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Adventist Health Study-2  
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## Investigating the Microbiome in AHS-2

You have probably heard that it is important to maintain a healthy balance of beneficial bacteria in the gut and that probiotics can help to promote a normal flora. In Adventist history, Dr. John Harvey Kellogg of the Battle Creek Sanitarium warned about “putrefaction” and “auto-intoxication” in the colon caused by unhealthy foods—perhaps rather prematurely from a scientific perspective.

Recently, this old idea has become a hot topic in biomedical research once again—being labelled the microbiome. Why? The key is the last part of that word—“-ome”, just like genome. Scientists have developed powerful new techniques, to identify thousands of different species and strains of bacteria living in our bodies (the microbiome), by looking at their genes. We can identify which microbes are present and in what abundance, and detect what kind of metabolic functions these bacteria have. This approach is much more complete and accurate than the old-way of growing the bacteria on small dishes in the laboratory.



### AHS-2 has an exciting new opportunity to study the connection between diet, the microbiome and health.

AHS-2 has an exciting new opportunity to study the connection between diet, the microbiome, and health.

A pilot study is beginning in collaboration with the National Cancer Institute in which we will ask 400 AHS- 2 participants to provide a small smear of stool and saliva. These samples will be mailed back to us so that we can determine the microbiome for each participant and search for differences related to diet.

If this approach proves successful, we hope to test a large number of

AHS-2 participants, then look for patterns related to the risk of cancer and other diseases, such as diabetes, heart disease, and obesity.

**If you would like to be part of this new and exciting pilot study, please email us to [ahs2@llu.edu](mailto:ahs2@llu.edu) or call 1-800-247-1699.**

## Remembering Your Old Eating Habits



Diet affects the risk of cancer. But *which* diet? It may be a diet from 10-20 years ago. How well do people remember their past eating habits? We were able to test this among a group of Californians who were part of AHS-1, a study from 37 years ago, and who are also now AHS-2 members. This was by comparing recollections about their diets 37 years ago to the actual records from that time.

We concentrated on animal foods that allowed us to categorize people as vegans, lacto-ovo-, pesco-, semi- or non-vegetarians. Most of the original lacto-ovo- and non-vegetarian members recalled their diets quite accurately. However, it was interesting that many who were originally lacto-ovo-vegetarians (but at the lower end of dairy/egg consumption) recalled themselves as having been vegan. Similarly, many who had originally been non-vegetarian (but were at the lower end of meat consumption) recalled themselves as either pesco-vegetarians (no meat, only fish) or semi-vegetarians (meats less than once weekly but more than once monthly).

This means that some who recalled themselves as vegans, pesco-, and semi-vegetarians actually had belonged at the lower end of the adjoining “less vegetarian” categories. Nevertheless, we can use these recalls about vegetarian habits from long ago to provide approximately correct results which was encouraging.

Dear AHS-2 Member,  
We hope that you enjoy reading this, our 10th annual newsletter. As promised, we have included study results and materials that have been recently published or accepted for publication. These findings, made possible by your participation, have already attracted the attention of major news outlets.



Gary E. Fraser, MD, PhD

To capitalize on the great potential of this study to provide information about diet and disease, we are actively expanding the focus from cancer to other diseases. Several grant applications have been submitted to the National Institutes of Health (our main funding agency). The process is highly competitive, but we are confident that with persistence, success is likely. The AHS-2 study now involves faculty from several schools at Loma Linda University aside from its base within the School of Public Health, a development that we welcome.

It is important that I point out that the on-going success of this study will always depend heavily on your continued active involvement. We are seeking additional funds to help us communicate with you more effectively and regularly using the mail, e-mail (with your help in updating our email database), and regular phone contacts. However, you can appreciate that the cost of every communication must be multiplied by about 85,000 (the approximate number of surviving study members).

We continue to be most grateful for the continued responses to our short questionnaires that come every two years, and for the usually gracious response to occasional telephone contacts. As you can see we are already finding interesting and unique new information about diet and risk of cancer, and are now exploring the effects of tomatoes, particular meat products, n-3 fatty acids, and soy foods. Much more is to come.

