight (Redman et al., 2009). After dosing, participants were asked to void their bladder at approximately 1 3 h after ingestion (this sample was dis-carded) and to collect six additional, timed urine samples: two approximately 4.5h and 6h after dosing, two on day 7, and two on day14.Measurement of hydrogen and oxygen isotope enrichments were measured by gas-isotope-ratio mass spectrometry at the USDA/ARS Children's Nutrition Research Center Stable Isotope Laboratory (Houston, TX) (Racette et al., 1994; Wong et al., 1992). Carbon dioxide production rate (VCO2) was calculated from the fractional turnover rates of 2H(kH) and 18O(kO)(Racette et al., 1994) and converted to TDEE based on an energy equivalent of a liter of CO2 to be 3.815/RQ + 1.2321 where the RQ was deter-mined for each individual using food diaries and changes in body composition.

Anthropometrics and Body Composition

Metabolic body weight was measured (Scale Tronix 5200, White Plains, NY) in the morning after an overnight fast and voiding while wearing a surgical gown which was subtracted from the total weight. Body composition (fat, lean, and bone) was measured by dual X-ray absorptiometry (DXA; Hologic QDR 4500A; Hologic, Bedford, MA) according to a standardized protocol and all scans were analyzed at a centralized reading center (University of CA, San Francisco) using Hologic software version Apex 3.3.

Sedentary 24-hour Energy Expenditure

Participants entered a metabolic chamber at approximately 0800h after an overnight fast for measurement of 24 hour sedentary en-ergy expenditure (24hEE) and sleeping energy expenditure (SleepEE). Meals were prepared by the metabolic kitchen and served according to a fixed schedule. At baseline, the energy intake provided was estimated according to an equation and adjusted during the day on the basis of actual measured energy expenditure of the first 7 hours of measurement (Nguyen et al., 2003). For the subsequent chambers, the energy content of the food was held constant for control participants and was 75% of measured baseline 24 hour energy expenditure for CR participants. SleepEE was assessed between 0200 0500h for those minutes that activity is less than 1%. During their stay in the chamber, no exercise was allowed. The change in 24hEE and SleepEE is expressed as the residual EE which is the difference between the measured value and the value predicted for the EE measurement (on the basis of weight and body composition) at each time point. The predicted values were derived from a linear regression at baseline for the 71 partic-ipants using fat-free mass, fat mass, age and sex as covariates; The difference in the residual EE (follow-up minus baseline) was then used as a marker of the extent to which energy expenditure adapted to calorie restriction independently from the changes in body mass and body composition with negative values indicating metabolic adaptation (Galgani and Santos, 2016).

1.24hEE (kcal/d) = 1100 + 17.2 (fat free mass, kg) + 4.6 (fat mass, kg) 1.9 (age, y) 167 (sex; 1=female, 0=male); R2=0.70, p<.0001.

2.SleepEE (kcal/d) = 749 + 17.6 (fat free mass, kg) + 3.2 (fat mass, kg) 2.6 (age, y) 58 (sex; 1=female, 0=male);R2=0.70, p<.0001.

Core Body Temperature

Core body temperature (VitalSense, Mini—Mitter, Bend, OR) was measured and recorded every minute during the energy expendi-ture measurement in the metabolic chamber. Mean temperature over 24—hours as well as mean day time (0800—2230h) and night time (0200—0500h) temperatures were calculated.

Physical Activity

The energy cost of physical activity, termed activity related energy expenditure (AREE) was calculated as the cost of daily activities beyond sleep using linear regression model of total daily energy expenditure by doubly labeled water measures (TDEE) and SleepEE at baseline: TDEE (kcal/d) = 859 + 1.1 (SleepEE, kcal/d) + 4.1 (age, y) 340 (sex; 1=female, 0=male); R2=0.66, p<.0001. AREE is positive for subjects with higher physical activity than average and negative for subjects with lower physical activity than average (Redman et al., 2009). Second, the calories expended in spontaneous physical activity (SPA) were determined by microwave motion detectors and indirect calorimetry in the metabolic chamber.

