Author's response to reviews

Title: Heated indoor swimming pools, infants, and the pathogenesis of adolescent idiopathic scoliosis A neurogenic hypothesis involving delayed epigenetic effects of neurotoxins during development of the central nervous system.

Authors:

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Author's response to reviews: see over
Dear Sirs,

Re: 1082038798561089

Heated indoor swimming pools, infants and the pathogenesis of adolescent idiopathic scoliosis (AIS). A neurogenic hypothesis involving delayed epigenetic effects of neurotoxins during development of the central nervous system

I refer to your email dated 5th August 2011, returning the manuscript asking that I comment on the referees’ reports. First, I thank the referees for their comments in reviewing the paper.

I address Dr. Alain Moreau’s report with the understanding that when he refers to IS he is not referring to infantile idiopathic scoliosis or juvenile idiopathic scoliosis but to adolescents who, it is generally agreed, make up 80% of scoliosis patients attending paediatric spine deformity clinics.

1. Dr. Moreau states that our previous studies need to be confirmed by others.

Answer: I agree and said so in the text.

2. AIS amongst individuals who did not swim in heated pools.

Answer: In the past 20 years there are several sporadic reports suggesting that environmental factors are important in the aetiology of AIS. There may be many such environmental factors acting in the first year of life to initiate AIS that differ around the world, with one environmental factor involving heated indoor swimming pools detected in Scotland.

3. Benefit of a statement about the complexity of AIS.

Answer: This has now been added.
“The complexity of causation is shown by the fact that present treatment for AIS is based on mechanical interpretation of pathogenesis, without any biological understanding of the cause. There are likely to be several factors contributing to the epiopathogenesis, and these factors are not necessarily the same in all patients—ie, AIS is a final common pathway deformity. Furthermore, the spectrum of disorder ranges in severity from minimal to very severe, and whether abnormalities thought to be linked to causation are cause or effect is difficult to establish. Finally, the difficulty that geneticists are having with this complex deformity should be acknowledged.”

4. Why the clinical manifestations of AIS occur several years later after exposure?

Answer: The reason is unknown. Because AIS is associated with puberty, I hypothesise that whatever the putative effects of the neurotoxic products on the brain, the process of puberty with its increased growth velocity has a role in its phenotypic expression. This suggestion has been added to the text.

5. It remains unclear what the author means by ...spinous process asymmetry? The sentence is very confusing. I am not sure why it is mentioned. Spinous process asymmetry is quite common. The fact that spinous process asymmetry is not mentioned again in the paper makes the sentence more confusing. What is the point?

Answer: For the past 25 years one of my roles in the scoliosis clinic is to produce a three-dimensional ISIS surface scan of the patient’s spinal column as opposed to a two-dimensional radiograph. This is achieved by placing markers on the spinous processes of the upright spine from which a lateral spinal angle is calculated by software. It is particular to the few operators who use the ISIS scanner. That is the point.

6. Spinous process asymmetry should not be associated automatically with scoliosis. How many individuals really developed scoliosis (with a Cobb angle of at least 10 degrees after skeletal maturity)? These clinical data must be provided

Answer: In the growing child neither the ISIS equipment nor the operator can detect any spinal asymmetry below a 13° radiological lateral Cobb angle. A radiological lateral Cobb angle of more than 10° is diagnosed as a mild scoliosis, which is termed lateral spinal asymmetry.

7. All references about spinous process asymmetry removed since this is not a language shared by the majority of researchers and clinicians in the field.

Answer: I cannot remove these statements about vertical spinous process asymmetry in scoliosis and healthy patients because they have been presented in the two previous epidemiological papers. The finding of spinous process asymmetry in controls was a new finding, particular to my research, as was the ascertainment in the controls. With regard to
spinal asymmetry (vertical spinous process asymmetry), Taylor et al state that having been made aware of a minor curve these children would have otherwise gone throughout life blissfully unaware that their spine was not as straight as it should have been. (Ref: State of the Art Reviews 2000, 14: 305–311).

7. The hypothesis could easily be tested epidemiologically with juvenile idiopathic scoliosis (JIS) patients.

Answer: Patients with juvenile patients are much less common than those with AIS. Research into the etiopathogenesis of idiopathic scoliosis is focused on AIS, not JIS. JIS may involve some different aetiological mechanisms quantitatively and/or qualitatively from AIS to explain its earlier presentation. These are questions for future research, probably multicentre, to garner enough subjects for study and are not addressed in this paper.

8. Presentation of the hypothesis section.
Answer: Dot after gasses has been added.

9. 3rd paragraph –
Answer: References have been added.

10. Entry of neurotoxic substances to infant section
Answer: Removed

11. Extra dot after the word ‘patients’.
Answer: Removed

Answer: Reference added

Answer: Dot added.

Yours faithfully,

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