网络出版时间:2017-1-20 11:13 网络出版地址:http://www.cnki.net/kcms/detail/34.1065.R.20170120.1113.050.html

# 应用国际新标准筛查 SGA 和 LGA 的可行性研究

胡 爽,李 毅,刘起飞,汪海晴,来汉麟,博庆丽,阮 亮,胡纯秋,李 李

**摘要** **目的** 应用 the INTERGROWTH-21st Project(2014)标准筛查小于胎龄儿(SGA)和大于胎龄儿(LGA)的可行性。**方法** 应用我国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准对收集的 1 859 例新生儿出生体重进行分布描述,同时按中国定义和国际定义筛查 SGA 和 LGA,以我国 15 城市不同胎龄新生儿的正常体重标准为金标准,对 the INTERGROWTH-21st Project(2014)标准筛查 SGA 和 LGA。**结果** 收集到的1 859例新生儿出生体重资料显示,小于中国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准 $P_3$ 的婴儿数分别为 23、31 例,而大于 $P_{97}$ 的婴儿数分别为 308、107 例,差异有统计学意义($P<0.01$)。以 $P_{10}$ 和 $P_{90}$ 为切点,中国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准 SGA 发生率分布为 3.98%、4.68%。LGA 发生率分别为 30.61%、17.11%;以 $P_3$ 和 $P_{97}$ 为切点,中国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准 SGA 发生率分布为 1.24%、1.67%,LGA 发生率分别为 16.57%、5.76%。the INTERGROWTH-21st Project(2014)标准筛查 SGA 和 LGA,灵敏度、阴性似然比均较低,特异度、阳性预测值、阴性预测值、阳性似然比较高。**结论** 可以应用 the INTERGROWTH-21st Project(2014)标准检出 SGA 和 LGA。

**关键词** 新生儿;出生体重;SGA;LGA
**中图分类号** R 714.51;R 714.15;R 722.1
**文献标志码** A **文章编号** 1000-1492(2017)02-0227-05
doi:10.19405/j.cnki.issn1000-1492.2017.02.017

2016-09-18 接收
基金项目:安徽省教育厅自然基金重点项目(编号:KJ2012A158);安徽省自然科学基金面上项目(编号:1408085MH160);国家自然科学基金面上项目(编号:81373011)
作者单位:安徽医科大学公共卫生学院营养与食品卫生学系,合肥 230032
作者简介:胡 爽,男,硕士研究生;
李 李,女,副教授,责任作者,E-mail:li1964li@163.com

# Changes of serum short chain fatty acid levels in NAFLD rats

Yang Le, Zhang Bao, Guan Shixia, et al
(*Dept of Clinical Nutriology, The First Affiliated Hospital of Anhui Medical University, Hefei* 230022)

**Abstract** ***Objective*** To investigate the changes and significance of serum short chain fatty acid (SCFA) level in non-alcoholic fatty liver disease (NAFLD) rats. ***Methods*** Thirty-six male SD rats were randomly divided into two groups, normal diet group (group NC) and high fat diet group (group HF) with 18 rats in each group after 1 week of adaptive feeding. Rats in group HF were fed with high-fat diet, and rats in group NC were fed with normal diet. After being fed for 4, 8 and 12 weeks, 6 rats were randomly selected to be killed from each group. The total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) of liver homogenate were measured with biochemical method. ELISA was used to test the levels of IL-6, TNF-α, IL-1β and IL-18. The SCFAs were detected by gas chromatography, mainly including acetic acid, propionate and butyrate. ***Results*** The levels of TG, TC and LDL-C were significantly higher in HF group than concurrent NC group in 4, 8 or 12 weeks ($P<0.05$). The level of HDL-C was lower in HF group than concurrent NC group in 4, 8 or 12 weeks ($P<0.05$). The levels of IL-6, TNF-α, IL-1β and IL-18 were significantly higher in HF group than concurrent NC group in 4, 8 or 12 weeks ($P<0.05$). The levels of total SCFA were significantly increased in the HF group than concurrent NC group in 4, 8 or 12 weeks ($P<0.05$). Among them, the level of acetic acid in HF group was significantly increased than concurrent NC group in 4, 8 or 12 weeks ($P<0.05$). And there was no significant difference between the levels of propionate and butyrate. ***Conclusion*** The serum levels of SCFA are increased in NAFLD rats, and SCFA may have a role in the pathogenesis of NAFLD.

