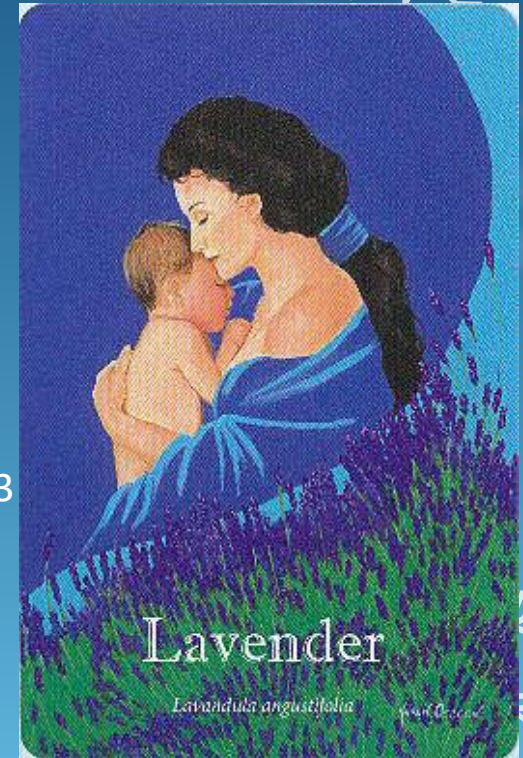


# Effects of Aromatherapy Massage on Pregnant Women's Stress and Immune Function: A Randomized Controlled Trial

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# Introduction



- Pregnancy women undergo bio-physio-psycho-social changes: **stress** (Curtis et al., 2012; Ngai and Chan, 2011).
- External stressors can lead to **adverse perinatal outcomes** (perinatal/postpartum depression, and preeclampsia (Bershadsky et al., 2014; Yu et al., 2013).
- Maternal health is important because it determines fetal and infant health, consistent with **global goals to promote maternal, fetal, and infant health** (United States Department of Health and Human Services. 2014; Koh, 2010).





# Healthy People 2020

## Leading Health Indicators

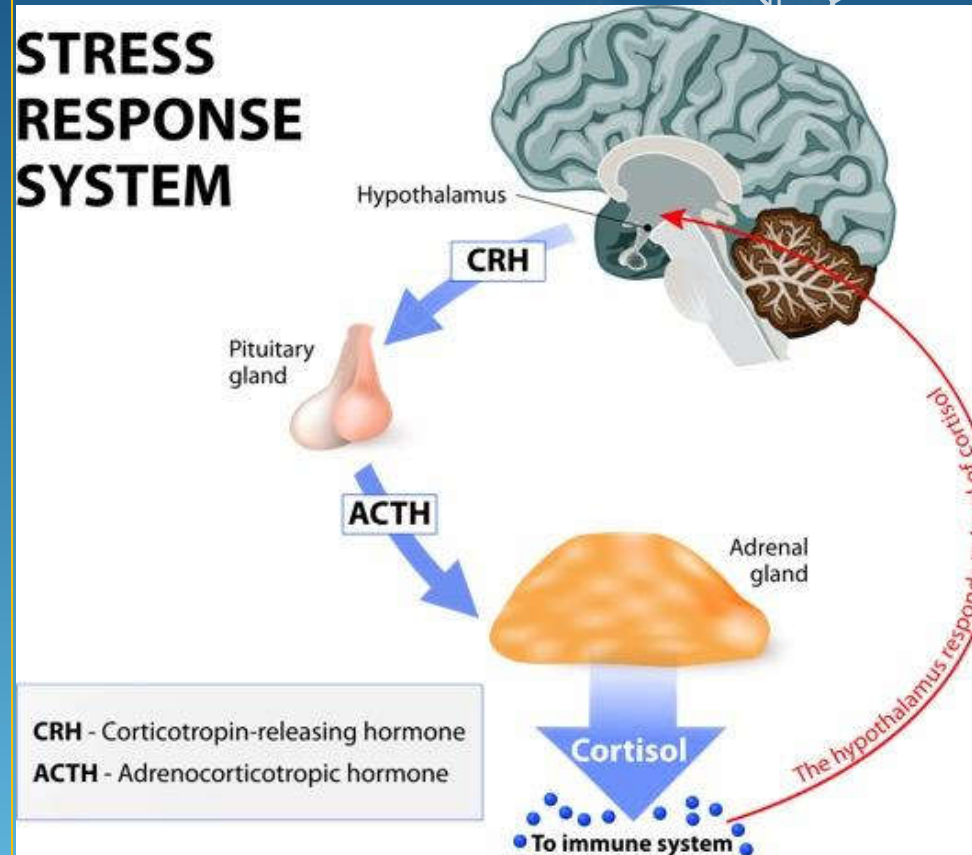
1. Access to Health Services
2. Clinical Preventive Services
3. Environmental Quality
4. Injury and Violence
5. Maternal, Infant and Child Health
6. Mental Health
7. Nutrition, Physical Activity and Obesity
8. Oral Health\*
9. Reproductive and Sexual Health
10. Social Determinants of Health
11. Tobacco Use
12. Substance Abuse