*With our thanks and best wishes for continued good health,*

**Gary E. Fraser, MD**  
*Principal Researcher*

Loma Linda University School of Public Health

## Dietary Patterns and Mortality

The first Adventist Health Study (AHS-1) identified five longevity factors in the AHS-1 population, one of which was eating a vegetarian diet. In the much larger and more diverse AHS-2 study, we also explored associations of dietary patterns with the risk of death, adjusting for many other lifestyle and medical factors that may differ between these groups. Results were published in the summer of 2013 in *JAMA International Medicine* and received extensive coverage in the media, with publicity in magazines and newspapers.

The vegetarians, taking account of vegans, lacto-ovo-pesco-, and semi-vegetarians, make up about 50 percent of the study group, with the others being non-vegetarian. Overall, vegetarians have a 12 percent relative reduction in risk of death from natural causes during the study period compared to non-vegetarians, a result that is statistically significant and not likely due to chance.

Different types of vegetarians all did better than the non-vegetarians, but among vegetarians, the vegans and pesco-vegetarians seemed to fare best of all, although the differences between these groups could yet be due to chance.

**Vegetarian diets were especially associated with reductions in death from cardiovascular diseases, kidney failure, and diabetes; and these reductions were greater in men.**

Several other large studies have published results recently linking increased consumption of red and processed meats to higher rates of mortality in their study groups. If the results from our study are truly caused by differences in diet, as seems likely, they may be due to a reduction in meat consumption, a reduction in other unhealthy foods in vegetarian groups, a higher consumption of many healthy plant foods among vegetarians, or a combination of all of these factors.

The main goal of AHS-2 is to find associations between diet and risk of certain cancers. In the U.S. cancers of the colon and rectum cause more deaths each year than any other cancer, except for lung cancer.

Of course, a unique aspect of the AHS-2 population is a large number of different types of vegetarians and non-vegetarians. Other studies have sometimes, but not always, linked higher consumption of red and processed meat, and lower consumption of foods high in dietary fiber, to an increased risk of colorectal cancer. As our vegetarian groups eat little to no meat and much more fiber than our non-vegetarian group, we expected to see an association between vegetarian diets and lower risk of colorectal cancer. Interestingly, however, no such association was found in a large British study containing many vegetarians.

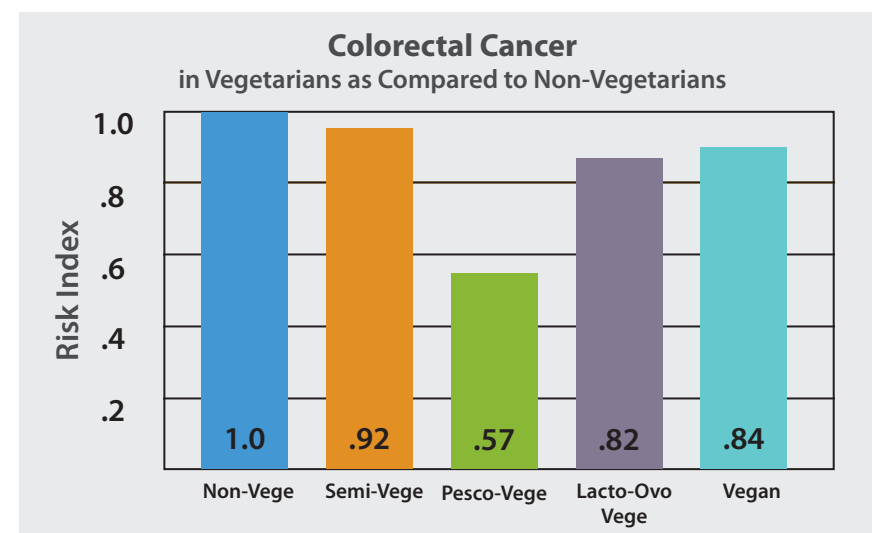
## Dietary Patterns and Colorectal Cancer

We recently published findings from AHS-2 in a high profile medical journal (*JAMA Internal Medicine*). During a follow-up time of 7 years, we found 380 new cases of colon and 110 new cases of rectal cancer. Comparing all vegetarians, as a group, to non-vegetarians, and after adjusting for differences in other lifestyle and medical factors, we found a 22 percent reduction in risk for colorectal cancer among the vegetarians that was not likely to be a chance finding.

