JCCA 2006;50 (3):172–181. Oakley P, Harrison DD, Harrison DE, Haas J. A Rebuttal to Chiropractic Radiologists' View of the 50 year old, Linear-No-Threshold Radiation Risk Model (Commentary).

To the Editor:

Potential harmful effects versus clinical benefits of radiography remain a significant concern and topic of debate in the chiropractic profession.[1] Oakley et al.[2] proposed the chiropractic profession review radiography standards and regulations implying there may be more good than harm from diagnostic ionizing radiation exposure. However, the preponderance of evidence does not support abandoning current standards and regulations as explained in our recent commentary.[3] This letter is in response to Oakley P, Harrison DD, Harrison DE, Haas J. A Rebuttal to Chiropractic Radiologists' View of the 50 year old, Linear-No-Threshold Radiation Risk Model (J Can Chiropr Assoc 2006, 50 (3): 172–181).[4]

Unfortunately, further attempts by Oakley P, Harrison DD, Harrison DE, Haas J. to justify their position has not helped further the discussion.[4] The critiques presented by Tubiana, Aurengo[5,6] to the microdosimetric arguments that support linear no-threshold do not seem to be valid.[7] Furthermore, there is no convincing evidence to support the suggestion that immune surveillance will differentially decrease cancer risks at very low doses, and there is some evidence to the contrary. According to Brenner and Sachs,[7] proposed data summarized in the both the French Academy report[5] and US National Academy BEIR VII report,[8] suggest that we currently know little of the magnitude of inter-cellular communication effects on radiation carcinogenesis in vivo. «It seems therefore premature to use arguments about inter-cellular interactions to justify replacing linearity in cancer risk at very low doses with any non-linear dose – response relationship».[7]

It is essential to emphasize that routine use of conventional radiography is simply not acceptable by any health care profession. As previously stated in our commentary,[3] one of the three basic principles of radiation protection that is most applicable is:

> «No practice involving exposure to radiation should be adopted unless it produces sufficient benefit to the exposed individual or to society to offset the radiation detriment it causes».

The only clinical trial Oakley[1] could propose indicating a clinical benefit related to conventional radiography is the recent article by Khorshid et al.[9] published in a non peer review journal. Well designed large randomized clinical trials are needed before concluding routine use of radiography has any demonstrable clinical benefits, either in children with autism treated by upper cervical spine care, or for any of the common conditions treated by chiropractors.

In conclusion, we stand by our commentary. However interesting the radiation hormesis theory may appear on the surface, it remains speculative and untestable. Until new standards in radiographic protection are established by international, national, and state organizations – an unlikely occurrence – routine use of conventional radiography should not be advocated or tolerated in any profession, including chiropractic, even if patients appear more satisfied or because a particular technique system advocates it.

The first and most important duty of health care professionals is to serve the best interests of patients. This entire debate brought forward by Oakley et al. may stem from the natural fear by practitioners of seeing their individual practices limited by adopting sound clinical guidelines based on appropriate and recognized indications for imaging studies. Evidence-based clinical and diagnostic imaging guidelines are intended to improve patient health outcome and quality of care, reduce unnecessary radiation exposure and practice variation, and encourage more efficient use of resources. In all cases, guidelines are intended to be used in conjunction with sound clinical judgement and experience. Such clinical indications for imaging studies are being developed by and for the chiropractic profession (available on online at: http://www.uqtr.ca/imagingchiroguidelines). Chiropractors world wide are invited to visit this site.

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To the Editor in Reply

We appreciate the continued debate as a letter from Bussieres et al.[1] as well as their commentary[2] regarding our original and rebuttal reviews of radiation hormesis.[3,4] Unfortunately, again these academics do not critique the evidence we put forth and continue to believe: *All radiation exposure is harmful,* and therefore, strict "*Red Flag Only*" x-ray guidelines are necessary for the chiropractic profession.