**Key words** high-fat diet; non-alcoholic fatty liver disease; short chain fatty acid

新生儿出生体重曲线是新生儿科医师临床必备工具，协助诊断异常出生体重病例，迅速判断新生儿大体营养状况。目前我国临床使用的出生标准为1986年研制的“中国15城市新生儿出生体重曲线”[1]。2014年，The Lancet杂志公布the INTERGROWTH-21st Project的不同胎龄新生儿出生体重新标准，旨在开发科学强有力的临床工具来评估胎儿生长和新生儿的营养状况。数据来源于巴西、中国、印度、意大利、肯尼亚、阿曼、英国和美国8国的全球多中心研究。其参照人群为4 321例母亲，通过超声测量孕周，孕期营养良好，不吸烟且不接触有毒物质，新生儿无先天性畸形的单胎活产儿。标准将被用于在群体水平监控和评估产妇健康，婴儿的健康和营养[2]。该研究使用中国15城市和the INTERGROWTH-21st Project两种标准对1 859例新生儿体格测量数据进行新生儿出生体重分布比较，对小于胎龄儿(small for gestational age，SGA)和大于胎龄儿(large for gestational age，LGA)进行分析比较。

## 1 材料与方法

**1.1 研究对象** 利用课题组在2011年1月～2012年7月收集的合肥市妇幼保健院住院分娩的孕妇及其新生儿的信息资料。纳入标准：孕周为33～42周，单胎正常妊娠，无心脏病、癫痫、甲亢、精神病及家族遗传病等特殊病史，无烟、酒等特殊嗜好。

**1.2 研究方法** 依据我国15城市新生儿体格发育科研协作组(1986～1987)公布的不同胎龄新生儿体重标准(简称中国15城市标准)和the INTERGROWTH-21st Project(2014)公布的不同胎龄新生儿的体重标准[简称the INTERGROWTH-21st Project(2014)]对本课题组收集的1 859例新生儿出生体重进行分布描述，同时按中国定义和国际定义筛查SGA和LGA，以中国15城市标准筛查的结果对the INTERGROWTH-21st Project(2014)的筛查结果进行灵敏度、特异度、阳性预测值、阴性预测值、阳性似然比、阴性似然比进行计算。

**1.3 SGA和LGA定义**

**1.3.1 中国定义** 低于同胎龄正常平均体质量的第10百分位者为SGA，高于同胎龄正常平均体质量的第90百分位者为LGA。

**1.3.2 国际定义** 低于同胎龄正常平均体质量的第3百分位者为SGA，高于同胎龄正常平均体质量的第97百分位者为LGA。

**1.4 统计学处理** 对问卷检查后统一进行编号，应用Epidata 3.1软件建立数据库进行数据录入和数据管理。使用SPSS 19.0软件进行分析。两种标准方法SGA和LGA检出率差异的比较采用配对$\chi^2$检验。以中国15城市标准作为“金标准”，计算用the INTERGROWTH-21st Project(2014)标准检出SGA或LGA的灵敏度、特异度、阳性预测值、阴性预测值、阳性似然比、阴性似然比。

## 2 结果

**2.1 研究对象一般情况** 1 859例研究对象中，男婴974例(52.39%)，女婴885例(47.61%)。孕周33～42周，其中33周3例，34周16例，35周9例，36周31例，37周92例，38周228例，39周579例，40周568例，41周302例，42周31例。

**2.2 33～42周的新生儿出生体重散点图** 以孕周为横坐标，出生体重为纵坐标，在the INTERGROWTH-21st Project(2014)的第3、50、97百分位数曲线下做出生体重的散点图。新生儿出生体重主要分布在the INTERGROWTH-21st Project(2014)的第3和第97百分位数曲线中间，第3百分位数曲线下的新生儿数较少。见图1。

