

Breastfeeding history and childhood allergic status in a prospective birth cohort

Ganesa Wegienka, PhD*; Dennis R. Ownby, MD†; Suzanne Havstad, MA*; L. Keoki Williams, MD, MPH‡; and Christine Cole Johnson, PhD, MPH*

Background: Breastfeeding provides the best possible nutrition for newborns, but its role in the development of allergies is complex.

Objective: To examine the relationship between breastfeeding and early childhood skin sensitization.

Methods: In a birth cohort of 405 children from the Childhood Allergy Study, we used maternal report to classify children's duration of breastfeeding and whether they were breastfed only, formula fed only, or both. We examined the relationships between this information and childhood allergies as determined by skin prick testing for inhalant allergens at age 6 to 7 years.

Results: There was no association between duration of breastfeeding and risk of allergic sensitization. Overall, children who were breastfed only were 50% more likely to have allergic sensitization than those fed formula only (relative risk [RR], 1.5; 95% confidence interval [CI], 1.1–2.1). Although the estimates are imprecise, this RR was higher for children born to mothers reporting a history of allergy (RR, 1.8; 95% CI, 1.0–3.0) than for those born to mothers with no allergic history (RR, 1.3; 95% CI, 0.9–2.1), for children in households without (RR, 1.6; 95% CI, 1.1–2.2) vs with (RR, 1.0; 95% CI, 0.3–4.0) multiple pets, and for those with an older sibling (RR, 2.0; 95% CI, 1.2–3.3) vs firstborns (RR, 1.3; 95% CI, 0.8–2.1).

Conclusions: Breastfeeding without formula supplementation may be associated with an increased risk of childhood allergies. However, this association may vary with birth order, exposure to household pets, and maternal allergic history.

Ann Allergy Asthma Immunol. 2006;97:78–83.

INTRODUCTION

Mothers in the United States are strongly encouraged to exclusively breastfeed their infants for at least 6 months.^{1,2} If we consider breastfeeding in the context of the hygiene hypothesis, it may reduce the number of infectious diseases experienced by a child, which, in turn, may predispose a child to allergies. Meanwhile, the debate on the relationship between breastfeeding and the subsequent development of atopy has carried on for decades, sustained by conflicting research results.^{3,4} These inconsistent results may be attributable to the various methods of quantifying breastfeeding (exclusive breastfeeding vs formula supplementation, feeding duration categorization), differences in assessing outcomes (skin prick test [SPT] results, antigen specific IgE determination, self-report of atopic disorders or symptoms), the length of time between exposure and when individuals are asked to recall feeding history, age at outcome evaluation, and the differential impact of other important risk-related variables.

In 1988, Kramer³ outlined a list of 12 methodological standards for examining the relationship between breastfeeding and atopic disease. The criteria for evaluating studies,

which generally reflect the Bradford-Hill guidelines for causation, are short recall of breastfeeding experience, blind ascertainment of infant feeding history, sufficient duration of breastfeeding, sufficient exclusivity of breastfeeding, strict diagnostic criteria for atopic disease, blind outcome ascertainment, severity of outcome (in case breastfeeding lessens disease severity in the absence of prevention), age at onset of outcome (in case breastfeeding delays the onset), control of confounding, evaluation of a dose-response effect, evaluation of effect in children at high risk, and adequate statistical power. To our knowledge, no published study has met all these criteria.

To examine the association between breastfeeding and allergic status as determined by SPT with a battery of common inhalant allergens at the age of 6 to 7 years, we used data from a cohort of children followed up prospectively since birth. Although the data collection for this study was conducted before the publication of Kramer's criteria, our data fulfill most of its requirements. Unlike most published research, we used information on formula or supplemental feeding to better examine the relationship between breastfeeding and allergic sensitization. This information is critical in understanding this relationship because it may act as an effect modifier or as a confounding variable.

METHODS

Using the cohort of children from the Childhood Allergy Study (CAS) conducted among children in a health maintenance organization (Health Alliance Plan [HAP] in the Detroit, MI, area), we examined the breastfeeding history of

* Department of Biostatistics and Research Epidemiology, Henry Ford Health System, Detroit, Michigan.

† Department of Pediatrics, The Medical College of Georgia, Augusta, Georgia.

‡ Department of Internal Medicine, Henry Ford Health System, Detroit, Michigan.