Oxidative Stress

Our primary measure of oxidative damage, urinary 2,3-dinor -iPF(2a)-III was measured by liquid chromatography-tandem mass spectrometry (LC-MS/MS) on a Shimadzu 20A series LC and Applied Biosystems API 4000 QTrap MS/MS instruments as previously described (Ilyasova et al., 2010). We also measured three additional isomers of F2-isoprostanes; iPF(2a)-III, iPF(2 a)-VI, and 8,12-iso-iPF(2a)-VI as exploratory variables. Urine specimens were diluted to 0.65 mg/mL creatinine, and samples with creatinine levels equal to or below this value were analyzed without dilution. Sample preparation included addition of internal standards [iPF(2a)-III-d4, 8,12-iso-iPF(2a)-VI-d11, iPF(2a)-VI-d4] and 10 mL 1M HCl; washing of samples (500 mL) with 1 mL hexane; extraction of the analytes by ethyl acetate/hexane mixture (3/1, v/v); evaporation of the liquid and resuspension of the residue in 150 mL of a mixture containing 70% mobile phase A (0.1% formic acid in water) and 30% methanol. Using LC-MS/MS, 100 mLof sample were injected into two solid core C18 columns (Phenomenex Kinetex C18, 150 x 4.6 mm) in series to achieve chromato-graphic separation of the F2-isoprostane isomers. The mass spectrometer was operated in negative mode with the following MRM transitions (m/z): 353/193 [iPF (2a)-III], 357/197 [iPF(2a)-III-d4], 325/237 [2,3-dinor-iPF (2a)-III], 353/115 [iPF(2a)-VI and 8,12-iso-iPF(2a)-VI], 364/115 [iPF(2a)-VI-d11], and 357/115 [8,12-iso-iPF(2a)-VI-d4]. Calibration samples covering the ex-pected range of concentrations were prepared by adding pure material into pooled human urine, injected before and after the patient samples. Lower limits of quantification (LLOQ, >80 % accuracy) were 0.007, 0.34, 0.25, and 0.12 mg/mL for iPF(2a)-III, 2,3-dinor-iPF(2a)-III, iPF(2a)-VI, and 8,12-iso-iPF(2a)-VI, respectively. As a complimentary measure of oxidative damage, serum protein carbonyls were determined using a modified 2,4-dinitrophenylhydrazine assay (Mates et al., 2000).

Clinical Chemistry

Fasting blood samples were

collected and the following assays were performed at the CALERIE central biochemistry laboratory at Vermont University or at the Clinical Chemistry Core at Pennington Biomedical Research Center: thyroid stimulating hormone (TSH) and triiodothyronine (T3) by chemiluminescent immunoassay (ADVIA Centaur, Bayer Health Care, Deerfield, IL); thyroxine (T4) by par-ticle-enhanced immunonephelometric assay, (BN II, Siemens, Deerfield, IL); reverse T3 by multiplex immunoassay (Bio-Plex, Bio-Rad Laboratories, Hercules, CA); leptin by multiplex immunoassay (Bio-Plex, Bio-Rad Laboratories, Hercules, CA); and insulin by chemiluminescent immunoassay (Elecsys 2010, Roche Diagnostics, Indianapolis, IN). Nitrogen, creatinine, norepinephrine and epinephrine were measured in a 24 hour pooled urine sample collected during the chamber stay.

QUANTIFICATION AND STATISTICAL ANALYSIS

Sample Size Estimation

This study was powered on the ability to detect a significant adaptation in energy metabolism (24hEE, SleepEE) from baseline and to detect differences in this adaptation between the two diet groups (AL vs CR). Sample size estimates were derived from the data ob-tained in our 6 month pilot study where the standard deviation in EE was assumed to be 140 kcal/d. Anticipating that a maximum of 75 subjects (50 in CR and 25 in control) would enroll in the ancillary study, the minimal detectable metabolic adaptation within groups is 60 kcal/d and between groups is 100 kcal/d to achieve a power R 80%.

Statistical Analysis

All analyses were carried out using SAS/STAT software, Version 9.4 of the SAS System for Windows (SAS Institute, Cary, NC, USA) and tests were evaluated using significance level of a=.05. The per protocol analysis (see ‘‘study subjects and throughput in the Results Section) comprised of computing the change from baseline to Y1 and Y2 in all outcomes which were investigated for fixed effects (treatment group, time) and a treatment-by-time interaction using linear mixed models for repeated measures. The models included the baseline outcome value as a covariate. A random subject effect was also included to account for intra-individual correlations over time. Two-sample t-tests derived from least squares means (LSM) were used to compare adjusted mean changes between treatment groups (AL vs CR) and to test for group differences in adjusted mean change at Y1 and Y2. This same method was used to model and assess differences in percent change from baseline. Finally, Pearson’s correlation analysis was used to assess relationships between % CR and metabolic adaptation, change from baseline in clinical chemistries and for Spearman’s correlation analysis was used to examine relationships between %CR, metabolic adaptation and isoprostane concentrations which were non-normally distributed.

