# Palm oil and its effect on health biomarkers

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### Rsearch Background

- Facts on Fats the Basics describes the role of fats in taste perception and the importance of fats in a number of food technology applications.
- From a nutritional point of view, dietary fats are important for several health related aspects and for optimal functioning of the human body.
- Dietary fats are not just a source of energy; they function as structural building blocks of the body, carry fat-soluble vitamins, are involved in vital physiological processes in the body, and are indispensable for a number of important biological functions including growth and development.
- The importance of dietary fats :
  - **Provision of energy**
  - Structural component
  - **Carrier of vitamins**
  - Other biological functions



Since the 1950s, there have been a relatively.....

# Replacing saturated fats with polyunsaturated fats decrease cholesterol levels; Dietary saturated fats increase blood cholesterol levels in feeding studies

increase blood cholesterol levels

increase heart disease risk

### Since 2000

- Women's Health initiative (2006) 48,835 women, 8 years, no significant difference between intervention and control.
- Diet and Reinfarction trial (1989) 2,033 men, 2 years, no significant difference between the groups given and not given fat and fiber advice. No significant differences in ischaemic heart disease between intervention and control (intervention was only advice in this trial)
- Minnesota Coronary Survey\* (1989) 4,393 men and 4,664 women, double-blind, 4 years, no significant reduction in cardiovascular events or total deaths from the treatment diet

from these studies, such risk might be overstated,

#### Several authors have published about meta nanlysis paper

- 1. Patty W Siri-Tarino, Qi Sun, Frank B Hu, et al. Meta-analysis of prospective cohort studies evaluating the association of saturated fat with cardiovascular disease. Am J Clin Nutr,2010, 91(3): 535-546.
- 2. Kazumasa Yamagishi ,Hiroyasu Iso , Hiroshi Yatsuya, et al. Dietary intake of saturated fatty acids and mortality from cardiovascular disease in Japanese: the Japan Collaborative Cohort Study for Evaluation of Cancer Risk (JACC) Study. Am J Clin Nutr,2010, 92(4): 759-765.
- 3. Chowdhury R, Warnakula S, Kunutsor S, et al. Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and Meta-analysis. Ann Intern Med, 2014, 160(6): 398-406.
- 4. Fattore E, Bosetti C, Brighenti F, et al. Palm oil and blood lipid-related markers of cardiovascular disease: a systematic review and Meta-analysis of dietary intervention trials. Am J Clin Nutr,2014, 99(6): 1331-1350.

#### Contents

Food and edible oil Composition and intake survey In China

Human trials were undertaken to evaluate the health benefits of different oil,

Chidren study were undertaken to evaluate the changes on Vit A level by Red palm oil

# Edible oil Composition and intake survey In China

- Food nutrition composition analysis and collection began from 1950 In China .
- The food compositin data have been devoloped by our Lab, now, the more than 4000 food items avilable from the CFCD database, covers the following: milk; eggs and egg products; fats; meat; fish; cereals; vegetables; fruits; jams and jellies from fruits and berries; sweets(honey, sugar); ice cream; alcoholic beverages; drinks(soft drinks,cocoa; coffee and tea), yeast so on, total 21 food category.

- The database contain the tota 97 nutritrients, including energy value as well as values corresponding to the content of protein, fat, carbohydrates, total dietary fibres and minerals, vitamins, amino acids, fatty acids,.
- For oil and fat-rich food products, the fatty acid composition is additionally given as mole percent and the contents in foods.



## Fatty acid content of different fats and oils



oil consumption

Soybean , peanut oil, Rapeseed , corn oil , sunflower oil are most common edible oil .

