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## Evaluation of Phototherapy Devices

The recent paper by Subramanian, *et al.* [1] evaluating phototherapy devices used for treating neonatal hyperbilirubinemia contains several flaws that limit the practical relevance and interpretation of the measurements.

1. The authors fail to distinguish adequately between photodegradation, in which bilirubin is degraded to substances of lower molecular weight, and photoisomerization, in which the pigment's structure changes but no degradation occurs. Both processes contribute to the effects of phototherapy in humans, but their relative contributions are presently unknown. However, in the Gun rat animal model photoisomerization is more important than photodegradation and the same is likely to hold for humans. In the article the authors focus largely on photodegradation, the pathway of least importance.
2. The relative effectiveness of the different lights tested was determined by comparing their effects on methanolic solutions of bilirubin *in vitro*. Residual bilirubin was measured after 15-120 min of exposure, by which time a substantial fraction of the original bilirubin had been bleached and degraded. Preparation of the methanolic solutions was not described. Aside from the fact that bilirubin is insoluble in methanol, the photochemistry of bilirubin in organic solvents is rather different from that in serum or aqueous albumin solutions. Therefore, methanolic solutions of bilirubin are inappropriate for comparative testing of phototherapy lights.
3. The test solutions were clearly over-irradiated and not sampled early enough to detect the relative rates of formation of the physiologically important photoisomers of bilirubin. Bleaching of bilirubin has been used in previous studies of the relative efficacy

of phototherapy lights, but there is no evidence that this is a valid method, especially when bleaching is allowed to continue to a point where secondary reactions of no relevance to phototherapy may be taking place. Measuring initial rates of formation of bilirubin photoisomers would probably provide a more valid and clinically relevant method.

4. The authors claim to have developed a novel high precision HPLC/MS technique for measuring bilirubin photoisomers, yet presented no examples of typical separations. Samples were extracted with a solvent containing formic acid. Configurational photoisomers of bilirubin, the most rapidly formed isomers in humans, are highly sensitive to acids, undergoing reversion to unisomerized bilirubin. Therefore, it seems unlikely that these important photoproducts would have survived the HPLC conditions. Reference standards were prepared by irradiating bilirubin in methanolic solution, but no details were provided of how specific photoisomers or other photoproducts were identified and characterized.

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### REFERENCE

1. Subramanian S, Sankar MJ, Deorari AK, Velpandian T\*, Kannan P, Prakash GV, *et al.* Evaluation of phototherapy devices used for neonatal hyperbilirubinemia. *Indian Pediatr.* 2010; Nov 30 (E-pub ahead of print).

### REPLY

We thank the reader for the interest shown in our article published recently in the Journal (Epub). The questions raised by the reader are indeed valid. However, they