Bussieres et al.[1] refer to their restrictive x-ray guidelines agenda they hope to push upon the profession; where 2/5 (40%) of the investigators are non-graduated chiropractic interns not licensed to utilize x-ray![5] In contrast, we have thoroughly rebutted their restrictive "Red Flag Only" guidelines[5] with competing x-ray guidelines[6] that recommend routine radiography for assessment of spinal subluxation in clinical practice. We note that the PCCRP x-ray guidelines (www.pccrp.org) were authored by 25 chiropractic clinical experts (none are student interns) and 2 attorneys licensed to practice law.[6]

In our original[3] and rebuttal reviews,[4] we have put forth a number of high quality scientific references invalidating the LNT model for use in the low dose range, to assess "risks" from x-ray exposure. In fact, after contacting Bernard Cohen, PhD, a leading authority on exposure risks, we presented factual information indicating that the LNT fails on many levels. The failures with the LNT include problems with its theoretical basis, direct experimental challenges, adaptive response mechanisms and stimulation of the immune system, and the animal and human cancer risk studies that flat out – contradict the LNT.[4]

This LNT-Hormesis debate is emerging as a central debate within toxicology and will likely intensify in the near future. Historically, for various reasons, hormesis was marginalized in the early and middle decades of the 20th century.[7] However, recent publications indicate the hormetic dose-response is much more common and fundamental than the LNT (or threshold) for risk assessment.[8] In evaluating more than 20,000 toxicology articles of various stressors (including radiation), it was determined that hormesis is a "*highly generalizable biological phenomenon independent of environmental stressor, biological endpoint, and experimental model system.*"[9] Further, Calabrese[10] has created a database containing 5,600 hormetic dose-response relationships for 900 agents (including radiation). Hormesis is anything but "*speculative and untestable*" as Bussieres et al.[1] claim; in fact, it is a ubiquitous natural phenomenon. We can either accept it, study it and use it or continue to deny and dismiss its' existence as Bussieres[1] and others have done.[11]

Although, previously, we mentioned only one randomized clinical trial (RCT) demonstrating improved outcomes with chiropractic techniques/interventions using x-ray,[12] there are other RCTs as well.[13] Also, Bussieres[1] ignore the plethora of non-randomized trials, cohort con-

trols, case series and case studies (scientific levels 2–4) which indicate spinal alignment as a clinically valid and accepted chiropractic treatment outcome in favor of their expert opinion (level 5 is the lowest level of evidence).[6,14–19] For a more thorough, lengthy evaluation of the scientific evidence for use of x-ray in the practice of chiropractic (*not medicine*) the reader is directed to the 350-paged, 2000-referenced document: "Practicing Chiropractors" Committee on Radiology Protocols' (www.pccrp.org).[6]

Bussieres et al.[1] would have us believe that the standard of care in chiropractic practice is to not routinely x-ray presenting patients; this is far from the truth. In surveys specific to the topic of radiography utilization in chiropractic practice, it is found that radiography is a primary subluxation assessment procedure utilized by more than 50% of the profession on at least 60% and up to 95% of presenting patients.[20–26]

Last, in studies specifically considering the role of chiropractic interventions, spinal radiographs demonstrate 66%–91% of patients can have significant abnormalities that would alter interventions.[27–29] Up to 33% of spinal radiographs have relative contraindications and 14% have absolute contraindications to certain types of chiropractic adjustments.[27]

There is no valid scientific evidence offered by Bussieres et al.[1] to limit x-ray utilization to "Red Flag Only" guidelines in chiropractic practice. Bussieres et al.[1,2] should accept that low dose x-rays are not harmful, and indeed safe or even beneficial (dose probably too low for benefits).

Routine spinal radiography is the standard of care in chiropractic practice. Since Bussieres et al.[1] are attempting to change the standard to "Red Flag Only" x-ray guidelines, *they* (not us) need to show that their new proposed "standard" yields improved outcomes and safety as compared to the past and present standard of routine spinal radiography.

Sincerely,

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