The blend oil is often use in the home, there are with different fatty acid compositions for the reasonable ratio of blend oil so ,palm oil is most common oil too



# Cooking oil Intake and changes in China from 2002-2012



Source: Nation Nutrition and Health Survey

#### 1989-2011年成人脂肪供能比的分布(%)

1989-2011年成人脂肪供能比的分布(%)								
	20%以下	20%-30%	30%-40%	40%及以上				
1989	36.7	27.0	19.5	16.8				
1991	36.8	31.6	20.7	10.9				
1993	37.3	32.6	19.0	11.1				
1997	32.5	32.3	22.3	12.9				
2000	23.2	33.5	28.2	15.1				
2004	28.8	31.3	25.3	14.7				
2006	19.5	29.6	31.4	19.5				
2009	13.8	31.1	34.4	20.7				
2011	10.3	28.1	32.9	28.7				
2011(直辖市)	4.2	14.4	32.9	48.5				

Source : China Health and Nutrition Survey (CHNS)

#### TFA content among 2613 food on the Chinese market

Food Item	N (total 2613)	TFA content (g/100g)
coco chocolate	16	15.6
Fat and oils	178	0.86
Chocolate candy	300	0.89
Baked foods, spices, cakes Deep-Fried Dough Stick	680	0.3-0.5
drinks	150	0.09
milk product	167	2.53

YxYang eatl : TFA content in Popular food

#### Trans fat analysis and intake estimated

#### TFA intake and the energy supply ratio among Chinese in 2012

Location	intake (g/d)	energy supply ratio (%E)
City	0.53	0.26
Twon	0.50	0.23
total X	0.52	0.25
Rural area : level 1	0.34	0.14
level 2	0.37	0.15
level 3	0.35	0.14
level 4	0.25	0.10
Χ	0.33	0.13
Total	0.39	0.16

Report: TFA intake estimated in Chinese population 2012

	II'A IIItake I		iou anu Deijn	ig
Age	Intake g/d	% E	P50	p97.5
/3-	0.49	0.40	0.43	1.23
7-	0.54	0.37	0.47	1.41
13-	0.61	0.39	0.49	1.65
18-	0.56	0.34	0.46	1.51
X	0.55	0.36	0.46	1.45

TFA Intake from GuangZhou and Beijing

Report: TFA intake estimated in Chinese population 2012



#### Chniese DRI for Deitary fat and fatty acid

<b>2</b> 人群	2013 Fat STF 人群		MUTA	MUTA		PUTA		
	AMDR	U- AMDR	AI	AMDR	AI	AMDR	AI	
0~	$48^{\mathrm{a}}$		7.3	—	0.87	—	$0.1^{a}$	
0.5~	<b>40</b> <sup>a</sup>		6	—	0.66	—	$0.1^{a}$	
1~	35 <sup>a</sup>	—	4	—	0.6	—	<b>0.</b> 1 <sup>d</sup>	
4~	$25 \sim 30$	8	4	—	0.6	—		
7~	$25 \sim 30$	8	4	—	0.6	—		
18~	$20 \sim 30$	10	4	2.5~9	0.6	0.5~2.0		
60~	$20 \sim 30$	10	4	2.5~9	0.6	0.5~2.0	1	
<b>孕</b> 妇和乳 母	20~30	10	4	2.5~9	0.6	0.5~2.0	0. 25 (0. 20 <sup>°</sup> )	
注:U-AMDR	,即宏量营	养素	可接受范围的上限	L o				
<sup>a</sup> AI值	<sup>d</sup> DHA							

# These studies provide more than just data and also necessary for human health and service



# Human trials to evaluate the health benefits of different oil





#### sn-2 FATTY ACID COMPOSITION





#### 1. Yi Xing Study



A textile mill in Yixing city

Effects on the Human Serum Lipid Profile of Palm Olein and Olive Oil in the Chinese population: a Randomized, Double-Blind, Cross-over Trial

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# **Objective and Study Design**

OBJECTIVE

To define the effects of the consumption of palm olein and olive oil in diet on the serum lipid profiles in Chinese population, and explore the differences between them. SUBJECTS AND STUDY DESIGN

Experimental site : Carried out in Yixing textile mill in Jiangsu , China. there are 15,000 workers and day's meal supply in the factory.

Subjects: 120 participants were recruited from the textile mill.



#### Subjets : Inclusion Criteria

- No history or family history of cardiovascular disease, diabetes, hypertension, dyslipidemia, chronic renal disease, hepatitis and cancer.
- Normal serum TG, TC, LDL-C, HDL-C and glucose level
- Age : 25-55 years
- Body mass index (BMI) : 18.5-24.9
- Complete the whole experiment;
- Stable physical activity level.
- Not pregnant or lactating

#### **The technical Protocol chart**



# Diet Design

 Daily meal plans were prepared according to the Chinese Food Guideline and Chniese DRI

the food and enengy in meals was similar in each groups during the test period .