\*New in 2020

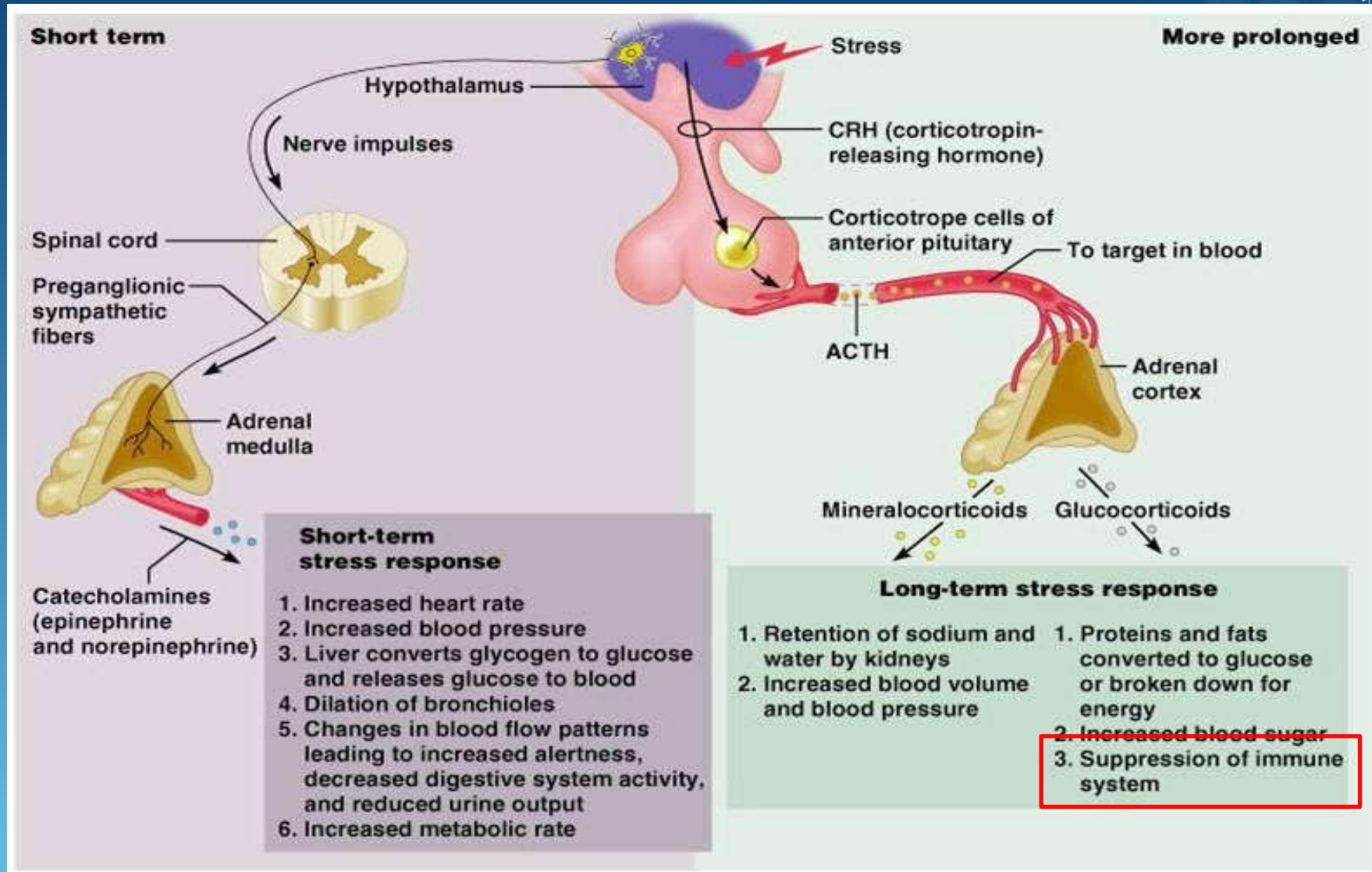
# Stress Response System

- ❖ Stress response is modulated by the hypothalamus–pituitary–adrenocortical **(HPA) axis**,
- ❖ Leading to adrenal secretion of **cortisol**
- ❖ HPA axis in turn **modulates the immune response** (Besedovsky et al., 2008).
- ❖ Stress-associated increases in cortisol levels may reduce cellular immunity (Littleton et al., 2010)



