CHAPTER 8: SUBMISSIONS ON IMMUNOLOGY

Expert evidence at trial

279. No medical specialist in the areas of infectious diseases, microbiology or immunology gave evidence in the trial. Evidence concerning the histology reports from the autopsies was mainly given by forensic pathologists. Their evidence is set out in Chapter 7.

Evidence before the Inquiry

The experts

280. Professor Cecelia Caroline Blackwell is a con-joint Professor in Immunology and Microbiology at the School of Health, University of Newcastle. She has qualifications in Microbiology and a PhD in Medical Microbiology.[481] She is a researcher and has no clinical qualifications. She gave oral evidence in the Inquiry and four statements she had prepared were in evidence.

281. The first statement was prepared in 2004 at the request of Legal Aid on behalf of Ms Folbigg.[482] It was annexed to and formed the draft of the second statement dated 5 March 2019 prepared at the request of those representing Ms Folbigg in the Inquiry.[483]

282. The Inquiry met with Professor Blackwell in November/December 2018 to request her assistance. She did not have the capacity to assist and recommended that the Inquiry contact Professor Rawlinson to inquire as to the availability of testing samples from one or more of the children.[484] We refer to his statement, tendered in the Inquiry, in these submissions.

[481] Exhibit T, CV of Professor Cecelia Blackwell (5 March 2019).
[482] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A.
[483] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019).
[484] Professor Rawlinson's statement was tendered in the Inquiry. In his statement he concluded that for a variety of reasons testing the available tissue of the children for infectious pathogens including viruses could not be conducted in a way as so as to be useful in determining cause of death in this case, Exhibit X, Expert report of Professor Rawlinson (undated) p 3.

283. Notwithstanding no formal request from the Inquiry, Professor Blackwell provided an undated (third) statement to the Inquiry in March 2019 setting out the relevant medical advances which had been made since 2004.[485]

284. The fourth statement by Professor Blackwell dated 13 March 2019 concerns Caleb only and was prepared at the request of Ms Folbigg's representatives.[486]

285. Professor Clancy is a mucosal immunologist and foundation Professor of Pathology at the University of Newcastle. Professor Clancy's field of specialised knowledge is mucosal immunology which concerns immune system responses that occur at mucosal membranes of the intestines, the urogenital tract and the respiratory system, i.e., surfaces that are in contact with the external environment. He retired in February 2013.

286. Professor Clancy was engaged by those representing Ms Folbigg to prepare a report on mucosal immunology.

287. He was provided with reports by Professors Duflou, Horne, Hutchinson and Dr Drucker (in relation to the IL-10 gene tested for in the children at the time of the trial), and the autopsy reports as well as Professor Blackwell's report dated 9 March 2019.[487]

288. Professor Clancy relied significantly on a research project in which he was engaged which commenced in the 1970s and which sought to define the normal pattern of mucosal immunity and concerned 263 children.[488] One child died unexpectedly, from SIDS, during the study. Professor Clancy described that death as a "bizarre and inappropriate immune response to a presumed virus infection three weeks prior to death".[489] The research was published in 1993.[490]

289. Professor Goldwater is a specialist in infectious diseases and a specialist clinical microbiologist. He was engaged by those representing Ms Folbigg to provide a peer review of the opinions offered by Professor Blackwell and Professor Clancy.[491] He was provided only with those reports and their annexures,

[485] Exhibit U, Further expert report of Professor Cecelia Blackwell (undated).
[486] Exhibit V, Further expert report of Professor Cecelia Blackwell (13 March 2019).
[487] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) and Supplementary expert report (17 March 2019), letter of instruction.
[488] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) Annexure D.
[489] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) p 1.
[490] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) Annexure D.
[491] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019).

together with transcripts of the oral evidence given by Professor Blackwell and Professor Clancy on 22 March 2019.[492] He was not provided with any of the reports by or evidence of the forensic pathologists.[493] He did not give oral evidence.