- Each subject consumed ~48g of test oil daily, accounting for 2/3 of total fat intake.
- Energy from fat, protein and carbohydrate makes up 30%, 15 % and 55 % of total dietary energy respectively. Dietary cholesterol was controlled to not exceed 300 mg/day.
- Test oils were weighed and then given to the chefs for cooking.





#### The composition of fatty acid in PO and OO (g/100g)

Fatty acid	Palm Olein (PO)	Olive Oil (OO)
Lauric acid (C12:0)	0.27	0
Myristic acid (C14:0)	0.88	0
Palmitic acid (C16:0)	27.46 (28. 61)	9.67
Palmitoleic acid (C16:1, n7)	0.24	0.59
Stearic acid (C18:0)	2.79	2.81
Oleic acid (C18:1, n9)	48.91	77.33
Linoleic acid (C18:2, n6)	13.87	3.74
a-linolenic acid (C18:3, n3)	0.21	0.55
Arachidic acid (C20:0)	0.23	0.34
Cis-11-Eicosenoic acid (C20:1)	0.14	0.14

# Dietary survey





- A total of 4 dietary surveys during zai test periods (14weeks) were conducted at the following times:
- 1) End of run-in period (week 2)
- 2) End of 1<sup>st</sup> experimental phase (week 7)
- 3) End of washout period (week 9)
- 4) End of 2<sup>nd</sup> experimental phase (week 14)
- Weighted food record (WFR) was used to investigate nutrition intake of subjects

# **Blood Indexes and Physical Examination**

 Blood sampling and physical examination were conducted before and after every experimental phase.

#### Blood indexes:

- Routine blood test
- 2) Serum lipid profile: including TC, TG, LDL-C, HDL-C, Apo-A1 and Apo-B
  - Serum glucose, insulin, C-peptide and HOMA-IR

HOMA-IR = [Fasting glucose (mU/L) x Fasting insulin (mmol/L)] / 22.5

#### Physical examination:

- l) Height
- 2) Weight
- 3) Hip and waist circumference
  - Blood pressure





# Ethics committee

- Study was approved by the Ethics Committee for Clinical Research of Zhongda Hospital, Affiliated to Southeast University (No: 2014ZDSYLL0540).
- All the participants have signed the informed consent form.
- This study was also registered on the website of Chinese Clinical Trial Registry (http://www.chictr.org.cn/).
  Reg No: ChiCTR-ICR-14005587.

	IEC 批件号: 20	东南大学附属 for Clinical Research of Zha 科研 Approval	中大医院临床研究伦理委员 mgda Hospital, Affiliated to S 项目伦理审查批件 Letter for Research Project	会 outheast University
审	查日期	2014.03.28	审查地点	中大16 12 20 - 人口会
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研	究科室	公共卫生学院	主要研究者姓名/职称	孙桂菊/教授
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	项目负责人 (20140314-02 同意开展"杨 展临床研究,保护 伦理委员会对 请同意书、招募材	三根据伦理委员会的修正 2014年4月10日),作 網油和橄榄油对人体血服 受试者的健康与权利。 该批准项目进行跟踪率置 料的任何修改及主要研判 行定答复前不得实施方案的	E意见,对知情同意书进 论理委员会问意修正后知情 冒影响研究"。请遵循 GCP 近直至研究结束。具体要求 论者变更等,请及时向伦理 的任何偏离和修改。②发生	行了修改并递交修正后知情同意书 同意书。 原则、遵循伦理委员会批准的方案开 为:①对已批准的临床研究方案、知 委员会提交修正案申请,在获得本院 严重不良事件及影响研究风险受益比
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1/1

# Result 1: Baseline Characteristics of Subjects

<b>Basic Information</b>	PO (N = 48)	OO (N = 52)	Р
Age (years)	39.19 ± 10.00	41.33 ± 8.36	0.251
Sex (Male/ Female)	25/23	23/30	0.250
BMI (kg/m²)	22.35 ± 2.23	22.03 ± 1.90	0.432
WHR	$0.83 \pm 0.07$	$0.83 \pm 0.06$	0.635