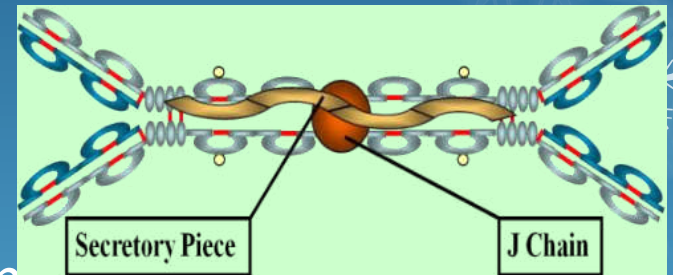


# Effects of Stress on Human Body



# Immunoglobulin A (IgA)

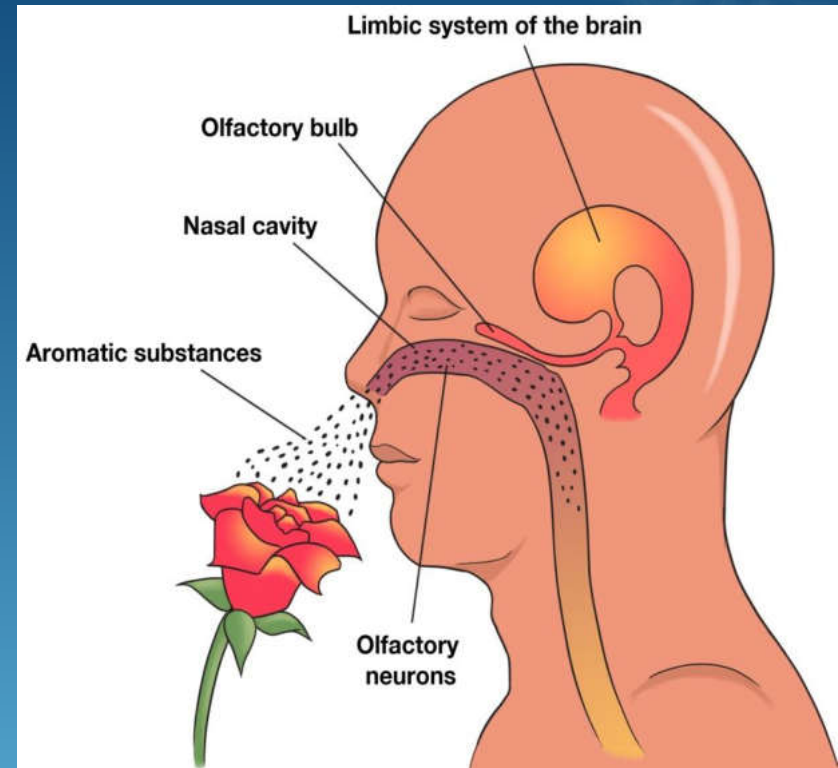
- IgA is found in vaginal secretions, semen, tears, **saliva**, colostrums, and **secretions from the respiratory and gastrointestinal tract** (Bosch et al., 2002; Castro-Sanchez and Martin-Villa, 2013; Engeland et al., 2016).
- Mucosal protection
- First-line immunological defense
- Stress directly affects immunity through modulating the secretion of IgA (Engeland et al., 2016).
- **Saliva** IgA and cortisol are **highly correlated** with the levels of **plasma** IgA and cortisol (Vining, 1983).