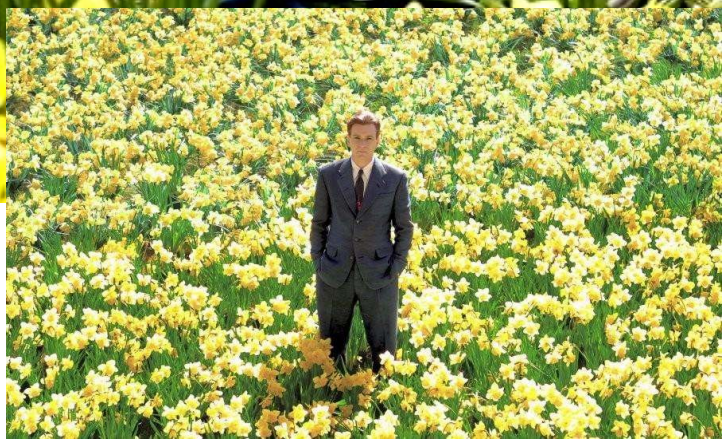
黄水仙&《大鱼》

——多花水仙花色相关基因的分离及功能分析

——黄水仙繁殖方法

万年青&《这个杀手不太冷》

——短期低温胁迫对广东万年青影响及最适水配方的研究



Narcissus pseudonarcissus L

——黄水仙——

电影介绍

《大鱼》

电影讲述了喜欢吹牛的爱德华·布鲁姆，总喜欢炫耀年轻时旅行推销的经历，儿子觉得父亲很虚荣浮夸，父子关系渐渐疏离。直到父亲不久于人世，儿子决定回去见父亲最后一面，他终于领悟到父亲充满激情和想象的一生。最后这些美丽的故事和父亲的生命一同陨落，儿子湿着眼眶，选择用延续父亲所讲故事的方式送别。

这部电影充满了充满了魔幻、隐喻和梦幻的色彩，而黄水仙更增添了似幻似真的感觉。

植物介绍

黄水仙为多年生草本。有皮鳞茎卵圆形。叶5～6枚，宽线形，先端钝，灰绿色。花茎略高于叶，顶生花有6片花瓣，分为内花冠和外花冠，内花冠呈橙色，外花冠呈黄色，且外花冠的长度大约是内花冠的2倍，花横向或略向上开放，外花冠成喇叭形、黄色，边缘呈不规则齿状皱褶。花的生长季节为10-次年4月，花期为3-4月。