Routine blood index	PO (N = 48)	OO (N = 52)	Р
WBC (10 <sup>9</sup> /L)	6.61 ± 1.71	5.83 ± 1.55	0.020*
RBC (10 <sup>12</sup> /L)	4.95 ± 0.59	$4.88 \pm 0.58$	0.565
HB (g/L)	144.19 ± 18.84	144.08 ± 19.12	0.977
PLT (10 <sup>9</sup> /L)	245.17 ± 60.37	130.13 ± 60.96	0.219

\*: Non-parametric test (Mann-Whitney test)

# Baseline blood biochemical indexes of Subjects

	PO (N = 48)	OO (N = 52)	P
Glucose (mmol/L)	$4.38 \pm 0.73$	$4.5 \pm 0.70$	0.431
TG (mmol/L)	0.91 ± 0.29	0.91 ± 0.28	0.946
TC (mmol/L)	$4.30 \pm 0.64$	4.41 ± 0.64	0.422
HDL (mmol/L)	1.19 ± 0.17	1.23 ± 0.22	0.288
LDL (mmol/L)	$2.47 \pm 0.44$	$2.55 \pm 0.38$	0.363
Apo-A1 (g/L)	$1.15 \pm 0.23$	1.18 ± 0.24	0.523
Apo-B (g/L)	$0.75 \pm 0.11$	0.79 ± 0.09	0.109
Insulin (ulU/mL)ª	6.01 (4.34, 8.29)	6.76 (5.19, 7.34)	0.129
C-peptide (ng/mL) <sup>a</sup>	1.60 (1.35, 1.92)	1.77 (1.46, 2.04)	0.157
HOMA-IR <sup>a</sup>	1.18 (0.77, 1.75)	1.32 (0.97, 1.78)	0.136

<sup>a</sup>: expressed as median (25<sup>th</sup> percentile, 75<sup>th</sup> percentile)

#### Result 2: Dietary nutritents intake

The energy, protein, fat and carbohydrate intakes at 4 different time points

Macronutrients expressed as % of total daily energy intake

	P O group			OO group				
time point	week 2	week7	week9	week14	week 2	week7	week9	week14
Energy (kcal)	2568.4	2284.2	2482.6	2454.4	2580.8	2275.5	2430.1	2449.7
Protein (%)	8.7	10.9	11.5	11.3	10.6	10.6	12.3	12.0
Fat (%)	28.3	30.8	28.9	29.4	28.2	28.2	29.8	28.1
Carbohydrate (%)	62.9	58.3	59.3	58.9	61.2	61.3	58.0	59.1

1) End of run-in period (week 2), 2) End of 1<sup>st</sup> experimental phase (week 7)

3) End of washout period (week 9), 4) End of 2<sup>nd</sup> experimental phase (week 14)
### Results 3: Anthropometric data & routine blood indexes

Effect of PO and OO on the anthropometric data and routine blood indexes in subjects

	PO (N = 100)	OO (N = 100)	P
BMI (kg/m²)	22.09 ± 2.14	22.22 ± 2.25	0.658
WHR	0.83 ± 0.07 0.83 ± 0.06		0.952
WBC (10 <sup>9</sup> /L)	6.40 ± 1.58	6.14 ± 1.50	1.410
RBC (10 <sup>12</sup> /L)	4.92 ± 0.53	4.87 ± 0.53	0.538
HB (g/L)	141.61 ± 17.26	139.60 ± 15.87	0.747
PLT (10 <sup>9</sup> /L)	238.18 ± 59.27	234.82 ± 60.08	0.675