# Effects of Aromatherapy

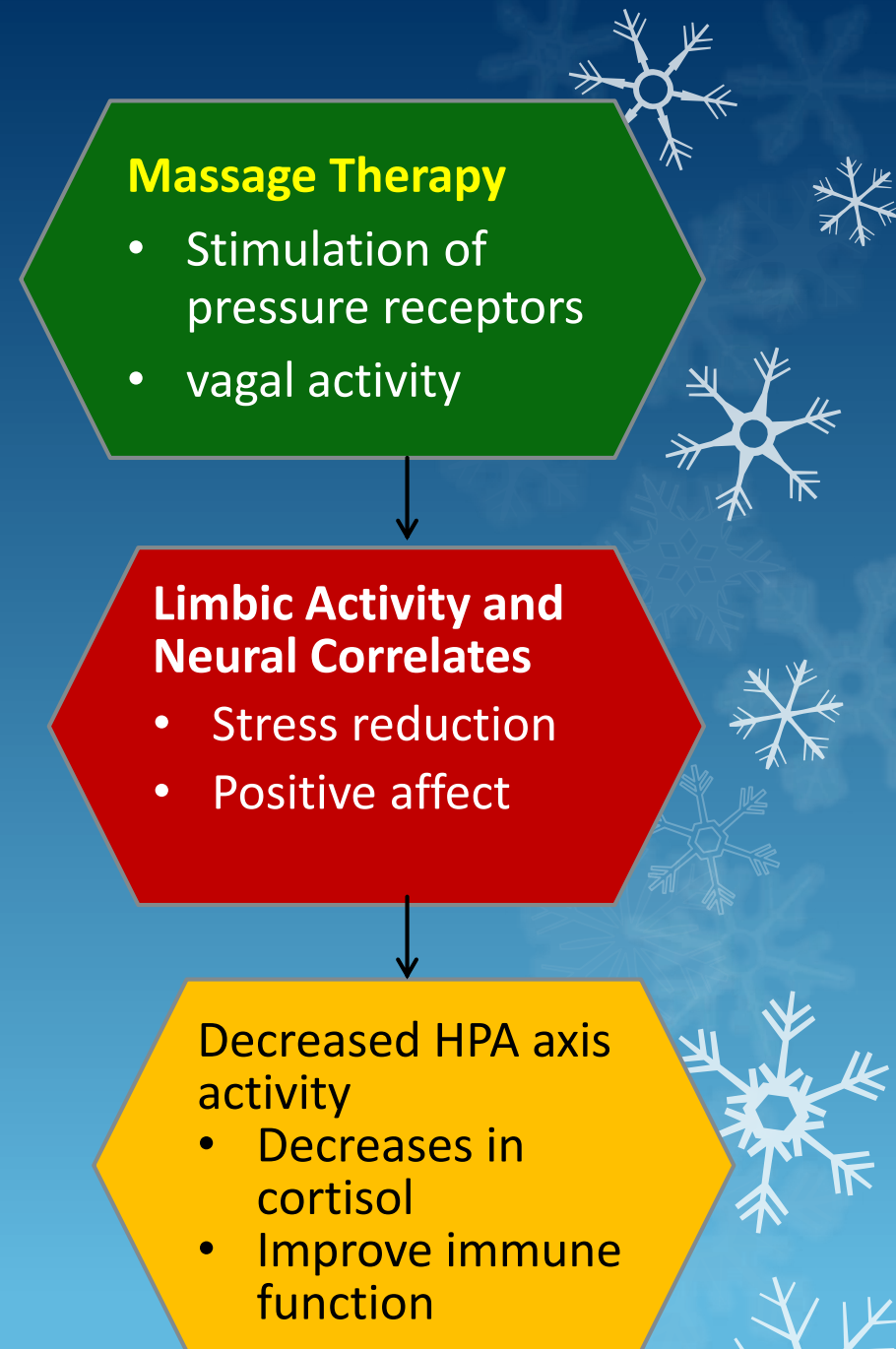


- Influence of aroma on brain especially the limbic system through the olfactory system.
- **Lavender Oil** – It relieves depression, stress.
- These signals cause the brain to release serotonin, endorphins, etc.
- Resulting in the desired change and providing a **feeling of relief stress**.



# Massage Therapy

- Massage therapy involves Limbic Activity and Neural Correlates : leads to enhanced positive affect and **reduced stress**.
- Improves HPA axis function to **decreased cortisol levels** and **improve immune function** (Nelson, 2015).





# Aromatherapy and Massage (AM)

- Aromatherapy combined with massage facilitates the absorption of essential oils via the skin (Wu et al., 2014).
- AM using essential oils can **reduce body tension** and **emotional stress** (Wu et al., 2014).
- AM to improve postpartum women's physical and mental status (Imura et al., 2006).
- AM significantly reduced pain perception during labour in primiparous women (Burns et al., 2007).
- **No studies** have examined the use of AM to relieve stress and enhance immune functions **in pregnant women.**