黄水仙在原产地是冬季湿润、夏季干热的生长环境。因此，盆栽黄水仙秋冬根生长期和春季地上部生长期均需充足水分，但不能积水。开花后逐渐减少，鳞茎休眠期保持干燥。

多花水仙花色相关基因的分离及功能分析

水仙花是世界著名的球根花卉，在中国已有1000多年的栽培历史，是中国十大传统名花之一。主栽品种单一、种性退化已经严重制约了我国水仙花产业的发展，由于主栽品种是三倍体，难于通过有性杂交开展新品种选育。国内水仙育种起点低，相关生理生化的基础研究积累少，花色分子育种进展慢。本研究以黄花水仙2号和金盏银台为材料，先测定开花期色素物质种类及变化，再构建不同颜色花瓣正反向抑制消减杂交cDNA文库，分离并克隆若干花色差异相关基因cDNA全长，通过分析花期候选基因的表达水平，筛选花色差异的关键因子，并获取黄花水仙2号PSY5'端侧翼序列。本研究为进一步开展水仙花色基因工程育种提供了一定的理论依据和部分基因资源。主要研究结果如下：1、测定两种花色水仙类胡萝卜素和类黄酮物质的含量 采用高效液相色谱法（HPLC）测定水仙花开花过程类胡萝卜素物质和类黄酮物质的含量。结果表明：黄花水仙2号的主要色素物质是芦丁和叶黄素，金盏银台的主要色素物质是芦丁、柚皮苷和叶黄素。两种水仙在花蕾期已经有大量色素物质的积累，花期两个品种副冠和花瓣中芦丁和柚皮苷的含量变化趋势基本一致，均表现为花蕾期含量最高，始花期、盛花期有所降低，衰败期又升高的趋势，而叶黄素含量变化不同。t测验分析结果表明：两种花色的差异可能主要受到叶黄素含量的影响，叶黄素可能与水仙花黄色、橙黄色的形成有关，而芦丁和柚皮苷可能起辅助色素作用。2、构建不同颜色水仙花瓣抑制消减杂交cDNA文库应用抑制性消减杂交(SSH)技术成功构建了盛花初期黄花水仙2号黄色花瓣与金盏银台白色花瓣的正、反向cDNA消减文库。随机挑选正向文库716个、反向文库216个阳性克隆进行测序和生物信息学分析。Gene Ontology(GO)功能分类结果显示，水仙花色差异可能涉及多条代谢途径，有多个基因的参与。文库二次筛选，获得13个与花色差异相关的候选基因UniESTs：八氢番茄红素合成酶基因(PSY)、类胡萝卜素异构酶基因(CRTISO)、异戊烯焦磷酸异构酶基因(IPI)、9-顺式-环氧类胡萝卜素双加氧酶基因(NCED)、1-羟基-2-甲基-2-丁烯基-4-磷酸合酶基因(HDS)、4，5，7-三羟黄烷酮,2-酮戊二酸3-双氧酶基因(F3H)、对香豆酸-3羟基化酶基因(C3H)、黄酮合酶基因(FNS)、黄酮醇3’单加氧酶基因(F3’H)、咖啡酸甲基转移酶基

因(COMT)、黄酮甲基转移酶基因(FOMT)、WRKY和NAC转录因子。3、克隆若干水仙花色相关基因cDNA全长 (1)从黄花水仙2号、金盏银台中各克隆1条IPI基因，分别命名为NtIPI-H和NtIPI-J（登陆号KC841854.1、KC841855.1），两个基因各含有一个858bp的开放阅读框，编码285个氨基酸，但存在8个氨基酸差异。氨基酸序列分析表明：黄花水仙2号与烟草、玉米、葡萄、甘薯IPI基因的氨基酸相似性分别为87%、86%、77%和75%。 (2)从黄花水仙2号、金盏银台中各克隆1条CRTISO基因，分别命名为NtCRTISO-H和NtCRTISO-J（登录号KC207079.1、JX469116.1），两个基因各含有一个1767bp的开放阅读框，编码588个氨基酸，但存在2个氨基酸差异。氨基酸序列分析表明：黄花水仙2号与番茄、葡萄、黄瓜、草莓F3’MO-like基因的相似性分别为65%、65%、64%、64%。 4、分析花期若干花色相关基因的表达水平 以水仙Actin基因为内参，采用荧光定量PCR方法分析NtPSY、NtCRTISO、NtIPI、NtNCED、NtF3’MO-like等5个基因在4个花期2种多花水仙的花瓣和副冠中的表达水平，结果表明：开花过程中，NtPSY、NtIPI、NtNCED基因在金盏银台白色花瓣的表达水平与黄花水仙2号黄色花瓣、金盏银台橙黄色副冠之间的差异都比较明显。推测NtPSY、NtIPI、NtNCED3个基因可能与水仙花色差异有关。 5、获取黄花水仙2号PSY基因5'端侧翼序列 应用染色体步移技术获得NtPSY基因5'端侧翼序列2522bp，经比对分析，发现在NtPSY基因5'UTR区内有一个198bp的内含子。启动子预测结果分析表明，转录起始位点可能在起始密码子上游305bp处，转录起始位点为碱基C。顺式作用元件预测结果表明，黄花水仙2号NtPSY基因5'端侧翼序列含有大量光响应元件，以及逆境胁迫和激素信号响应元件，推测NtPSY的表达可能受到多种信号的调控。