WHR Waist-hip ratio WBC White blood cells RBCRed blood cells

HB Hemoglobin PLT Platelets

## Results: 4 Lipid and Glucose profiles

#### Effect of PO and OO on the lipid profiles in subjects

PO (N = 100)	OO (N = 100)	P
$0.93 \pm 0.40$	$0.94 \pm 0.39$	0.836
4.34 ± 0.69	$4.36 \pm 0.68$	0.861
1.21 ± 0.17	1.22 ± 0.20	0.963
$2.48 \pm 0.50$	2.51 ± 0.50	0.703
1.21 ± 0.21	1.17 ± 0.18	0.176
0.76 ± 0.13	0.79 ± 0.11	0.162
	PO (N = 100) $0.93 \pm 0.40$ $4.34 \pm 0.69$ $1.21 \pm 0.17$ $2.48 \pm 0.50$ $1.21 \pm 0.21$ $0.76 \pm 0.13$	PO (N = 100)OO (N = 100) $0.93 \pm 0.40$ $0.94 \pm 0.39$ $4.34 \pm 0.69$ $4.36 \pm 0.68$ $1.21 \pm 0.17$ $1.22 \pm 0.20$ $2.48 \pm 0.50$ $2.51 \pm 0.50$ $1.21 \pm 0.21$ $1.17 \pm 0.18$ $0.76 \pm 0.13$ $0.79 \pm 0.11$

<sup>a</sup>: expressed as median (25<sup>th</sup> percentile, 75<sup>th</sup> percentile)

#### Effect of PO and OO on the **glucose profiles** in subjects

Glucose profile	lucose profile PO (N = 100)		P	
Glucose (mmol/L)	4.18 ± 0.64	4.12 ± 0.62	0.455	
Insulin (uIU/mL)ª	5.50 (3.71, 7.45)	5.36 (3.75, 7.49)	0.199	
C-peptide (ng/mL)ª	1.61 (1.29, 2.01)	1.57 (1.28, 1.86)	0.247	
HOMA-Ir <sup>a</sup>	0.97 (0.65, 1.52)	0.95 (0.63, 1.40)	0.178	

#### **Results** (Anthropometric data & Blood tests)

No differences were found in the anthropometric data, routine blood indexes, lipid profile and glucose profile between the palm oil and olive oil two groups.

### **Summary of Results**



- No differences in the reported intakes of energy, macronutrient composition (ie, percentage of energy from protein, fat, and carbohydrates) were observed during the periods with test diets in two groups
- Similar to othe study , no differences were found between palm olein and olive oil on blood lipid and glucose profiles as well as routine blood indexes during 12weeks.
- No differences were found in the anthropometric data,

Although high in palmitic acid (27.46 %), palm olein had similar effects to olive oil. Palmitic acid of palm olein is predominantly at the sn-1&3 position (51.3 %), making palm olein less easily absorbed and excreted via the formation of calcium soaps.

#### CHRONIC PALM OLEIN STUDIES: PALM OLEIN VS MUFA OILS



42

#### CHRONIC PALM OLEIN STUDIES: PALM OLEIN VS MUFA OILS

Sundram et al 1995 AJCN	Palm olein and canola oil exhibited identical results in their effects on total cholesterol, LDL cholesterol and HDL cholesterol levels.
Zhang et al 1997 APJCN	Palm olein lowered total cholesterol, LDL cholesterol, total cholesterol/HDL cholesterol ratio compared to peanut and lard.
Zhang et al 1997 JN	Total cholesterol ,LDL cholesterol, total cholesterol/HDL cholesterol ratio and plasma thromboxane2/6-keto-prostaglandin- 1a ratio were significantly decreased in palm oil group while not appreciably altered in peanut oil group by the end of the test.
Truswell et al. 2000 Int J Food Sci Nutr	Palm olein and olive oil are similar in lipid profile

43

# 2 NanJing Study

second studies

### Comparative study of the effects of palm olein, cocoa butter and olive oil on lipid profile of young and middle-aged healthy people

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The project was carried out from February to June 2016, Southeast University, China.

### Aim of Study

- Hypothesis:

We hypothesize that palm oil with an oleic acid in sn-2 will have no effect on plasma total cholesterol.

Objectives:

To investigate the effects of unsaturated fatty acids in the sn-2 position on cholesterol levels





• 67 subjects completed the study (Male 33, Female 34; Age: 20-29 y)







### **3 Beijing Studies**

Third studies

# The Effect of Positional Distribution of Fatty Acids at Triglyceride Backbone on Fat Deposition

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Capital medical university, China

2 Beijing Institute for Nutrition Resource

3 National Institute for Nutrition and Health, Beijing 100050, China

**Objectives:** To investigate the effects of saturated fatty acids in the sn-1 and sn-3 positions on fat deposition



Figure Flow of participants through the study

### 4. GanSu Study

fourth study

An intervention study of food based Vitamin A supplement in rural school-age children in Gansu province China