# Study Aims

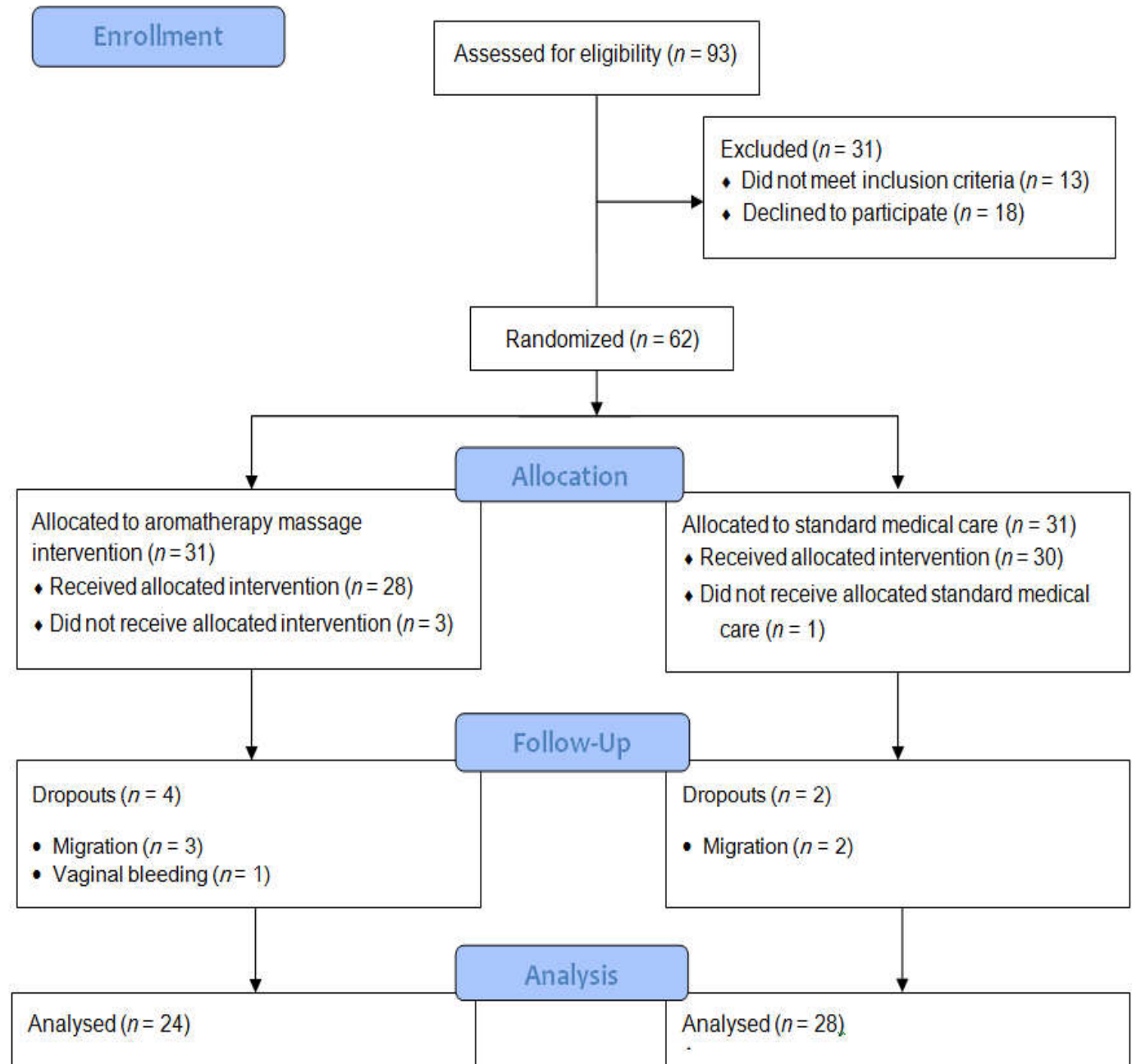


- The study's aims are to examine the effects of aromatherapy massage on **women's stress** and **immune function** during pregnancy.
- We measured levels of **salivary cortisol** and **IgA** from 16 to 36 weeks of pregnancy.

# Study Design

- Prospective, randomized controlled trial, longitudinal, repeated measure design
- Using Clinstat block randomization into either the control group or the aromatherapy massage (AM) intervention group.
- Control group received only routine prenatal care
- **Intervention group** received routine prenatal care plus the **AM** intervention from **16 to 36 weeks gestational**.
- Two saliva samples (before and after AM) were collected from participants in both groups on each data collection day at **16, 20, 24, 28, 32** and **36 weeks' GA** (**12 saliva samples/participant**).

# Participant Flow Chart





# Aromatherapy Massage Interventions



- The intervention group received 70 minutes of aromatherapy massage (AM) with **2% lavender** essential oil **every other wk** (10 times in total) for 20 wks
- A certified aromatherapy therapist.
- AM sessions were scheduled between 15:00 and 17:00 in the afternoon.
- AM took place in a quiet room with the temperature maintained at 25°C-26°C and the humidity at 50%-60%.

# Intervention Protocol



Massage oils  
2 c.c. **lavender**  
blended with 98  
c.c. almond oil.

Quiet room with  
temperature at  
25°C-26°C  
humidity at 50%-  
60%

Participants wore a  
comfortable gown and lay  
down on a massage bed  
for 10 minutes

Lay down on a  
massage bed for  
10 minutes  
after the AM

The **therapist** massaged the  
body parts, including the **head,**  
**neck, shoulder, arms, waist,**  
**back, legs, and feet**

**Pretest  
Saliva  
Collection**

**Posttest  
Saliva  
Collection**

**200 mL warm  
water to the  
participants to  
drink.**



# Saliva Collection and Analysis

- To collect a sufficient quantity of saliva, participants chew a cotton swab for about 2 to 3 minutes.
- **Cortisol** was measured using a competitive **enzyme-linked immunoassay (ELISA)** kit (Cayman Chemical Company, USA).
- **IgA** was measured using double-antibody sandwich **ELISA method** per the manufacturer's instruction (ICL, Inc., USA).



