Null Results in Brief

No Association of Meat, Fish, and Egg Consumption with Ovarian Cancer Risk

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Introduction

Ecologic and migration studies showed positive correlations between meat and egg consumption and rates of ovarian cancer (1, 2). Although these data suggest that environmental factors are of importance in the etiology of ovarian cancer, they are seriously confounded by other aspects of diet, other lifestyle factors, and economic development. Prospective cohort studies can better control for possible confounding factors. To date, however, only two prospective cohort studies have examined meat and egg consumption in relation to ovarian cancer incidence (3, 4). These two studies reported no significant association between meat consumption and ovarian cancer risk, but found an increased risk associated with high consumption of eggs (3, 4). Cohort data on fish consumption and risk of ovarian cancer are currently lacking. In the present analysis, we sought to prospectively examine the association of meat, fish, and egg consumption with incidence of ovarian cancer in the population-based Swedish Mammography Cohort.

Materials and Methods

Details of the Swedish Mammography Cohort have been described elsewhere (5). Briefly, this population-based cohort was established in 1987 to 1990, when all women of ages 40 to 76 years, living in Uppsala and Västmanland Counties, central Sweden, received a questionnaire by mail that solicited data on diet (along with data on parity, weight, height, and educational level). In total, 66,651 women, representing 74% of the source population, returned a completed questionnaire. A follow-up questionnaire sent to all surviving participants in 1997 was expanded to include information on lifestyle factors. Diet was assessed at baseline and in 1997 using food frequency questionnaires. In a validation study of the baseline dietary questionnaire among 129 women randomly selected from the cohort, the Spearman correlation coefficients between values obtained from the questionnaire and dietary records ranged from 0.3 to 0.7 for individual red meat items and were 0.5 for fatty fish, 0.4 for lean fish, and 0.5 for egg.

For this analysis, women were included if they completed the baseline questionnaire and had an energy intake within 3 SD from the loge-transformed mean energy intake in the cohort. We excluded women with a previous cancer diagnosis, a bilateral oophorectomy, or a hysterectomy with unknown number of ovaries removed at baseline. This left 61,057 women who were followed up from March 1987 to the date of an ovarian cancer diagnosis, death, or a bilateral oophorectomy, or until June 30, 2004. Incident cases of epithelial ovarian cancer were ascertained by linkage to the Swedish Cancer Registry. This study was approved by the Ethics Committees at the Uppsala University Hospital and the Karolinska Institutet, Stockholm.

To provide the best estimate of long-term diet, we used the baseline diet for the follow-up from March 1987 through 1997, and the average of the baseline and 1997 diet for the follow-up from 1998 through June 2004. The data conformed to the proportional hazards assumptions, and we estimated age-adjusted and multivariate rate ratios (RR) with 95% confidence intervals (95% CI) using Cox proportional hazards models stratified on age in months at start of follow-up and year of entry into the cohort. Tests for trend were conducted by assigning the median value to each exposure category and modeling this variable as a continuous variable. All P values were two-sided. We had 80% power to detect a RR of ≥1.6 for the highest versus the lowest quartile (z = 0.05).

Results

During an average follow-up of 14.7 years, 288 women were diagnosed with invasive epithelial ovarian cancer. We observed no significant association between consumption of red meat, fish, or egg and incidence of total epithelial ovarian cancer (Table 1). In further analyses, consumption of red meat, fish, or egg had no significant relationship with either serous or nonserous ovarian cancer (data not shown). The findings remained unchanged after we excluded cases diagnosed during the first 2 years of follow-up. We also observed no significant association when only the baseline consumption was analyzed. We conducted additional multivariate analyses stratified by potential risk factors for ovarian cancer, including age, body mass index, and the use of oral contraceptives and postmenopausal hormones. There was no evidence of an association with red meat, fish, or egg consumption in any subgroup. When we examined individual red meat items, we observed a statistically nonsignificant positive association between sausage consumption and ovarian cancer risk (P for trend = 0.24). The multivariate RR for women who consumed two or more servings of sausage per week compared with those who rarely or never consumed sausage was 1.37 (95% CI, 0.83-2.24).
In this large population-based prospective cohort study, we observed no significant association between consumption of red meat, fish, or egg and risk of ovarian cancer. Our finding for red meat is broadly consistent with those from two previous cohort studies showing no significant association of red meat (3) or total meat (4) consumption with ovarian cancer risk. In contrast to those two cohort studies and some (6, 7), but not all (8, 9), case-control studies, we did not find a positive association between egg consumption and risk of ovarian cancer. Case-control studies of fish consumption and ovarian cancer risk have yielded mixed results (6, 8, 9).