### vitamin A Calcium, deficiency still exists

nutrites intake	X_	city	rural	Refrence
<pre>Vit A(µg)</pre>	443. 5	514. 5	375. 4	800
Ca (mg)	366. 1	412. 4	321. 4	800-1000
Te (mg)	21.5	21. 9	21. 2	12–20

资料来源:中国居民营养与健康状况调查





资料来源:中国居民营养与健康状况调查

Background and Study Objective

The WHO has estimated that 19 million (15.3%) pregnant women and 190 million (33.3%) of preschool aged children in the world's poorest countries are vitamin A deficient.

In west of China, one in five preschool-age children are vitamin A deficient, this deficiency contributes to morbidity and mortality from severe infections and is the main cause of blindness in undernourished children.

Inadequate growth , nutrients deficiency ( such as Vit A deficiency ) in the western rural areas resulted in a decline in labor and economic losses of 957 billion

#### BACKGROUND

 GanSu province is located at north west China Less economically developed

Children, especially those in rural areas, have a higher rate of malnutrition compared to other parts of China

though hunger and malnutrition fall under the very first MDG(Millennium Development Goals), beyond traditional food aid, they receive nothing for improment nutrition sources, but more needs to be done to achieve the target.

#### OBJECTIVE

 To observe the effects of biscuits made from red palm oil on the hea and diet of children in rural areas in Gansu province.



### Study Design

- 2,000 school children aged 7-12 years from 14 rural schools in Gansu province were recruited, they recevid bacicase intervention in the 6 months.
- A general questionnaire regarding past medical history, sex, etc. were filled by the subjects under the supervision of researchers.
- Anthropometric measurements were conducted (height & weight)
- Dietary survey was performed before and after the intervention using 3-day recall method.
  VitA Intervention
- food based Vit A intervention .

the subjects were followed for 6 months.

	VitA		Intervention			
	Reference		study			
	EAR	RNI				
7	360	500RAE/	90-10	Ong RE	/ d,	1
	RAE/d	d	portion			
- 8y						
9-11y	450-	630-	136-1	40ng RE	/ d,	
	480AE/d	670AE/d	1.5 port	ion		
			6 month	S		

1-2pack of biscuit daily suplement 6 months among 2000 shcool chdrien



Vita concentration was determined using high performance liquid chromatography (HPLC).

### food based Vit A intervention

- Ingredients: Flour, sugar, food-grade Red palm oil, eggs, milk powder.
- Biscuits 50g--75g/pack/d

Biscuits were made from red palm stearin
 Palm oil is rich in natural carotenes. The palm

carotenes are biologically active as pro-vitamin A.

	Per 100 g	NRV (%)	1-1.5 portion/d
Energy	2316 kJ	28 %	13-15%
Protein	7.6 g	13 %	6-7%
Fats	27.1 g	48 %	24-26%
Carbohy drate	56.4 g	19 %	10-14%
Vit A	180 Mg	30 -35%	1 <b>8-20</b> %



目初

微水化合物

质期:十二个月

含量: 50克

33.1克(q)

608 至克(mg

56.4克(g)

55%

19%

### **Results 1** Dietary intake

Daily energy and macronutrient intake post and prior intervention using biscuits made from red palm oil.

	<b>Before Intervention</b>	After Intervention after 6m
Energy (kcal)	1648.8	2061.4
Protein (g)	51.9	61.2
Fat (g)	68.5	66.2
Carbohydrate (g)	214.6	305.7
Vit A		

 Increase in daily energy intake from 1648.8 kcal to 2061.4 kcal, reaching the estimated energy required of ~2000kcal

### Retinol Intake

Students from 296 schools children in different parts of GanSu province showed an increase in blood retinol concentrations after 6 mnthods intervention.



Daily vitamin A intake increased from 324.1µgRE (49.9% of the recommended daily intake before intervention to 488.5µgRE after intervention (75-80% of the recommended daily intake).