黄水仙繁殖方法

常用分球、播种和组培繁殖。

分球繁殖：

鳞茎内的侧芽膨大形成子鳞茎。秋季挖出鳞茎时分出子鳞茎进行分球繁殖，自然繁殖率为4～5倍。主鳞茎开花率100%，侧鳞茎开花率80%～90%。为提高繁殖系数，可人工诱发子鳞茎。用利刀将充实鳞茎自鳞茎盘向顶部交叉纵切3～4刀，深度约为鳞茎高的荣昌盛／2，以损及短缩茎的生长点为度。切割后将鳞茎倒置于清洁的干沙中，使其产生愈伤组织，再放21℃繁殖箱内培养，温度渐升高至30℃，相对湿度85%，约3个月形成多数子鳞茎，可取下分植。诱发的子鳞茎培育3～4年成为开花鳞茎。

播种繁殖：

9月中旬播种。播种土用腐叶土、泥炭和粗沙混合土，经消毒后装盆待播。播后精细管理，翌春出苗，有1片叶子。初夏叶、根相继枯萎，形成休眠小鳞茎。小鳞茎需培育4～5年成为开花鳞茎。

组培繁殖：

以鳞茎或芽尖、茎盘作为外植体。先将洗涤剂清洗干净，再用75%酒精和0．1%升汞消毒30分钟，再用无菌水冲洗3次。接种于添加2，4－D2毫克／升和激动素0．1毫克／升的MS培养基上，半个月后转移至MS加6－苄氨基腺嘌呤2毫克／升和萘乙酸1毫克／升的培养基，约15天可形成幼苗，再转移到1／2MS加吲哚丁酸1毫克／升的生根培养基上，10天后形成生根小苗，经3年培育成开花鳞茎。

银皇后万年青

1 电影介绍

《这个杀手不太冷》

男主角里昂是意大利裔的顶尖职业杀手，一直孤独的住在纽约小意大利，只有一株盆栽——银皇后万年青是他最好的朋友。 一天，12岁的邻居女孩玛蒂达从外归家，路过走廊时看清了被血洗的一家大小，机灵地不动声色忍痛直接走往邻居里昂敲开他的房门，要求在他家暂避杀身之祸。在得到里昂的收留后，开始帮里昂管家并教他识字，里昂则教她杀手的技能，两人渐渐生起似父女又似恋人的复杂情愫。 后来玛蒂达遇到危险，里昂救出玛蒂达，并让她和那株盆栽逃生，自己却死了。里昂死后，玛蒂达将里昂生前唯一的朋友——那株盆栽栽种在大地，让里昂终于得以“落地生根” 。这盆银皇后万年青一直陪伴着里昂，更是男女主感情的象征，意义深远。

2 植物介绍

形态特征： 为多年生常绿草本植物。株高30－40厘米，茎直立不分枝，节间明显。叶互生，叶柄长，基部扩大成鞘状，叶狭长，浅绿色，叶面有灰绿条斑，面积较大。叶色美丽，特别耐阴，盆栽点缀厅室，效果明显，特别明亮舒适。

生活环境： 生长适温为20－27℃，3－9月为21－27℃，9月至翌年3月为16－21℃，冬季温度不低于12℃。以肥沃的腐叶土和河沙各半的混合土为宜。生长期需充足水分，盛夏每天早晚向叶面喷水，放半阴处。 冬季茎叶生长减慢，应控制水分，盆土稍干燥。5－10月茎叶生长旺盛期，每半月施肥1次。成年植株下部叶片易枯萎，造成茎干秃裸，可剪取顶端茎干扦插，留下基部可重新萌发新芽。 冬季如遇低温，盆土过湿，叶片易变黄脱落。常有叶斑病和炭疽病、茎腐病和根腐病，根线虫危害。

病虫防治： 1、叶斑病：湿度大的天气，易于发生。病斑直起初为褐色小斑，周边呈水浸状褪绿色，并呈轮纹状扩展，圆形至椭圆形，边缘褐色内灰白色。后期病斑中心出现黑褐色霉斑，潮湿条件下变成黑褐色霉层。防治此病的方法是及时清除病残叶片；用800倍代森锰锌防治，一星期一次，连续3-4次即可。

2、炭疽病：主要发生在叶片上，严重时可蔓延至叶柄上。病斑初期呈水浸状小黄斑，扩展后是椭圆形至不规则状的褐色或黄褐色，稍显轮纹状，后期病斑连成一片呈干枯状，并产生轮纹排列的小黑点。这种病主要是通风不好，有介壳虫危害时有利病害的发生。此病的方法是加强养护、增施磷、钾肥；发病初期可用1000倍百菌清防治，一星期一次防治，连续3-4次即可。