Actually, the largest reduction in risk appeared to be in the pesco-vegetarian group (a 43 percent reduction compared to non-vegetarians), but it was still not clear that this was really different from the reduction in risk among other vegetarians. The reduction in risk among vegetarians appeared to be similar for both colon and rectal cancer, among both men and women, and in both black and white study members.

**Vegetarians in our study population tend to have lower risk of colorectal cancer.**

In summary, vegetarians in the AHS-2 have lower risk of colorectal cancer. We will next explore in more detail just which meats may increase risk of this cancer, or which plant foods may decrease risk.



## Do the Diets of Different Adventists Really Differ All that Much?



We often focus at the AHS-2 on differences in the consequences of various dietary patterns that are well-known within Adventism. It is striking that on average there are large differences in body fatness between these vegetarian/non-vegetarian groups. Yet interestingly there are NOT large differences in caloric intakes. Although vegans and pesco-vegetarians do exercise a little more than others, it seems possible that the same calories “packaged differently” may follow different metabolic pathways that result in more or less fat storage.

Do these different dietary groups really eat all that differently? They are distinguished only by consumption of dairy products, eggs and meats. If caloric intakes are similar, the absence or near absence of animal foods in some groups implies that other foods coming from plants are being substituted. So these groups also differ in the consumption of plant foods hence the intake of many phytochemicals (plant chemicals). This may affect risk of many chronic diseases just as importantly as does the absence of meats

Generally, the non-vegetarians consumed the least of fruit, vegetables, whole grains, soy, other legumes, nuts and seeds, and water but of course consumed the highest amounts of meat (including fish), eggs, and dairy products. What is not so obvious is that they also consumed more added fats, sweets, snacks and beverages. Conversely, vegans (and other vegetarians to a lesser extent) ate greater

quantities of all plant foods but smaller amounts of added fats (especially solid fats), sweets and soft drinks—and also drank more water. Clearly, many vegetarians care about their diets in ways that go beyond the avoidance of animal foods.

**Many vegetarians are people who care about their diets in ways that go beyond avoidance of animal foods.**

As expected, differences in the intakes of vitamins, fatty acids and minerals were also found in these comparisons. Vegans differed from non-vegetarians by having lower intakes of saturated fat, arachidonic acid, and trans-fatty acids, and higher intakes of soy, dietary fiber, carotenoids, and vitamin C. Vegans also had lower intakes of calcium than other groups—to a moderate extent. After considering B12 supplemental use however, intakes of B12 were similar to other groups, although a few vegans do not supplement adequately and are at risk of deficiency. Non-vegetarians, women and white study members were more likely to use supplements. Black study members consumed much less dairy and somewhat more soy.

| Food                  | Vegans | Lacto-ovo-Vegetarians | Pesco-Vegetarians | Non-Vegetarians |
|-----------------------|--------|-----------------------|-------------------|-----------------|
| Fruit                 | 483    | 357                   | 400               | 299             |
| Vegetables            | 424    | 347                   | 386               | 320             |
| Nuts and Seeds        | 36     | 28                    | 25                | 19              |
| Meat (including fish) | 0      | 0                     | 18                | 59              |
| Dairy Products        | 2.1    | 121                   | 114               | 200             |
| Added Fats            | 26     | 41                    | 41                | 46              |

*Foods Eaten by Vegetarians and Non-Vegetarians (grams per day)*

In most dietary respects, lacto-ovo vegetarians fell between non-vegetarians and vegans; whereas pesco-vegetarians were generally similar to lacto-ovo-vegetarians except for the fish intake and the expected nutritional consequences (more n-3 fatty acids, vitamin D and arachidonic acid). We can conclude that these dietary patterns do indeed span a large difference in dietary habits and that this is reflected in the intakes of many important vitamins, fatty acid and other nutrients.

### Links to Videos of the AHS

To find links to videos that contain presentations from CNN, *NY Times*, *Harvard Health*, or talks by Gary Fraser, Mike Orlich and Terry Butler, visit our website (<http://www.adventisthealthstudy.org>) and click on “Videos and Media Reports.”