**2.3 33～42周的新生儿出生体重分布** 按照中国15城市标准和the INTERGROWTH-21st Project(2014)标准，以其第3百分位数($P_3$)和第97百分位数($P_{97}$)为分割点划分新生儿出生体重，小于中国15城市标准和the INTERGROWTH-21st Project(2014)标准$P_3$的婴儿数分别为23、31例，而大于$P_{97}$的婴儿数分别为308、107例，明显中国15城市标准相对于the INTERGROWTH-21st Project(2014)检出更多的大于$P_{97}$的婴儿数。两种标准新生儿出生体重分布比较中，差异有统计学意义($\chi^2$ = 110.00，$P$ < 0.01)。见表1。

**2.4 两种标准检出SGA和LGA** 以我国15城市标准和the INTERGROWTH-21st Project(2014)标准，按照我国定义和国际认同定义筛查。我国定义，the INTERGROWTH-21st Project(2014)标准筛查SGA率高于中国15城市标准，差异有统计学意义；国际定义，两种标准检出SGA差异无统计学意义。无论我国定义还是国际定义，the INTERGROWTH-21st Pro-

ject(2014)标准筛查 LGA 率都低于中国 15 城市标准,差异有统计学意义($P<0.01$)。见表 2。

**表 1 两种标准新生儿出生体重分布比较($n$)**

| 项目 | 孕周(周) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| 例数 | 3 | 16 | 9 | 31 | 92 | 228 | 579 | 568 | 302 | 31 |
| 中国 15 城市标准 | | | | | | | | | | |
| $<P_3$ | 0 | 1 | 0 | 0 | 2 | 5 | 4 | 6 | 5 | 0 |
| $P_3 \sim P_{97}$ | 3 | 12 | 9 | 26 | 76 | 187 | 469 | 456 | 260 | 30 |
| $>P_{97}$ | 0 | 3 | 0 | 5 | 14 | 36 | 106 | 106 | 37 | 1 |
| the INTERGROWTH-21st Project(2014) | | | | | | | | | | |
| $<P_3$ | 0 | 0 | 0 | 3 | 4 | 7 | 3 | 7 | 7 | 0 |
| $P_3 \sim P_{97}$ | 3 | 13 | 9 | 25 | 79 | 206 | 540 | 528 | 288 | 30 |
| $>P_{97}$ | 0 | 3 | 0 | 3 | 9 | 15 | 36 | 33 | 7 | 1 |