短期低温胁迫对广东万年青影响及最适水培配方的研究

广东万年青为天南星科广东万年青属多年生草本观叶植物。其叶四季碧绿、富有光泽，可长期耐受室内散射光，其茎似竹节具高雅亮节之韵味且可水培养护，是家居养护观赏的首选花卉之一。基于目前我国北方地区观叶植物种类十分匮乏的现状，引进广东万年青于北方地区能丰富家居盆栽的种类。广东万年青为亚热带植物，对生长环境的温度要求相对较高。若将广东万年青于我国华南地区引进北方，在秋末及初春时期，引进地室内在供暖前后有近7d的低温期，此时的低温会影响广东万年青的正常生长，而关于广东万年青对于短期低温的耐受情况尚鲜有研究，故本试验以引进种广东万年青为试材，进行4℃低温胁迫，分别于胁迫1d、2d、4d、6d、8d时检测胁迫以及对照（20℃）植株叶片的生理指标变化情况，研究广东万年青在4℃低温环境下的耐受情况，探究所测指标表明的抗寒生理机制，为北方高寒地区的大规模合理引进提供可靠的理论依据，同时为探究其它天南星科植物的抗寒性强弱提供有效的参考价值。

目前，我国北方地区水培植物多以竹类为主，品种较为单一。广东万年青又名竹节万年青，具有竹类可家居水培养护的特性，因此引进广东万年青到北方地区可丰富当地水培花卉的种类。对广东万年青水培技术的研究以在华南、华北地区为主，在东北地区的研究尚鲜有报道。本试验以广东万年青为试材，基于北方特有环境下，研究7种水培配方对其生长状况的影响，并结合其生理指标数据，筛选出最适水培配方，为广东万年青在东北地区的水培技术的推广提供有效的理论依据和可行的技术指导。主要的研究结果如下：⑴在短期低温胁迫试验中，广东万年青的相对电导率（REC）指标可作为与其抗寒性相关性最大的单一指标来反映其抗寒能力的强弱，且与试材抗寒相关性相对较大的指标为可溶性糖及可溶性蛋白，而过氧化物酶（POD）活性要结合丙二醛（MDA）与游离脯氨酸（Pro）含量判断且这三个生理指标与试材抗寒性的相关性相对最弱。试材在4℃低温胁迫8d中，其相对电导率的最大值小于50%，认为该试材能够耐短期的4℃低温；⑵在短期低温胁迫试验中，低温对试材细胞内可溶性糖及可溶性蛋白含量的影响明显且趋势一致，说明在低温胁迫下可溶性糖与可溶性蛋白可作为评价广东万年青抗寒性的

同一类效力因子；⑶在短期低温胁迫试验中，随着胁迫时间的持续，MDA的含量逐渐增加，说明膜脂的过氧化作用在不断的加强，在胁迫6d、8d时MDA含量达到相对高峰，说明植物在这个阶段受到的伤害最为严重。随着胁迫时间的持续，Pro的含量逐渐增加显高于对照，说明持续低温激活了Pro的合成机制，维持正常的细胞结构与功能。促进细胞间物质的运输，从而抵抗低温对其的伤害；在低温胁迫1d时，MDA与Pro含量与ck对比均差异不显著，但POD活力却差异显著，说明POD应对低温伤害的反应速度高于Pro及MDA；⑷在不同浓度的萘乙酸（NAA）对广东万年青进行水培诱导生根的试验中，激素NAA对试材根系的生长有一定的影响，试材在NAA浓度为8mg/L处理下生根最多，平均达8.7条，新根平均根长6.82cm，根系长且粗壮，因此表明8mg/LNAA对广东万年青水培诱导生根效果最好。但当NAA浓度达到10ml/L的时候，广东万年青根部大面积腐烂，说明较高的NAA浓度会对其根系生长起到抑制与阻碍的作用；⑸在广东万年青水培配方的筛选的试验中，7种水培配方，相对较好的为调试配方B，观叶植物营养液配方和调试配方C，相对较差的为日本园试配方，其余配方由于每个分析的排名不定，故无法准确排名。

《生物通讯》以自己的方式存在着，引领大家逐渐接触到前沿的生物知识，让大家有所收获，有所进步，有所思考，有所创造。

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