# Results

**Table 1. Participants' characteristics by group.**

Variable	Intervention	Control	Total	<i>p</i>
	group ( <i>n</i> = 24)	group ( <i>n</i> = 28)	( <i>n</i> = 52)	
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Gravida <sup>a</sup>				0.115
1	12 (50.0)	18 (64.3)	30 (57.7)	
2	9 (37.5)	8 (28.6)	17 (32.7)	
>3	3 (12.5)	2 (7.1)	5 (9.6)	
Para <sup>a</sup>				0.111
Primipara	16 (66.7)	23 (82.1)	39 (75.0)	
Multipara	8 (33.3)	5 (17.9)	13 (25.0)	
Education level <sup>a</sup>				0.090
College	9 (37.5)	3 (17.8)	14 (26.9)	
University	10 (41.7)	15 (53.6)	25 (48.1)	
Graduate school	5 (20.8)	8 (28.6)	13 (25.0)	
Employment status <sup>a</sup>				0.843
Full-time homemaker	10 (41.7)	11 (39.3)	21 (40.4)	
Employed full-time	14 (58.3)	17 (60.7)	31 (59.6)	
Annual household income <sup>a</sup> (NTD)				0.868
< 600,000	5 (20.8)	5 (17.9)	10 (19.2)	
600,000 – 800,000	4 (16.7)	4 (14.3)	8 (15.4)	
800,000 – 1,000,000	5 (20.8)	5 (17.9)	10 (19.2)	
> 1,000,000	10 (41.7)	14 (50.0)	24 (46.2)	
	M ± SD	M ± SD	M ± SD	
Chronological age <sup>b</sup> (years)	33.88 ± 4.14	32.82 ± 3.86	33.31 ± 4.01	0.116

M ± SD: Means ± Standard deviation; *p*: Statistical significance was defined as *p* < 0.05.

NTD: New Taiwan dollars (33 NTD = US \$1)

<sup>a</sup>Fisher's exact test

<sup>b</sup>Mann-Whitney U test

Non-significant



# Results

**Table 2. Comparison of aromatherapy massage effects on salivary cortisol by GEE.**

Variable	B	SE	Wald Chi-square	p	95% Confidence Interval	
					Lower	Upper
<b>Cortisol (<math>\mu\text{g/dL}</math>)</b>						
Group <sup>a</sup> (1 vs. 0)	-0.041	0.039	1.095	0.295	-0.117	0.036
Post <sup>b</sup> (1 vs. 0)	0.016	0.012	1.653	0.199	-0.009	0.041
36 weeks vs. 16 weeks <sup>c</sup>	0.134	0.038	12.183	<0.001	0.059	0.209
32 weeks vs. 16 weeks <sup>c</sup>	0.082	0.048	2.888	0.089	-0.013	0.177
28 weeks vs. 16 weeks <sup>c</sup>	0.046	0.039	1.373	0.241	-0.031	0.124
24 weeks vs. 16 weeks <sup>c</sup>	0.013	0.033	0.157	0.692	-0.053	0.079
20 weeks vs. 16 weeks <sup>c</sup>	-0.017	0.031	0.293	0.589	-0.078	0.044
Group x 36 weeks <sup>c</sup>	-0.094	0.048	3.692	0.055	-0.189	0.002
Group x 32 weeks <sup>c</sup>	-0.051	0.058	0.761	0.383	-0.164	0.063
Group x 28 weeks <sup>c</sup>	-0.085	0.047	3.182	0.074	-0.179	0.008
Group x 24 weeks <sup>c</sup>	-0.046	0.039	1.374	0.241	-0.123	0.031
Group x 20 weeks <sup>c</sup>	-0.040	0.036	1.201	0.273	-0.113	0.032
<b>Group<sup>a</sup> x post<sup>b</sup></b>	<b>-0.124</b>	<b>0.023</b>	<b>28.672</b>	<b>&lt;0.001</b>	<b>-0.170</b>	<b>-0.079</b>
36 weeks <sup>c</sup> x post <sup>b</sup>	-0.019	0.009	3.875	0.049	-0.037	-8.059
32 weeks <sup>c</sup> x post <sup>b</sup>	-0.020	0.012	2.685	0.101	-0.044	0.004
28 weeks <sup>c</sup> x post <sup>b</sup>	0.004	0.115	0.105	0.746	-0.019	0.026
24 weeks <sup>c</sup> x post <sup>b</sup>	-0.022	0.011	4.463	0.035	-0.043	-0.002
20 weeks <sup>c</sup> x post <sup>b</sup>	-0.009	0.014	0.344	0.558	-0.038	0.020
Group x 36 weeks <sup>c</sup> x post <sup>b</sup>	0.052	0.341	2.332	0.127	-0.015	0.119
Group x 32 weeks <sup>c</sup> x post <sup>b</sup>	0.058	0.035	2.738	0.098	-0.011	0.127
Group x 28 weeks <sup>c</sup> x post <sup>b</sup>	0.057	0.031	3.369	0.066	-0.004	0.119
Group x 24 weeks <sup>c</sup> x post <sup>b</sup>	0.071	0.223	10.210	0.001	0.028	0.115
Group x 20 weeks <sup>c</sup> x post <sup>b</sup>	0.033	0.022	2.172	0.141	-0.011	0.076