Received for publication March 7, 2005.

Accepted for publication in revised form November 1, 2005.

each child and then examined its relationship to allergic sensitization status as determined by SPT at the age of 6 to 7 years. Briefly, the CAS is an ongoing study to evaluate the environmental determinants of pediatric allergy and asthma. All pregnant women 18 years or older living in a predefined geographic area who had an estimated date of confinement between April 15, 1987, and August 31, 1989, who were seeing providers at Henry Ford Health System as part of HAP, and who planned to deliver at the hospitals covered by HAP were invited to participate in the study. Only full-term infants (≥ 36 weeks gestation) were included in the study. Further details have been previously published.⁵

Of 1,194 women who were eligible for the CAS, 953 consented to participate. Infants from 106 of these women were not further enrolled in the study because their cord blood was not collected at delivery (part of the original protocol). Of the remaining 847 infants, 6 had cord blood that was believed to be contaminated by maternal blood, and 6 more were determined to be ineligible at subsequent review of eligibility criteria. Of the remaining 835 children, 484 (58%) underwent a clinical evaluation for allergic sensitization at the age of 6 to 7 years. It has been previously shown that the children who underwent clinical evaluation were not different compared with those who did not with respect to maternal and parental allergy and asthma histories, the presence of cats and dogs in the home, and parental education level.⁶ Also, the groups did not differ with respect to the prevalence of breastfeeding either overall or when we looked at the prevalence of breastfeeding within maternal education strata (data not shown). Of the 484 children evaluated, we had complete information on breastfeeding histories for 405 (84%).

Breastfeeding practices were collected from the children's mothers by telephone or at home visits at yearly intervals starting with the child's first birthday. Trained nurse interviewers asked the mothers whether they had breastfed the enrolled child and, if so, whether they were still breastfeeding and whether they supplemented with formula. Neither the type of formula nor the time the mother initiated supplementation was recorded. The mothers were also asked when they stopped breastfeeding the child. We categorized the duration of breastfeeding by combining adjacent 1-month intervals. This was completed before conducting the analysis.

Children were invited to undergo a clinical evaluation between their sixth and seventh birthdays. All clinical evaluations were performed by a single pediatric allergist (D.R.O.) in a research setting. The evaluation included a standardized history and physical examination and SPTs for *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, ragweed (*Ambrosia artemisiifolia*), dog, cat, bluegrass (*Poa pratensis*), and *Alternaria* (extracts from Bayer Biologics, Spokane, WA). Positive (histamine, 1 mg/mL) and negative (glycerosaline) controls were used. Tests were applied by the puncture method using a lancet (Bayer Biologics). A positive SPT reaction was defined as a wheal at least 2×2 mm greater than the negative control, with a flare of at least

10 mm. Children with 1 or more positive SPT results were classified as positive for allergic sensitization. At the time of the evaluation, the nurse recording the SPT results was not aware of whether the child had been breastfed.

We used 2×2 mm as the cutoff point for several reasons. First, the testing device we used was selected to minimize discomfort for the child, and this device yielded wheals that are initially smaller overall. Second, we conducted a sensitivity analysis using the positive (histamine) and negative (glycerosaline) controls to set a cutoff point and determined that a 2×2 -mm wheal provided the best discrimination for a positive test result. We used this definition in all previous publications from this cohort.

We used percentages and risk models for the analyses. Using "never breastfed" as a referent category, we calculated the relative risks (RRs) for the binary outcome of allergic sensitization (yes/no) at the age of 6 years. We examined the duration of breastfeeding and the use of supplemental formula. We used stratified analyses to evaluate potential effect modification. We used change in effect criteria (15%) in risk models to evaluate potential confounders. The following were evaluated for effect measure modification and confounding for all models and were taken from parental report in predelivery and annual interviews and medical record abstracts:

- *Child Care Before 1 Year of Age.* We collected specific information on whether the child attended any type of child care facility during the first year of life.
- *Maternal and Paternal Allergy Histories.* We evaluated each separately. Women were interviewed at enrollment, usually during the second trimester. They were asked whether a physician had ever diagnosed them as having "allergies" or told them that they had "hay fever" and whether they had ever had "immunotherapy (allergy shots)." Mothers who reported "yes" to any of these questions were classified as having an allergic history. A paternal allergic history was defined as the mother reporting the father being diagnosed as having "hay fever" or "allergies" in the past.
- *Fever Before 1 Year of Age.* This information is based on medical record review and parental report of fever before 1 year of age. Fever was defined as a rectal temperature of 38.3°C (101°F) or greater or its equivalent measured at another site.
- *Maternal and Paternal Smoking Status.* Each was evaluated separately and was based on self-reports.
- *Firstborn.* This information was taken from parental report of household composition.
- *Exposure to Dogs and Cats.* This information was taken from parental report of the child's exposure to cats and dogs in the first year of life and includes information on sources of exposure outside the home. We focused on those who had 2 or more cats or dogs compared with those who did not.

Analyses were performed using a statistical software package (SAS version 8.0, SAS Institute Inc, Cary, NC). The

institutional review board at Henry Ford Health System approved the original and ongoing studies, and written informed consent was obtained from each family.

RESULTS

Most of the parents of the children who underwent SPT had formal education beyond high school (>61%). Almost all the parents described themselves as white, non-Hispanic (96%). Of the 405 children in the analysis, 197 were boys (49%) and 208 were girls (51%). Of the 405 mothers for whom we had reported breastfeeding status (ever or never) and complete child follow-up, 257 (63%) reported ever breastfeeding their infants; 26% of all the women breastfed the recommended 6 or more months, although not all breastfed exclusively. A maternal history of allergies was not associated with reported breastfeeding practices (formula alone, formula and breastfeeding, breastfeeding alone) or with pet keeping (data not shown).

Children who were breastfed were not less likely to test positive for allergic sensitization at the age of 6 to 7 years compared with children who were never breastfed (RR, 1.3; 95% confidence interval [CI], 0.9–1.7; never breastfed is the referent). There were no significant associations between duration of breastfeeding and risk of allergic sensitization (Table 1). Child care exposure before the age of 1 year, maternal allergic history, paternal allergy history, fever before 1 year of age, maternal smoking, paternal smoking, being firstborn, and exposure to dogs and cats were neither effect modifiers nor confounders of these associations. Of the 259 breastfeeding mothers, 105 (41%) gave their children supplemental formula at some point before weaning. However, women who breastfed the longest were the least likely to supplement (Table 1).

Children who were breastfed and not given supplemental formula were 50% more likely to have at least 1 positive SPT reaction compared with those fed formula only (RR, 1.5; 95% CI, 1.1–2.1). The risk of allergic sensitization was not appreciably different for children who were breastfed and given supplemental formula compared with those who were given formula only (RR, 0.9; 95% CI, 0.6–1.4). These associations were similar even after we stratified by the recommended duration of breastfeeding (≥6 months) (Table 2) and after the data were further divided into those breastfed 3 months or

Table 2. Associations Among Breastfeeding, Supplemental Feeding, and Allergic Sensitization: Childhood Allergy Study, Detroit, MI

Breastfeeding and formula use	Relative risk (95% CI) of allergic sensitization	Children, No.
Formula only	Referent	146
Breastfeeding and formula		
<6 mo breastfeeding	1.0 (0.6–1.6)	54
≥6 mo breastfeeding	0.9 (0.5–1.6)	51
Breastfeeding only		
<6 mo	1.6 (1.1–2.2)	98
≥6 mo	1.3 (0.9–2.1)	56

Abbreviation: CI, confidence interval.

less, 4 to 5 months, and at least 6 months (data not shown). Child care before the age of 1 year, fever before the age of 1 year, paternal history of allergies, maternal smoking status, and paternal smoking status were neither effect modifiers nor confounders of these associations. In addition, 3 covariates had at least 1 significant RR in at least 1 stratum: maternal allergic history, being firstborn, and the presence of multiple pets in the household (<2 vs ≥2 cats or dogs) (Table 3). Although precision was limited by the sample size, we explored these potential effect modifiers using stratified associations.

