Author's response to reviews

Title: Ultimate Answers in Medical and Health Profession Courses

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Version: Date: 7 February 2005

Dear Editor,

We would like to thank the two reviewers of our manuscript "Ultimate Answers in Medical and Health Professions Courses" for their constructive criticisms. We are pleased that both referees believe our message is an important one. We would like to enumerate the changes we have made to the manuscript; our list (found below) follows the referee’s points. We hope that you (and the referees) are satisfied with the changes we have made. We have tried to incorporate most, if not all, of the referee's suggestions and criticisms.

Respectfully submitted,

Eugene E. Harris, PhD
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REFEREE 1

Point 1. Referee has stated it is confusing that we refer to female students with respect to "an interest in the complications of childbirth". We have changed our wording to be inclusive of both male and female students. It now reads "Many of our students are perplexed when they hear about the pain accompanying child delivery." We have tried to shorten this section. The referee felt the explanation was not background so we moved our discussion of childbirth complications out of the Background section and into its own section on "Complications of Human Childbirth: Proximate Causes."

The referee also suggested we briefly summarize Darwinian Medicine and follow it with our examples. We have followed this advice, and now provide a brief introduction in the Background Section.

Point 2. Upon the suggestion of the referee, we removed the phrase "the story goes like this." We replaced it with "Following is a classic evolutionary explanation backed by considerable paleoanthropological evidence." Also, now in several places in the text emphasize further the scientific basis of evolutionary medicine.

Point 3. The referee has noted that our placement of the Discussion section was awkward, as it seemed we were trying to fit the prescribed journal format. Thus, we have moved the discussion section so that its heading serves more appropriately. Upon suggestion, we have also labeled the two types of explanation by giving them their own subtitles: Complications of Human Childbirth, Proximate Causes and one following this called "Evolutionary Causes." We believe these subtitles, and our new Introduction section, serve to highlight the differences between these two types of explanations.

Point 4. The referee has noted that the example of sickle cell is a good and classic example. The referee has stated that most students learn this, but we have found that in many courses it is overlooked. It has a special significance for students in urban areas (where we teach) where the prevalence of the disease in hospitals and clinics is higher. We agree with the referee, however, that the example of sickle cell is a special case. Therefore in our final bullet point on Principles of Natural Selection page we have given examples of other more widespread disease genes (PKU, Hemochromatosis HFE C282Y gene, diabetes type I linked gene and other examples) that presumably have been maintained by the compensating advantages they provide (see bullet point pages 11 and 12). Also, our examples G6pDH, cystic fibrosis, Tay-Sachs genes are given following our discussion of the sickle cell example (pg. 7 and 8). We have listed
these examples in the Figure 1 for the article. We list additional references in the Bibliography section for these examples.

Point 5 We have made no changes to our section on "symptoms." We agree with the referee "that student learn to little about the utility of these responses."

Point 6 The referee has noted that many examples we have given have been given in other articles or books on Darwinian Medicine. Our new Introductory section summarizes the science of Darwinian Medicine. Our Discussion section also points readers to articles and books in which they can find more about the examples we have given as well as further examples. The editor will note that we have referenced the sources from wherever we have taken examples.

Point 7. As the referee noted the gene for Huntington's disease is not really an appropriate example in our last bullet point on pages 11 and 12. We therefore have removed the example. We have given further examples to show that natural selection does not necessarily promote health or longevity. We feel we have given sufficient examples to illustrate this point both with respect to longevity and health (giving new examples of disease genes that offer compensating advantages).

Point 8. We have removed our discussion in the text of antibiotic resistance, though we make a brief description of it in the Figure. Although it is an important example, out of concerns for sufficient article space given the present revisions we decided to emphasize other topics and examples.

Point 9. The referee states the "thrust of the article is very useful." We have tried to emphasize that hypotheses of Darwinian explanations can be tested, and follow the same scientific methodology of testing as required for proximate hypotheses. One of our chief reasons for writing the article is to make educators aware that evolutionary questions can be posed, and discussed with students. As described, there is a rather exclusive emphasis on proximate mechanisms. Evolutionary thinking and questioning will grow with increased awareness by student and professor.

Point 10. We agree with the reasons the referee has pointed out showing that "evolutionary explanation" is more appropriate over "ultimate explanation." Therefore, we have changed all occurrences of "Ultimate explanation or causes" to "Evolutionary Explanation explanation or causes." Additionally, we have changed the manuscripts title to "Evolutionary Explanations in Medical and Health Profession Courses"

REFEREE 2

In agreement with the referee, we realize that evolutionary processes are increasingly discussed in medical schools, but at the same time we believe there is a long way to go. We have rephrased our sentences in various places to ward off the impression that we are being grandiose in our message. Thus, instead where we had "Ultimate Answers" we now have "Evolutionary Answers." We have also written in our introduction: "However, we realize that evolutionary explanations may seem foreign to many in the medical field..." with the intention of course of recognizing that some professors and researchers are aware of evolutionary causes and evolutionary thinking.

Although genetics books do routinely discuss evolutionary processes (because the science of genetics has grown up in a population genetics and evolutionary oriented framework), this is not so for medicine nor in the medical subdisciplines where evolution has largely been absent.