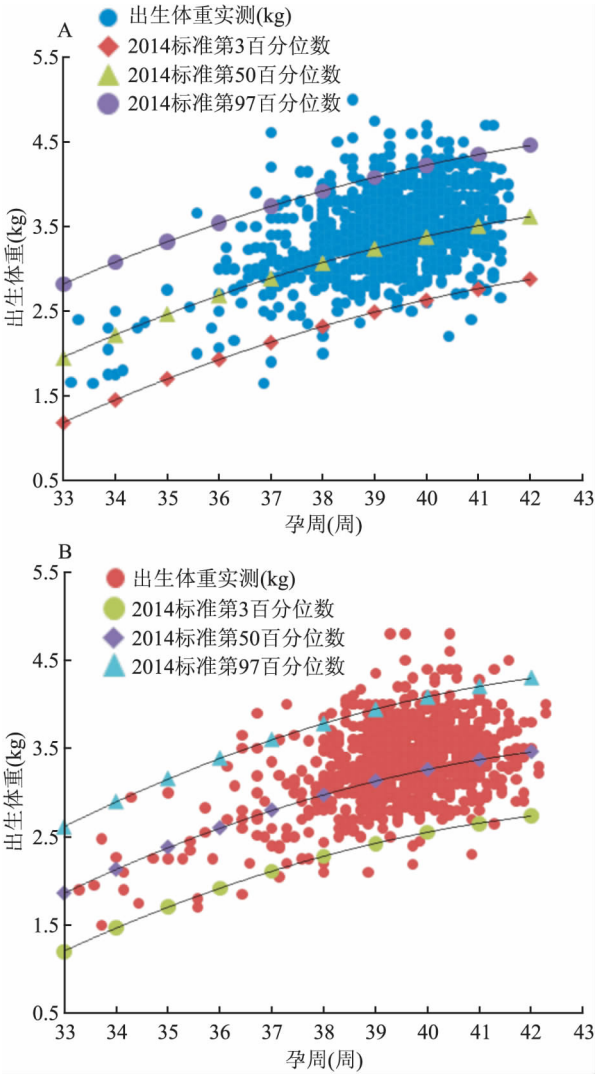


**图 1 新生儿出生体重散点图**

A:男;B:女

### 2.5 the INTERGROWTH-21st Project(2014)检出 SGA 和 LGA 的灵敏度、特异度、阳性预测值、阴性预测值、阳性似然比、阴性似然比

SGA 的检出中,中国定义($<P_{10}$)有较高的灵敏度和特异度,而国际定义($<P_3$)的灵敏度较低,特异度较高。LGA 的检出中,中国定义($>P_{90}$)和国际定义($>P_{97}$)的灵敏度都较低,特异度较高。见表 3。

**表 2 两种标准检出的 SGA 和 LGA [$n$(%)]**

| 项目 | | 中国 15 城市标准 | the INTERGROWTH-21st Project(2014) | $\chi^2$ 值 | $P$ 值 |
|---|---|---|---|---|---|
| SGA | $<P_{10}$ | 74(3.98) | 87(4.68) | 1 417.79 | <0.01 |
| | $<P_3$ | 23(1.24) | 31(1.67) | 0.00 | >0.05 |
| LGA | $>P_{90}$ | 569(30.61) | 318(17.11) | 869.72 | <0.01 |
| | $>P_{97}$ | 308(16.57) | 107(5.76) | 15.35 | <0.01 |

**表 3 SGA 和 LGA 的灵敏度、特异度、阳性预测值、阴性预测值、阳性似然比、阴性似然比**

| 项目 | SGA | | LGA | |
|---|---|---|---|---|
| | $<P_{10}$ | $<P_3$ | $>P_{90}$ | $>P_{97}$ |
| 灵敏度 | 0.959 | 0.043 | 0.559 | 0.010 |
| 特异度 | 0.991 | 0.984 | 0.999 | 0.934 |
| 阳性预测值 | 0.816 | 0.032 | 0.997 | 0.028 |
| 阴性预测值 | 0.998 | 0.988 | 0.837 | 0.826 |
| 阳性似然比 | 107.040 | 2.687 | 559.000 | 0.152 |
| 阴性似然比 | 0.041 | 0.973 | 0.441 | 1.060 |

## 3 讨论

本研究对象的出生体重的极端分布(小于 $P_3$ 和大于 $P_{97}$)是第 97 百分位数曲线上的婴儿数多于 the INTERGROWTH-21st Project(2014)的第 3 百分位数曲线下的婴儿数,说明本研究对象的出生体重总体不低于国际水平。

国内近年关于 SGA 的相关报道中,SGA 发生率为 3.20%~6.61%[3-5],国内关于 LGA 报道较少,研究[6]显示 LGA 发生率为 8.2%。中国定义:中国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准 SGA 发生率分布为 3.98%、4.68%,LGA 发生率分别为 30.61%、17.11%;国际定义:中国 15 城市标准和 the INTERGROWTH-21st Project(2014)标准 SGA 发生率分布为 1.24%、1.67%,LGA 发生率分别为 16.57%、5.76%。明显 the INTERGROWTH-21st Project(2014)标准筛查 SGA 和 LGA 的切点定在 $P_3$ 和 $P_{97}$ 合适,也说明中国 15 城市标准年代久远,已经落后目前我国新生儿的宫内发育水平。