The RR of allergic sensitization in children who were breastfed only compared with those who were given formula only was greater among children of women with a history of allergy compared with those whose mothers did not have a history of allergy. However, the 95% CIs did overlap. Among those without multiple pets in the home (<2 cats or dogs), the data also suggest that children who were breastfed only were more likely to be positive for allergic sensitization than those who were given formula only. Among those with multiple pets in the household, elevated risks were not found for any level of breastfeeding. Also, among children who had older siblings, those who were breastfed only were almost twice as likely to be allergic compared with those who were never breastfed. The 95% CIs did not exclude 1.0 among those who were firstborn. Again, the numbers were small and the stratum-specific estimates were not extremely precise. Child care

Table 1. Associations Between Duration of Breastfeeding and Allergic Sensitization: Childhood Allergy Study, Detroit, MI*

Duration of breast feeding, mo	Women, No. (%) (n = 403)	Children with allergic sensitization, %	Children given supplemental feedings, %	Relative risk (95% CI) of allergic sensitization
Never	146 (36)	27	NA	Referent
0–1	58 (14)	40	57	1.5 (1.0–2.3)
2–3	46 (11)	33	64	1.2 (0.7–2.0)
4–5	46 (11)	37	70	1.4 (0.9–2.2)
6–9	51 (13)	37	67	1.4 (0.9–2.2)
≥10	56 (14)	23	35	0.9 (0.5–1.5)

Abbreviations: CI, confidence interval; NA, not applicable.

* Excludes 2 children who were breastfed but had no information on duration of breastfeeding.

Table 3. Associations Among Breastfeeding, Supplemental Feeding, and Allergic Sensitization for Specific Maternal and Childhood Characteristics: Childhood Allergy Study, Detroit, MI*

Breastfeeding and formula use	Relative risk (95% CI) of allergic sensitization					
	Maternal history of allergies	No maternal history of allergies	Multiple household pets	No multiple household pets	Older siblings	Firstborn
Formula only	Referent n = 52	Referent n = 94	Referent n = 17	Referent n = 129	Referent n = 81	Referent n = 49
Breastfeeding and formula	0.9 (0.4–1.9) n = 40	0.9 (0.6–1.6) n = 65	0.5 (0.1–2.6) n = 23	1.1 (0.7–1.6) n = 82	1.1 (0.6–2.1) n = 51	0.6 (0.3–1.3) n = 38
Breastfeeding only	1.8 (1.0–3.0) n = 64	1.3 (0.9–2.1) n = 89	1.0 (0.3–4.0) n = 22	1.6 (1.1–2.2) n = 132	2.0 (1.2–3.3) n = 62	1.3 (0.8–2.1) n = 74

Abbreviation: CI, confidence interval.

* One mother had no information on allergic history; 50 children had no information on birth order.

before the age of 1 year, fever before the age of 1 year, paternal history of allergies, maternal smoking status, and paternal smoking status were not confounders of these associations.

We repeated the analyses for 2 additional outcomes: (1) using a 3×3 -mm wheal cutoff value for a positive SPT reaction and (2) requiring at least 2 positive SPT reactions (2×2 -mm wheal) to define allergic sensitization. Neither appreciably changed the results.

DISCUSSION

Children who were breastfed only were at an increased risk of allergic sensitization to common aeroallergens during childhood compared with those who were never breastfed. Our data indicate that duration of breastfeeding did not meaningfully affect risk of allergic sensitization at the age of 6 to 7 years when breastfed children were compared with those never breastfed. However, those who received supplemental feedings in addition to breast milk were not at increased risk. Also, the increase in risk associated with the exclusion of supplemental formula may possibly be modified by maternal history of allergies, the presence of pets (dogs or cats) in the household, and birth order. Although we did not have sufficient numbers to more precisely detail these relationships, we look forward to seeing these stratum-specific estimates from other studies of the role of breastfeeding in allergic status.

The relationship between breastfeeding and subsequent development of allergies is complex. Breast milk does indeed provide ideal nutrition and advantages regarding general health, growth, and development, as well as psychological and social benefits.⁷ We are not saying that children should not be breastfed to prevent allergic disease—breastfeeding provides ideal nutrition, and that is not up for debate. However, if a specific subset of breastfed children is at higher risk for skin sensitization or perhaps other allergic diseases, this may indicate a greater need for close observation of these children for symptoms of allergic diseases and, thus, potentially allow for earlier intervention in symptom and disease management or even allow for a new intervention, such as supplementation, that could be targeted to this group.