### Results 2 : Blood Vit A level

- According to WHO standards, Vit A status is classified as follow:
- 1) Vit A deficiency (VAD): < 0.70 µmol/L
- 2) Sub clinical deficiency (SVAD): 0.70 1.05 µmol/L
- 3) Normal Vit A status: ≥ 1.05 µmol/L

	Before Intervention	After Intervention after 6m
Total Case (N)	29	76
VAD	5.07 % (N = 15)	1.01 % (N = 3)
SVAD	16.55 % (N = 49)	5.07 % (N = 15)
Mean plasma Vit A levels (µg/mL)( X±SD)	0.463 ± 0.192	0.599 ± 0.184

Total Vita deficiency of improvement rate 26% can be observed post intervention .

suplement Vita on 20% RNI greatly improved the serum concentration, although it is still not up to

#### Rsults 3 Weight and height growth were also observed





### Summary and Conclusion

- Daily energy intake increased from 1648.8kcal before intervention to 2061.4kcal after intervention.
- Daily vitamin A intake increased from 324.1 µgRE (BI 49.9 % RDI) before intervention to 488.5 µgRE after intervention (AI - 75.2 % RDI).
- after 6m Biscuits withred palm oil intervention, Increased serum Vitamin A levels were observed(0.4663±0.192 - 0.5988±0.184ug/mL). vitamin A deficiency has reduced 26% among the school children.

Food based intervention is an effective way to prevent malnutrition and vitamin A deficiency for cildren in west area China .



- We performed several studies to confirm and clarify of edible oil composition, and the palm oliec effects on both lipid profil and vita deficiency based on (1) randomized dietary trials and (2) observational studies.
- Results also suggests the importance of positional distribution of the fatty acids rather than the fatty acid content of oils.

Further analytical study is yet required to reveal the relationship. In any case, we have found some valuable results.

Following a banlance dietary pattern associated with reduced risk of CVD, obesity and overweight will have additional positive benefits on health.

# ACKNOWLEDGMENTS

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Southeast University, China. Gansu University, China Capital medical university, China National Institute for Nutrition and Healthy, China

Malasian palm Oil Board





# THANK YOU!

Several authors have published about baobab food products **BMJ 2016; 353** doi: http://dx.doi.org/10.1136/bmj.i1246 (Published 12 April 2016) Cite this as: BMJ 2016;353:i1246

Re-evaluation of the traditional diet-heart hypothesis: analysis of recovered data from Minnesota Coronary Experiment (1968-73)

**Conclusions** Available evidence from randomized controlled trials shows that replacement of saturated fat in the diet with linoleic acid effectively lowers serum cholesterol but does not support the hypothesis that this translates to a lower risk of death from coronary heart disease or all causes. Findings from the Minnesota Coronary Experiment add to growing evidence that **incomplete publication has contributed to overestimation of the benefits of replacing saturated fat with vegetable oils rich in linoleic acid.** 

#### Vopr Pitan. 2016;85(1):5-18.

[ Modern conceptions about the possible impact of palm oil on human health]. [Article in Russian] Medvedev OS, Medvedeva NA.

Abstract

Review of the scientific literature on the evidence of the relationship between palm oil (PO) and its components and adverse effects on human health, on the mechanisms of cholesterol control and risks for development of cardiovascular diseases. PO is solid or semisolid at room temperature and often is used as a natural substitute for partially hydrogenated vegetable oils containing trans fatty acids which increase risks of hypercholesteremia. PO contains both saturated and unsaturated fats as well as substances with antioxidant activity. Taking into account the lipid theory of atherosclerosis pathogenesis, and sp-2 hypothesis, PO was compared with other vegetable oils, like olive, sunflower or soybean oils, and did not show great differences in changes of LDL, HDL or total cholesterol levels. Comparison of diets rich in PO with diets rich in trans fatty acids shows improvement of lipid profiles in groups with PO, and serves as a basis for replacement of trans fatty acids in food with PO and its fractions. In addition to fatty acids content, PO contains several phytonutrients including 4 forms of tocopherols and tocotrienols, carotenoids, sterols, and some others. Most of these compounds are considered beneficial for human health, mainly on account of their antioxidant activity. It is concluded that PO is safe component of food, when we pay attention to the rather high content of saturated fats in it. PMID: 27228696