290. Before the Inquiry, but not before the jury, was a report prepared in the context of the trial by Dr Drucker from the University of Manchester, at the request of Ms Folbigg's then-representatives.[494] Dr Drucker was the Head of the Oral Microbiology section of the University Dental Hospital of Manchester and had a research interest in the microbial causes of SIDS. He was provided with and commented upon the microbiology reports for Patrick, Sarah and Laura.[495]

The role of infection in SIDS deaths

291. In his 2003 report Dr Drucker explained the scientific explanation for SIDS, assuming infection as a cause:

> *Those who die from an infective cause are believed to die because they are unable to defend themselves against toxins (poisonous products) of commonly occurring bacteria. This is because they lack immunity (antibody) and may also be genetically pre-disposed to respond less effectively to challenge by bacteria.*[496]

292. Dr Drucker referred to the SIDS risk factor of sleeping position and posited the explanation that "sleeping position alters levels and quantities of bacteria present in the nasal passages… because nasal fluid cannot drain equally well in all sleeping positions".[497] Professor Blackwell in oral evidence provided the same explanation in relation to the relationship between infection and sleeping position.[498]

293. Professor Blackwell commented on a number of studies that she said provided a "growing body of evidence that infection plays a role in these infant deaths".[499]

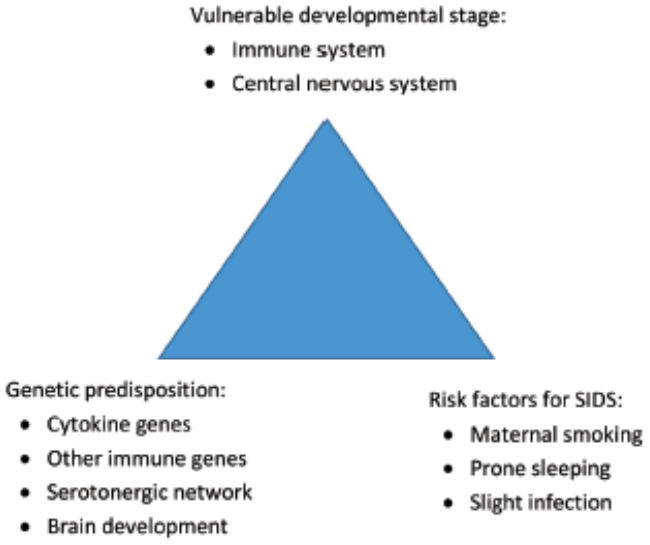
294. In Duncan and Byard (2018) Professor Opdal stated:

[492] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 2.
[493] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 2.
[494] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003).
[495] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 1.
[496] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 3.
[497] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 4.
[498] Transcript of the Inquiry, 22 March 2019, T342.3-28.
[499] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) p 5.

Both experimental and observational studies provide evidence indicating that infection and inflammation might play a role in sudden infant death syndrome (SIDS)… [500]

There are also several studies indicating that virus infections may play a role in SIDS, and higher rates of viruses have been isolated in samples from SIDS compared to controls (17-19). The involvement of viruses may be direct, by induction of a cytokine storm upon viral infection, or indirect, through synergistic interactions with bacterial virulence factors and/or immunoregulatory polymorphisms. However, so far, no single respiratory virus has been exclusively found in a high proportion of SIDS cases: rather, a range of viruses are found at a higher frequency in SIDS compared to controls. [501]

295. In that chapter, the role that the immune system may play in the risk factors was depicted diagrammatically, using the triple risk model, although not including all the risk factors commonly associated with SIDS: [502]



296. Professor Opdal concluded:

[500] Siri Hauge Opdal, 'Cytokines, Infection and Immunity' in Jhodie R Duncan and Roger W Byard (eds), *SIDS – Sudden Infant and Early Childhood Death: The Past, the Present and the Future* (University of Adelaide Press, 2018) 689, 689.
[501] Siri Hauge Opdal, 'Cytokines, Infection and Immunity' in Jhodie R Duncan and Roger W Byard (eds), *SIDS – Sudden Infant and Early Childhood Death: The Past, the Present and the Future* (University of Adelaide Press, 2018) 689, 690.
[502] Siri Hauge Opdal, 'Cytokines, Infection and Immunity' in Jhodie R Duncan and Roger W Byard (eds), *SIDS – Sudden Infant and Early Childhood Death: The Past, the Present and the Future* (University of Adelaide Press, 2018) 689, 701.