Our findings are consistent with those of previous studies^{8–10} that have not found breastfeeding to be associated with a reduced risk of allergies. One year after birth, we asked the mothers about breastfeeding; this recall period was shorter than that in most other studies.^{8,10–12} Our outcome of SPT was a more objective measure compared with self-report or parental report of allergies or hay fever for the child. Some studies have used SPT^{9,11,13} and others have relied on parental report of allergic symptoms^{8,10,12,14} to classify the children's allergic status. In our research, as with most other studies,^{8–10,12,14} parental allergic histories were based on self-report. We performed clinical testing on inhalant allergens only. In children aged 6 to 7 years, inhalant allergens represent most of the burden of allergic disease compared with food allergies. They are also the greatest predictors of subsequent morbidity¹⁵ and are far less avoidable compared with food allergies.

We acknowledge that a positive SPT reaction may not mean that allergic disease is clinically present. Conversely, it is difficult to classify allergic disease from questionnaires about symptoms of allergic disease. Use of specific symptoms could easily introduce “disease status” misclassification. We also acknowledge the limitations associated with using parental report of allergic disease diagnosis in classifying their allergic history. However, unless breastfeeding status was associated with parental allergic status misclassification (differential misclassification), it would be highly unlikely that misclassification could bias our results. In theory, there may be self-selection by mothers with allergies to breastfeed or not. However, in our data, rates of self-reported maternal allergic status did not vary by whether the child was breastfed (36% of those who did not breastfeed and 40% of those who did breastfeed reported a maternal allergic history). We could not examine the relationship between breastfeeding and current (prevalent at the age of 6–7 years) atopic asthma. We did not have enough children with atopy (positive SPT reaction) and current asthma (previous physician diagnosis and asthma symptoms in the past 12 months) to study this important outcome in a similarly rigorous manner.

We also collected information about supplemental feeding, as some, but not all, other studies have done.^{8–10,13,14} Based on

our findings, this is likely an important effect modifier that, if not considered, might obfuscate results. Use of supplemental feedings may actually be a proxy measure for other factors, such as increased exposure to microbes that may affect the development of allergies. Although we collected information on whether the mothers gave their infants supplemental feedings, we did not have detailed information on when they started the supplemental feedings, the type of supplemental formula used, and the frequency of the supplemental feedings across time.

We met many, but not all, of Kramer's 12 proposed standards.³ We have no information on severity of allergy or age at onset of allergic sensitization as determined by SPT (other than by the age of 6 years). The size of the original cohort limits our ability to provide precise estimates of effects in subpopulations of children. However, this does not diminish the validity of our findings. We had good exposure evaluation (timely, information on supplemental feeding) and an objective outcome evaluation by an allergist who was blind to exposure status, as well as detailed information about potential effect modifiers and confounders that were considered in the analyses. However, more details about feeding would have been helpful, including the time of formula introduction, the frequency and amount of supplementation, the types of formula used, and the timing of solid food or cereal introduction.

The role of breastfeeding in the overall health of children is complex. Breastfeeding provides nearly ideal nutrition for infants and may reflect many exposures, such as a mother's immune function, diet, antibiotic drug use, and allergic history. Breast milk, in turn, affects infection and gut flora in the child,^{2,16} which, in turn, could affect the child's tendency to become allergic¹⁷ and susceptibility to other risk factors. The results of the study by Wright et al,¹⁸ who reported that specific skin sensitization (7 common allergens examined) in the mother was associated with specific sensitization in the child only if the child had been breastfed, support the conclusion of a role for breast milk in skin sensitization. We found an association between early antibiotic drug use and allergic sensitization only among breastfed infants in this cohort.¹⁹ However, fever before the age of 1 year, which we found to be protective,²⁰ did not affect the relationships we found in the present study among breastfeeding, supplementation, and skin sensitization results. Breastfeeding helps prevent infections in infants, and this protection against infections, in highly developed countries, may result in an increased risk of allergies in some maternal-child dyads. According to the hygiene hypothesis, infections early in life shift or alter the development of the immune system in such a way that the risk of allergies is reduced. By reducing infections, particularly in children less likely to be exposed to infectious agents or bacterial products, exclusive breastfeeding may allow the developing immune system to maintain the predisposition toward atopy that is present at birth.