#### 日常食用油<u>脂肪酸含量</u>表(食物中脂肪总量的百分数) Fatty acid content in diet oil (%total fat)

composition	大豆油	橄榄油	花生油	猪油	棕榈油
composition	Soybean oil	Olive oil	groundnut	Lard	palmolein
月桂酸(12:0)					0.2
lauric acid.					
豆蔻酸(14:0)				1.2	1.0
Myristic acid					
棕榈酸(16:0)	11.1	8.4	12.5	26. 0	37.7
palmitic acid					
硬脂酸(18:0)	3.8	2.2	3.6	15.7	4.3
stearic acid					
油酸(18:1)	22.4	81.4	40.4	44.2	44.4
oleic acid					
亚油酸(18:2)	51.7	6.4	37.9	8.9	12.1
linoleic acid					
业麻酸(18:3)	6.7	0.6	0.4		——
linolenic acid					

A m J Clin Nutr. 2014 Jun;99(6):1331-50.

Palm oil and blood lipid-related markers of cardiovascular disease: a systematic review and meta-analysis of dietary intervention trials.

Fattore E1, Bosetti C1, Brighenti F1, Agostoni C1, Fattore G1.

#### Abstract

BACKGROUND:

Palm oil (PO) may be an unhealthy fat because of its high saturated fatty acid content. OBJECTIVE:

The objective was to assess the effect of substituting PO for other primary dietary fats on blood lipidrelated markers of coronary heart disease (CHD) and cardiovascular disease (CVD). Results:

a systematic review and meta-analysis of dietary intervention trials. studies shouwed that : Studies were eligible if they included original data comparing PO-rich diets with other fat-rich diets and analyzed at least one of the following CHD/CVD biomarkers: total

#### Nutr. 2015 Jul;145(7):1549-58.

Palm Oil Consumption Increases LDL Cholesterol Compared with Vegetable Oils Low in Saturated Fat in a Meta-Analysis of Clinical Trials.

Sun Y1, Neelakantan N2, Wu Y2, Lote-Oke R2, Pan A2, van Dam RM3. Author information

**Method:** We searched Public Health and NUS Graduate School for Integrative duration that compared the effects of palm oil consumption with any of the predefined comparison oils: vegetable oils low in saturated fat, trans fat-containing partially hydrogenated vegetable oils, and animal fats. Data were pooled by using random-effects meta-analysis.

**Results:** Palm oil consumption results in higher LDL cholesterol than do vegetable oils low in saturated fat and higher HDL cholesterol than do trans fat-containing oils in humans. The effects of palm oil on blood lipids are as expected on the basis of its high saturated fat content, which supports the reduction in palm oil use by replacement with vegetable oils low in saturated and trans fat. This systematic review was registered with the PROSPERO registry at http://www.crd.york.ac.uk/PROSPERO/display\_record.asp?ID=CRD42012002601#.VU3wv

SGeDRZ as CRD42012002601.

#### Eur J Clin Nutr. 2009 May;63 Suppl 2:S22-33. doi: 10.1038/sj.ejcn.1602976.

ntitative effects on cardiovascular risk factors and coronary heart disease risk of acing partially hydrogenated vegetable oils with other fats and oils.

Mozaffarian D1, Clarke R. Division of Cardiovascular Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA 02115, USA

#### SUBJECTS/METHODS:

We performed meta-analyses of (1) the effects of TFAs on blood lipids and lipoproteins in controlled dietary trials and (2) associations of habitual TFA consumption with CHD outcomes in prospective cohort studies. On the basis of these results and corresponding findings for saturated fatty acids (SFA), cis-monounsaturated fatty acids (MUFA) and cis-polyunsaturated fatty acids (PUFA), we calculated the effects on CHD risk for replacing 7.5% of energy from three different PHVO formulations (containing 20, 35 or 45% TFAs) with butter, lard, palm or vegetable oils.

#### CONCLUSIONS:

Effects on CHD risk of removing PHVO from a person's diet vary depending on the TFA content of the PHVO and the fatty acid composition of the replacement fat or oil, with direct implications for reformulation of individual food products. Accounting for the summed effects of TFAs on multiple CHD risk factors provides more accurate estimates of potential risk reduction than considering each risk factor in isolation, and approaches the estimated risk reduction derived from prospective cohort studies. PMID: 19424216 DOI: 10.1038/sj.ejcn.1602976