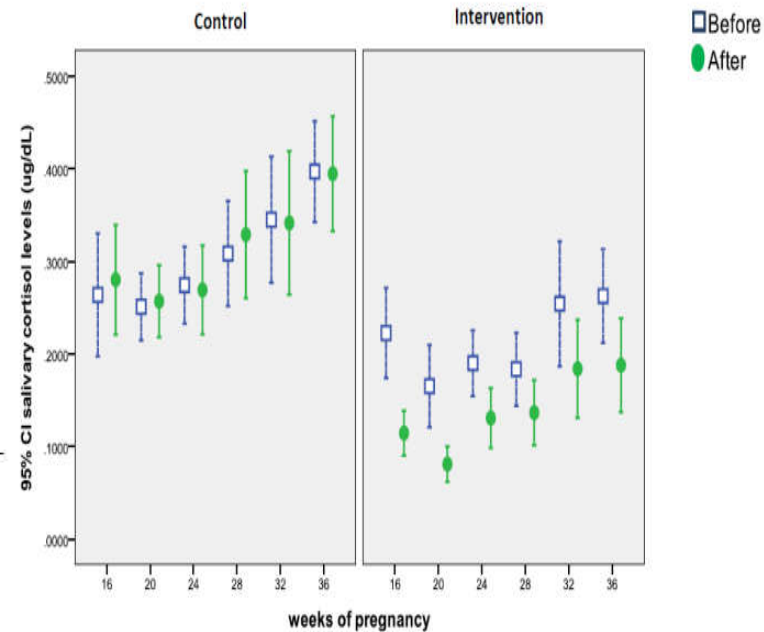
GEE: Generalized estimating equations; B: Coefficient; SE: Standard error

p: Statistical significance was defined as  $p < 0.05$ .

<sup>a</sup> Group: 1 = intervention group; 0 = control group

<sup>b</sup> Post: Posttest minus pretest; 1 = posttest; 0 = pretest

<sup>c</sup> The reference category was baseline or 16 weeks of gestation.



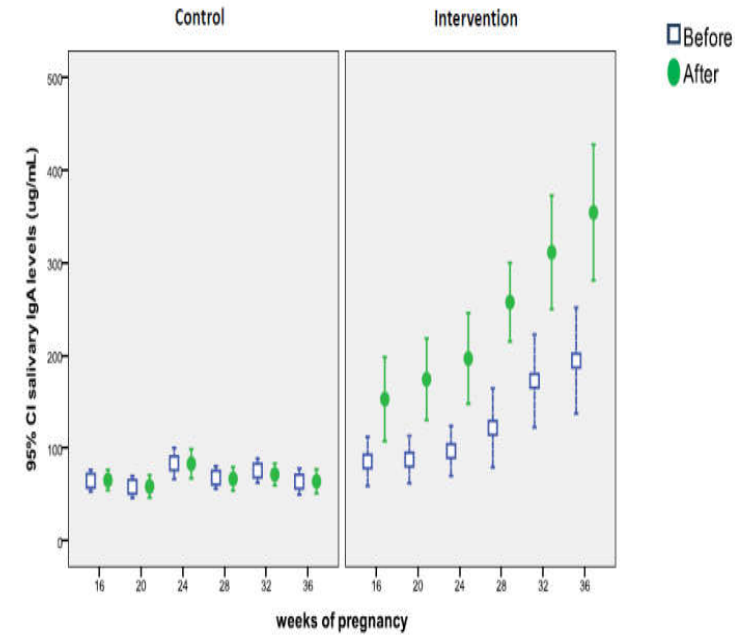
**Immediate effect**

# Results



Table 3. Comparison of aromatherapy massage on salivary Immunoglobulin A by GEE.

