ASSOCIATION BETWEEN OBESITY AND SEROLOGIC RESPONSE TO INFLUENZA VACCINATION

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INTRODUCTION

- Immunosenescence contributes to an age-related decrease in antibody response to vacccination in older adults.
- Obesity was directly associated with serious disease and complications during the 2009 H1N1 influenza pandemic.
- *In vitro*, obesity is associated with altered cytokines, natural killer cell activity, CD4:CD8 T cell balance, and decreased proliferative response to antigenic stimulation.
- No studies have examined serologic response to influenza vaccination in obese vs. non-obese humans.

OBJECTIVE

- To determine whether obesity is associated with serologic response to influenza vaccination in adults ≥ 50 years old, after adjusting for age, comorbidities, and pre-vaccination antibody titer.

STUDY DESIGN

- Study Sites: Nashville, TN; Marshfield, WI
- Subjects: ≥ 50 years old
- Enrollment Period: Sept. – Oct. 2008
- Vaccination (TIV): A/Brisbane/59/2007 (H1N1), A/Brisbane/10/2007 (H3N2), B/Florida/4/2006
- Blood Collection: Pre-vaccination, 21 – 28 days post-vaccination, post-influenza season (Apr. 09)

METHODS

- Data Collection: Interview and/or chart review – age, comorbidities, sex, race, immunomodulating medications; height and weight measured for body mass index (BMI) calculation
- Laboratory: Serum antibody determined by hemagglutinin inhibition assay (HAI)
- Analytic Approach:

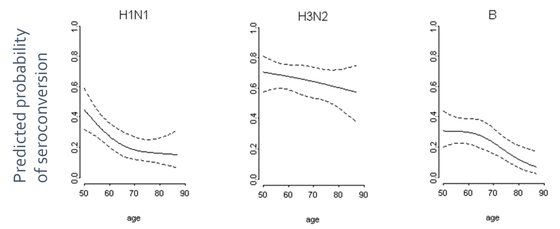
Definitions	Seroprotection = HAI titer ≥ 1:40
	Seroconversion = 4-fold increase in HAI pre- to post-vaccination
	Obese = BMI ≥ 30 kg/m^2, non-obese = BMI 18.5 – 24.99 kg/m^2
Logistic Regression	Independent variables = Seroprotection and Seroconversion
	Dependent variables = BMI (continuous and categorical), age (continuous), sex, comorbidities, pre-vaccination antibody titer

RESULTS

Participant Characteristics

		Vanderbilt (n=229)	Marshfield (n=186)	Combined (n=415)
	Age, yrs Median (IQR)	57 (55, 63)	73 (69, 78)	67 (57, 74)
Age Category	50-59	59%	0%	33%
	60-69	26%	26%	26%
	70+	15%	74%	41%
Sex	Female	67%	52%	60%
Race	White	94%	100%	97%
BMI, kg/m^2	Mean (SD)	28.8 (5.7)	29.4 (5.4)	29.0 (5.6)
	BMI ≥ 30	*38%*	*42%*	*40%*

Seroconversion by Age and Sub-type



Serologic Response, Non-Obese (n=250) vs. Obese (n=163) Participants

	H1N1		H3N2		B	
	BMI < 30	BMI ≥ 30	BMI < 30	BMI ≥ 30	BMI < 30	BMI ≥ 30
Seroconversion[1] *OR (95% CI)*	70 (28) *1.00*	46 (28) *0.90 (0.57, 1.44)*	155 (62) *1.00*	119 (73) ***1.63 (1.04, 2.55)***	71 (28) *1.00*	55 (34) 1.17 (0.75, 1.84)
Seroprotection[1] *OR (95% CI)*	107 (43) *1.00*	76 (47) *0.90 (0.55, 1.47)*	191 (76) *1.00*	133 (82) *1.32 (0.74, 2.37)*	237 (95) -[4]	154 (94) -[4]
Baseline GMT[2]	10.4 (9.4, 11.5)	12.1 (10.5, 14.0)	15.0 (13.0, 17.4)	15.3 (12.9, 18.2)	51.8 (45.1, 59.4)	56.5 (48.7, 65.4)
GMT-fold[3]	2.5 (2.2, 2.8)	2.4 (2.1, 2.8)	5.5 (4.8, 6.4)	7.4 (6.1, 8.9)	2.2 (2.0, 2.4)	2.4 (2.1, 2.8)

[1]n (%) [2]Pre-vaccination GMT (95% CI) [3]GMT-fold increase pre- to post vaccination (95% CI)
[4]Seroprotection against B subtype not modeled due to high proportion (94%) who were protected

SUMMARY

- 415 subjects completed all study visits
  - 65 ± 10 years old
  - 60% female
  - 16% reported >1 comorbid condition
  - BMI 29.0 ± 5.6 kg/m2
- Pre-vaccination GMT did not differ by age, sex, or BMI
- Comorbid conditions and sex had no impact on seroprotection or seroconversion
- Obesity was not independently associated with post-influenza vaccination seroprotection against any of the 2008-09 vaccine components
- Seroconversion to the H3N2 component was increased among obese subjects

DISCUSSION

- Observation that obese subjects had increased seroconveresion to the H3N2 subtype could be related to chance, or to increased leptin, leading to more robust serologic responses.
- Ability to detect consistent differences in antibody response by nutritional factors may have been limited by relatively healthy population.

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