一般情况下，当测试结果是肯定的，那么高度特异性的测试对于临床医师来说非常有用，当测试结果是否定的，高度灵敏性的测试则对临床医师非常有用。一个实验的预测值取决于该实验的灵敏性和特异性和该实验结果被采用下的患病率。阳性预测值和阴性预测值都是随着疾病的患病率的改变而改变的。当两个人群疾病的患病率不同时，直接采用公布的预测值是错误的。阳性似然比反映筛查实验正确判断阳性可能性是错误判断阳性可能性的倍数，阴性似然比反映筛查实验错误判断阴性可能性是正确判断阴性可能性的倍数[7]。

本研究中筛查 SGA 和 LGA 的灵敏度和特异度，采用中国定义的 SGA（$<P_{10}$）和 LGA（$>P_{90}$）比采用国际定义的 SGA（$<P_3$）和 LGA（$>P_{97}$）的灵敏度、特异度、阳性预测值、阴性预测值、阳性似然比均较高，阴性似然比较低。说明中国定义下的 SGA 和 LGA，the INTERGROWTH-21$^{st}$ Project（2014）标准与中国 15 城市标准更加接近。可以应用 the INTERGROWTH-21$^{st}$ Project（2014）标准检出 SGA 和 LGA。

本研究的不足之处：由于本研究样本量还不足够大，33～36 孕周以及 42 孕周样本例数较少，小于 $P_3$ 和大于 $P_{97}$ 例数甚至出现 0 的情况，以致各个孕周组内以及组间无法作比较，有待进一步研究。

## 参考文献


[1] 中国 15 城市新生儿体格发育科研协作组. 我国不同胎龄新生儿体格发育的现状[J]. 临床儿科杂志，1991，9(2)：72－7.

[2] Villar J，Cheikh Ismail L，Victora C G，et al. International standards for newborn weight，length and head circumference by gestational age and sex：the Newborn Cross-Sectional Study of the INTERGROWTH-21$^{st}$ Project[J]. Lancet，2014，384(9946)：857－68.

[3] 王庆红，杨于嘉，魏克伦，等. 我国小于胎龄儿现状分析[J]. 中国实用儿科杂志，2009，24(3)：177－80.

[4] 徐 蓉. 小于胎龄儿发生率及其影响因素队列研究[D]. 安徽医科大学，2012.

[5] 杨 凡，熊 英，余 波，等. 146 例小于胎龄儿高危因素及合并症分析[J]. 四川大学学报(医学版)，2003，34(4)：770－3.

[6] 袁 力，何善阳，陈淑琴，等. 孕前体重指数和孕期体重增加对大于胎龄儿和巨大儿发生风险的影响[J]. 中国妇幼保健，2010，25(35)：5198－200.

[7] Selamat R，Zain F，Raib J，et al. Sensitivity and specificity of visual clinical assessment as compared to WHO 2006 standard and NCHS 1977 reference in measuring the growth status of malaysian infants[J]. J Am Coll Nutr，2011，30(6)：522－8.


# Application of new international standards for the feasibility study screening of SGA and LGA


Hu Shuang，Li Yi，Liu Qifei，et al

(*Dept of Nutrition and Food Hygiene，Anhui Medical University，Hefei* 230032)



**Abstract** ***Objective*** To evaluate the feasibility of screening SGA and LGA by applying the INTERGROWTH-21$^{st}$，Project (2014) standard in China. ***Methods*** In accordance with standards of different gestational age newborns，published by Research Group (1986 to 1987) normal weight standard weight of 15 cities neonatal physical development and the INTERGROWTH-21$^{st}$ Project (2014) of different age group of newborns，described this collection the 1 859 birth weight distribution. Screen SGA and LGA according to the Chinese and international definitions. The Domestic screening was the gold standard for international screening of SGA and LGA. Sensitivity，specificity，positive predictive value，negative predictive values，etc. are calculated. ***Results*** In the 1 859 birth weight data，there were 23 and 31 infants less than Chinese 15 cities standard and the INTERGROWTH-21$^{st}$ Project (2014) standard's 3rd percentile，respectively. However there were 308 and 107 infants more than Chinese 15 cities standard and the INTERGROWTH-21$^{st}$ Project (2014) standard's 97rd percentile，respectively. The difference was statistically significant ($P<0.01$). When using $P_{10}$ and $P_{90}$ as the cutoff point，Chinese 15 cities standard and the INTERGROWTH-21$^{st}$ Project (2014) standard SGA incidence distribution were 3.98% and 4.68%，