Variable	B	SE	Wald Chi-square	p	95% Confidence Interval	
					Lower	Upper
<b>Immunoglobulin A (<math>\mu\text{g/mL}</math>)</b>						
Group <sup>a</sup> (1 vs. 0)	20.712	13.761	2.265	0.132	- 6.260	47.684
Post <sup>b</sup> (1 vs. 0)	0.666	1.810	0.135	0.713	- 2.882	4.214
36 weeks vs. 16 weeks <sup>c</sup>	-1.135	7.199	0.025	0.875	- 15.246	12.975
32 weeks vs. 16 weeks <sup>c</sup>	10.713	5.921	3.273	0.070	- 0.894	22.319
28 weeks vs. 16 weeks <sup>c</sup>	2.804	4.972	0.318	0.573	- 6.941	12.549
24 weeks vs. 16 weeks <sup>c</sup>	17.520	6.191	8.007	0.005	5.385	29.656
20 weeks vs. 16 weeks <sup>c</sup>	- 5.051	4.815	1.101	0.294	- 14.490	4.388
Group x 36 weeks <sup>c</sup>	09.844	28.745	14.602	<0.001	53.504	166.183
Group x 32 weeks <sup>c</sup>	76.162	24.352	9.781	0.002	28.432	123.893
Group x 28 weeks <sup>c</sup>	33.446	23.084	2.099	0.147	- 11.799	78.691
Group x 24 weeks <sup>c</sup>	- 6.229	14.863	0.176	0.675	- 35.360	22.902
Group x 20 weeks <sup>c</sup>	7.093	9.854	0.518	0.472	- 12.222	26.407
Group <sup>a</sup> x post <sup>b</sup>	57.542	20.266	10.781	<0.001	26.821	106.264
36 weeks <sup>c</sup> x post <sup>b</sup>	- 0.350	2.530	0.019	0.890	- 5.310	4.611
32 weeks <sup>c</sup> x post <sup>b</sup>	- 4.846	2.180	4.941	0.026	- 9.119	- 0.573
28 weeks <sup>c</sup> x post <sup>b</sup>	- 1.863	2.639	0.499	0.480	- 7.036	3.309
24 weeks <sup>c</sup> x post <sup>b</sup>	- 0.163	2.285	0.074	0.785	- 5.103	3.856
20 weeks <sup>c</sup> x post <sup>b</sup>	- 0.892	2.287	0.152	0.697	- 5.375	3.591
Group x 36 weeks <sup>c</sup> x post <sup>b</sup>	92.933	34.183	7.391	0.007	25.935	159.931
Group x 32 weeks <sup>c</sup> x post <sup>b</sup>	76.304	23.523	10.522	<0.001	30.200	122.409
Group x 28 weeks <sup>c</sup> x post <sup>b</sup>	70.238	21.401	10.772	<0.001	28.294	122.409
Group x 24 weeks <sup>c</sup> x post <sup>b</sup>	33.082	23.892	1.917	0.166	- 13.747	79.910
Group x 20 weeks <sup>c</sup> x post <sup>b</sup>	20.184	12.181	2.745	0.098	- 3.692	44.060



Long-term effects

Immediate effect

GEE: Generalized estimating equations; B: Coefficient; SE: Standard error

p: Statistical significance was defined as  $p < 0.05$ .

<sup>a</sup> Group: 1 = intervention group; 0 = control group

<sup>b</sup> Post: Posttest minus pretest; 1 = posttest; 0 = pretest

<sup>c</sup> The reference category was baseline or 16 weeks of gestation.



# Main Findings in this Study

- Pregnant women's stress (salivary **cortisol levels**) significantly **decreased** after receiving aromatherapy massage (AM).
- Women's immune function (salivary **IgA levels**) significantly **increased** immediately after receiving AM.
- AM showed significant **long-term effects** on salivary **IgA** levels at 32 and 36 weeks GA.



# Other Findings and Suggestions

- Pregnant women's **stress (cortisol levels) increases as the pregnancy progresses**, and this is the normal physiological response to pregnancy.
- The **dosages of aromatherapy massage** that we provided to the pregnant women needed to **increase after 32 weeks GA**.
- We can infer the dosages need to be adjusted according to the pregnant woman's stress levels at different points,
  - may need to receive aromatherapy massage once week or twice a week.



# Study Strengths

- Outcome variables were **biological markers** of both salivary cortisol and IgA.
- **Saliva samples** were collected from the participants **every month from 16 to 36 weeks** gestation before and after aromatherapy massage.
- A longitudinal randomized control trial
- We used the **GEE** method's generalized linear models with 3-way interaction.



# Study Limitations

- Did not measure the long-term clinical outcomes or other physiological markers of immune and adrenal function
- Dose and frequency of AM may not be adequate to produce long-lasting effects on salivary cortisol levels
- Attrition rate was higher in intervention group than in control group because of the time required for the AM
- Sample size was small, and data were collected from only one hospital at Taipei.
- Results may not be generalized to pregnant women in other countries
- Only used lavender oil for massage and did not try other essential oils that might have had different treatment effects for pregnant women.
- Only examined the effects of the combined use of AM on salivary cortisol and IgA.
- There was no way to separate the effects of massage from the effects of the lavender oil.

# Conclusions

- Aromatherapy massage (AM) significantly benefited women **by immediately reducing their stress** and **strengthening their long-term immunity**.
- Maternity health care teams could work with **personnel certified** in AM and provide individualized stress-relief interventions to pregnant women based on their needs.
- The **educational programme** for midwifery could include **training** on complementary therapies and educate more midwives in providing AM or other complementary therapies to help promote health in pregnant women.

# Future Studies can....

- A design **four different intervention groups** (massage alone, massages with essential oil, essential oils alone, and routine care),
- Other clinical outcomes and physiological markers,
- Use **different essential oils** and compare their treatment effects.
- The **dosages** of the aromatherapy massage once week or twice a week.
- Compare the effects of various methods of aromatherapy, such as bathing, topical application, and foot soaks.



*Thank You for Your Listening*