We acknowledge the limitations of these data, but we also think that they have value in the scope of answering the

important research question about the relationship between breastfeeding and allergic disease. Although no study, to our knowledge, has evaluated the roles of all the paths of the complex network of causality, we addressed some of the relationships in this analysis. Breastfeeding is an important aspect of a child's experience that must be thoroughly investigated in the pursuit to fully understand the causal web of allergic disease. Having learned from this experience, we developed a detailed feeding questionnaire that we are using in a new cohort study. We encourage other researchers to also collect such important information.

REFERENCES

1. Queenan JT. Breastfeeding: it's an important gift [editorial]. *Obstet Gynecol.* 2003;102:3–4.
2. Heining MJ. Host defense benefits of breastfeeding for the infant: effect of breastfeeding duration and exclusivity. *Pediatr Clin North Am.* 2001;48:105–123.
3. Kramer MS. Does breast feeding help protect against atopic disease? biology, methodology, and a golden jubilee of controversy. *J Pediatr.* 1988;112:181–190.
4. Bottcher MF, Jenmalm MC. Breastfeeding and the development of atopic disease during childhood. *Clin Exp Allergy.* 2002;32:159–161.
5. Ownby DR, Johnson CC, Peterson EL. Maternal smoking does not influence cord serum IgE or IgD concentrations. *J Allergy Clin Immunol.* 1991;88:555–560.
6. Ownby DR, Johnson CC, Peterson EL. Exposure to dogs and cats in the first year of life and risk of allergic sensitization at 6 to 7 years of age. *JAMA.* 2002;288:963–972.
7. American Academy of Pediatrics Work Group on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics.* 1997;100:1035–1039.
8. Taylor B, Wadsworth J, Golding J, Butler N. Breast feeding, eczema, asthma, and hayfever. *J Epidemiol Community Health.* 1983;37:95–99.
9. Sears MR, Greene JM, Willan AR, et al. Long-term relation between breastfeeding and development of atopy and asthma in children and young adults: a longitudinal study. *Lancet.* 2002;360:901–907.
10. Miyake Y, Yura A, Iki M. Breastfeeding and the prevalence of symptoms of allergic disorders in Japanese adolescents. *Clin Exp Allergy.* 2003;33:312–316.
11. Kaufman HS, Frick OL. The development of allergy in infants of allergic parents: a prospective study concerning the role of heredity. *Ann Allergy.* 1976;37:410–415.
12. Aberg N, Engstrom I, Lindberg U. Allergic diseases in Swedish school children. *Paediatr Scand.* 1989;78:246–252.
13. Oddy WH, Holt PG, Sly PD, et al. Association between breast feeding and asthma in 6 year old children: findings of a prospective birth cohort study. *BMJ.* 1999;319:815–819.
14. Kull I, Wickman M, Lilja G, Nordvall SL, Pershagen G. Breast feeding and allergic diseases in infants: a prospective birth cohort study. *Arch Dis Child.* 2002;87:478–481.
15. Sears MR, Greene JM, Willan AR, et al. A longitudinal, population-based, cohort study of childhood asthma followed to adulthood. *N Engl J Med.* 2003;349:1414–1422.
16. Rubaltelli FF, Biadaioli R, Pecile P, Nicoletti P. Intestinal flora in breast- and bottle-fed infants. *J Perinat Med.* 1998;26:186–191.

-
17. Kalliomaki M, Kirjavainen P, Eerola E, et al. Distinct patterns of neonatal gut microflora in infants in whom atopy was and was not developing. *J Allergy Clin Immunol.* 2001;107:129–134.
 18. Wright AL, Stern DA, Holonen M. The association of the allergic sensitization in mother and child in breast-fed and formula-fed infants. *Adv Exp Med Biol.* 2001;501:249–255.
 19. Johnson CC, Ownby D, Alford SH, et al. Antibiotic exposure in early infancy and risk for childhood atopy. *J Allergy Clin Immunol.* 2005;115:1218–1224.
 20. Williams LK, Peterson, E, Ownby D, Johnson CC. The rela-

tionship between early fever and allergic sensitization at age 6 to 7 years. *J Allergy Clin Immunol.* 2004;113:291–296.

Requests for reprints should be addressed to:

Ganesa Wegienka, PhD

Department of Biostatistics and Research Epidemiology

Henry Ford Health System

1 Ford Place, 3E

Detroit, MI 48202

E-mail: gwegien1@hfhs.org