Finally, death in SIDS cases may be due to more than one mechanism. It is, however, likely that a dysregulation of inflammatory responses to apparently mild infections is involved in a proportion of SIDS. Genetic variations in cytokine genes are most likely involved, as they contribute to differences in the expression, translation, cellular transport, and secretion of the cytokine. However, it is important to interpret cytokine SNP data with caution and to consider the effects of other genetic, developmental, and environmental influences on the responses.[503]

297. Professor Blackwell also gave evidence that in any of these deaths there is no single cause. It is a multifactorial series of events.[504]

298. Professor Blackwell gave evidence about the way that minor infections could trigger death in children aged 2-4 months:

> *Have the lowest level of immunoglobulins that would be protective against infection. The material they received from their mother before birth has waned probably to the lowest, and they will have the lowest level of protective antibodies that they will ever have in their lives. If an infection gets into the body they're going to be dependent on the non-specific immune system, the white cells, to go in and deal with this, to kill the organism, to mop up the pieces and these will then be turned into antibodies against the organisms that they've dealt with…*[505]

> *A minor infection, say a large number of organisms get in, might trigger a very massive inflammatory response - it might not be a major pathogen like meningococcus – it could be a minor pathogen like Staphylococcus aureus or Escherichia coli, so the damage is done not by the organism itself, but by the body's response to the organism; it's very powerful.*[506]

299. Researchers do not know what actually causes the death in SIDS, but some researchers propose "different mechanisms by which the physiology of the child

[503] Siri Hauge Opdal, 'Cytokines, Infection and Immunity' in Jhodie R Duncan and Roger W Byard (eds), *SIDS – Sudden Infant and Early Childhood Death: The Past, the Present and the Future* (University of Adelaide Press, 2018) 689, 703.
[504] Transcript of the Inquiry, 22 March 2019, T335.46.
[505] Transcript of the Inquiry, 22 March 2019, T321.34-42.
[506] Transcript of the Inquiry, 22 March 2019, T321.44-48.

could be disrupted and inflammatory responses to infection can affect all of these.[507]

300. Professor Clancy also gave his opinion that there is a causal connection between mild infection and SIDS:

> *In my opinion, current evidence would have as a primary cause in half of the population of sudden death infants a mild intercurrent airways infection at a critical time of immaturity of the local mucosal immune response leading to an inappropriate excessive immune response - leaving the airways paresed and unable to clear bacteria that descend all the time from the upper airways.*[508]

301. In relation to Professor Blackwell's statement that infectious agents identified in SIDS/SUDI can elicit inflammatory responses, Professor Cordner described a gap between such research and practice.[509]

302. Each of the forensic pathologists, Professor Elder and Professor Horne gave evidence about infection in association with the sudden death of infants, as well as the role it may have played in the deaths of the four Folbigg children.

303. Professor Elder said:

> *That we have to always remember that risk factors are risk factors, they're not - they won't always cause death, so some - many babies have slept prone and not died, many babies have been bottle fed, such as myself, and not died. It's - the model is about things that might work together, and for all risk factors, as a clinician, faced with a baby who's died, I still need to be able to process some mechanism by which that risk factor might have resulted in the death of a child. Now, there is some of these factors when they work together - I certainly feel that there is a plausible evidence base, as I discussed earlier, the in utero exposure to smoking affects serotonin supply in the brainstem, so that when you are faced with an asphyxial insult you can't respond and gasp and self-resuscitate. That's reasonably well-documented.*

[507] Transcript of the Inquiry, 22 March 2019, T322.50-T333.4.
[508] Exhibit AT, Additional expert report of Professor Robert Clancy AM (27 March 2019) p 15 (emphasis in original).
[509] Transcript of the Inquiry, 19 March 2019, T135.13-16.