LGA rates were 30.61% and 17.11%, respectively. When using $P_3$ and $P_{97}$ as the cutoff point, Chinese 15 cities standard and the INTERGROWTH-21st Project (2014) SGA incidence distribution standards distribution of 1.24% and 1.67%, LGA rates were 16.57% and 5.76%. The INTERGROWTH-21st Project (2014) standard screening SGA and LGA, sensitivity, negative likelihood ratio were lower, and specificity, positive predictive value, negative predictive value, positive likelihood were high. ***Conclusion*** The INTERGROWTH-21st Project (2014) standard might be used to screen SGA and LGA.

**Key words** newborn;birth weight;SGA;LGA

(**上接第** 223 **页**)

[8] Whiting J F, Green R M, Rosenbluth A B, et al. Tumor necrosis factor-alpha decreases hepatocyte bile salt uptake and mediates endotoxin-induced cholestasis [J]. Hepatology, 1995, 22(4 Pt 1): 1273 - 8.

[9] Chen F, Castranova V, Shi X. New insights into the role of nuclear factor-kappaB in cell growth regulation [J]. Am J Pathol, 2001, 159(2): 387 - 97.

[10] Sio S W, Ang S F, Lu J, et al. Substance P upregulates cyclooxygenase-2 and prostaglandin E metabolite by activating ERK1/2 and NF-kappaB in a mouse model of bum-induced remote acute lung injury [J]. J Immunol, 2010, 185(10): 6265 - 76.

[11] Strong V E, Mackrell P J, Concannon E M, et al. Blocking prostaglandin E2 after trauma attenuates pro-inflammatory cytokines and improves survival [J]. Shock, 2000, 14(3): 374 - 9.

# Experimental study on acute closed hepatic injury induced by underwater firearm explosion in rabbits

Huang Yijiang[1,2], Qi Xiaolin[2], Ma Honghao[3], et al

([1] *Dept of General Surgery, The First Affiliated Hospital of Anhui Medical University, Hefei* 230022;
[2] *Dept of Hepatobiliary Surgery, The* 123*rd Hospital of Chinese People's Liberation Army, Bengbu* 233015;
[3] *Dept of Modern Mechnics, University of Science and Technology of China, Hefei* 230022)

**Abstract** ***Objective*** To explore the pathophysiology mechanism of acute closed hepatic injury of rabbits by firearm explosion underwater. ***Methods*** 30 rabbits were randomly divided into two groups as follow: control group (10 rabbits) and experimental group (20 rabbits). Rabbits in experimental group were made to rabbit models of acute closed hepatic injury by firearm explosion underwater. Animals samples were havested after the explosion at 12 hours and 24 hours, respectively (10 at each time point). Liver wet/dry weight ratio (W/D), arterial partial pressure of oxygen ($PaO_2$), transaminase, inflammatory factors and liver pathology were detected. ***Results*** Liver tissue haemorrhage, rupture of liver blood vessels, liver tissue necrosis, inflammatory cell infiltration were observed after explosion at 12 h and more seriously than those for 24 h in experimental group. Compared with the control group, W/D increased significantly ($P < 0.05$), $PaO_2$ decreased significantly ($P < 0.05$), transaminase index and inflammatory cytokines increased significantly ($P < 0.05$) in the experimental group. ***Conclusion*** The shock wave of explosion underwater can cause acute closed hepatic injury with relevant pathophysiology changes of experimental rabbits.

**Key words** acute closed hepatic injury; blast injury; rabbit