Important strengths of our study include its large sample size, the population-based design, and the completeness of case ascertainment through the Swedish Cancer Registry. The analyses were based on prospectively collected data, thus eliminating the potential for recall and selection biases. Additionally, repeated dietary assessment reduced random within-person variation in the measurement of food intake and took into account changes in eating behavior. However, error in the measurement of food intake cannot be discounted. Nondifferential misclassification tends to attenuate true associations and we cannot rule out that the absence of significant associations in the present study was due to such error.

In conclusion, our findings suggest that consumption of red meat, fish, or egg is unlikely to have any considerable influence on the risk of ovarian cancer in middle-aged and older women.

### References


### Table 1. Rate ratios of epithelial ovarian cancer according to consumption of red meat, fish, and egg

|                      | No. cases | Person-years | Age-adjusted RR (95% CI) | Multivariate RR (95% CI) *
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Red meat, servings/wk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 (1.5)</td>
<td>91</td>
<td>286,110</td>
<td>1.00 (reference)</td>
<td>1.00 (reference)</td>
</tr>
<tr>
<td>2.0 to &lt;3.0 (2.5)</td>
<td>55</td>
<td>183,792</td>
<td>0.84 (0.60-1.17)</td>
<td>0.86 (0.62-1.21)</td>
</tr>
<tr>
<td>2.0 to &lt;4.0 (3.0)</td>
<td>96</td>
<td>260,028</td>
<td>1.23 (0.89-1.70)</td>
<td>1.31 (0.94-1.82)</td>
</tr>
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<td>≥4.0 (5.0)</td>
<td>46</td>
<td>169,171</td>
<td>0.92 (0.65-1.30)</td>
<td>1.01 (0.70-1.46)</td>
</tr>
<tr>
<td><em>P</em> for trend</td>
<td>0.62</td>
<td></td>
<td></td>
<td>0.27</td>
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<tr>
<td><strong>Fish, servings/wk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt;1.0 (0.5)</td>
<td>92</td>
<td>293,106</td>
<td>1.00 (reference)</td>
<td>1.00 (reference)</td>
</tr>
<tr>
<td>1.0 to &lt;2.0 (1.5)</td>
<td>89</td>
<td>286,383</td>
<td>1.03 (0.77-1.39)</td>
<td>1.08 (0.79-1.46)</td>
</tr>
<tr>
<td>2.0 to &lt;3.0 (2.5)</td>
<td>46</td>
<td>134,374</td>
<td>1.02 (0.71-1.48)</td>
<td>1.04 (0.71-1.52)</td>
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<tr>
<td>≥3.0 (3.0)</td>
<td>61</td>
<td>185,237</td>
<td>1.01 (0.72-1.41)</td>
<td>1.08 (0.75-1.55)</td>
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<tr>
<td><em>P</em> for trend</td>
<td>0.97</td>
<td></td>
<td></td>
<td>0.69</td>
</tr>
<tr>
<td><strong>Egg, servings/wk</strong></td>
<td></td>
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</tr>
<tr>
<td>&lt;0.5 (0.5)</td>
<td>97</td>
<td>309,509</td>
<td>1.00 (reference)</td>
<td>1.00 (reference)</td>
</tr>
<tr>
<td>0.5 to &lt;2.0 (1.0)</td>
<td>93</td>
<td>305,791</td>
<td>0.99 (0.74-1.32)</td>
<td>1.01 (0.75-1.36)</td>
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<td>2.0 to &lt;3.0 (2.5)</td>
<td>80</td>
<td>223,717</td>
<td>1.08 (0.80-1.47)</td>
<td>1.10 (0.80-1.52)</td>
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<td>≥3.0 (5.0)</td>
<td>18</td>
<td>60,084</td>
<td>0.90 (0.54-1.50)</td>
<td>0.93 (0.55-1.57)</td>
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<td><em>P</em> for trend</td>
<td>0.98</td>
<td></td>
<td></td>
<td>0.95</td>
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*Multivariate RRs were adjusted for age (in months), body mass index (in quartiles), educational level (less than high school, high school, university), parity (nulliparous, 1-2, ≥3 children), use of oral contraceptives (ever or never) and postmenopausal hormones (ever or never), total energy intake (continuous), and quartiles of consumption of fruits, vegetables, and dairy products.

1 Beef or pork as a main dish.
2 Values in parentheses are medians.
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