> *For all the other risks, such as exposure to infection, there are some theories about how that might cause death, as has been discussed, through a toxin effect on the heart rate, but all, all these things you have, you have to kind of go to the end point to truly understand how the infants died.*[510]

304. Professor Elder gave evidence that while factors for SIDS will not always cause death, there is a plausible evidence base and it was reasonably well documented that in utero exposure to smoking affects serotonin supply in the brainstem affecting a baby's response to an asphyxial insult.[511] Whereas, in relation to other risk factors, such as exposure to infection, there are theories about how it might cause death but the final mechanism is not completely understood.[512]

305. Professor Elder also gave evidence that there have been theories about the role of infection for a long time between a recent not apparently very severe infection and infant death.[513] The issue, however, remained, in her opinion, to explain how that can cause the death of four children "in a row".[514]

306. Professor Horne told the Inquiry, and Professor Elder agreed, that a mild respiratory infection is common and half of babies who die have had a mild respiratory infection not severe enough to be attributed to the cause of death.[515]

307. Professor Hilton said there has been a suspicion that there are immunological-type problems associated with SIDS for decades – both Professor Clancy and Professor Blackwell's research on immune bodies in lung exudates is an interesting research technique which may or may not have technical application.[516]

308. Professor Hilton said a slight infection may be associated with sudden infant death, which is very much a work in progress, and it's a concept which is gathering

[510] Transcript of the Inquiry, 18 March 2019, T52.16-32.
[511] Transcript of the Inquiry, 18 March 2019, T52.16-27.
[512] Transcript of the Inquiry, 18 March 2019, T52.23-45.
[513] Transcript of the Inquiry, 18 March 2019, T48.23-32.
[514] Transcript of the Inquiry, 18 March 2019, T48.30.
[515] Transcript of the Inquiry, 18 March 2019, T38.13-25.
[516] Transcript of the Inquiry, 20 March 2019, T236.47-T237.10.

scientific validation.[517] He agreed this was only in its very nascent stages in 2003.[518]

309. All of the pathologists agreed that since then, the science about the link between infection and the cytokine response continues to be consolidated (Dr Cala saying "it appears to").[519] However, Professor Hilton did not agree that there is a strong link between *S aureus* and staphylococcal endotoxins triggering sudden infant death.[520] Forensic testing of tissue to identify immune reaction would tend to support the view that a particular organism detected at autopsy was an active bacterium rather than contamination.[521] This was not widely available in 2003 and did not form part of forensic pathology practice.[522]

310. Professor Hilton said that "germs are irritants that can elicit inflammatory responses".[523] On occasion, bugs detected in the lungs of post-mortem specimens taken from dead babies raise questions – very often, a pathologist cannot tell if they are real or a contaminant.[524] Professor Hilton described this as an interesting theory relating to factors which may be involved in the death of a child, at the research stage.[525] Dr Cala and Professor Duflou agreed.[526] Professor Duflou added that forensic pathologists generally view organisms in lungs as clinically relevant if there is discernible inflammation under the microscope, and it would probably not change his view about whether or not the death was SIDS.[527] There has also been no broad acceptance by the forensic medical community about Professor Clancy's statement that "there is in SIDS and near-miss SIDS an exaggerated secretion of immunoglobulins, proteins intermucosal… secretions".[528]

311. As discussed in Chapter 4, the genetic testing undertaken by the Inquiry identified no known pathogenic or likely pathogenic genetic variant which could have caused the children's deaths, including in genes associated with immunological responses.

[517] Transcript of the Inquiry, 21 March 2019, T273.1-4.
[518] Transcript of the Inquiry, 21 March 2019, T273.18-21.
[519] Transcript of the Inquiry, 21 March 2019, T273.27-39.
[520] Transcript of the Inquiry, 21 March 2019, T273.50-T274.6.
[521] Transcript of the Inquiry, 21 March 2019, T274.22-23.
[522] Transcript of the Inquiry, 21 March 2019, T274.28-T275.10.
[523] Transcript of the Inquiry, 19 March 2019, T136.13.
[524] Transcript of the Inquiry, 19 March 2019, T136.14-17.
[525] Transcript of the Inquiry, 19 March 2019, T136.37-46.
[526] Transcript of the Inquiry, 19 March 2019, T137.9-15.
[527] Transcript of the Inquiry, 19 March 2019, T137.16-38.
[528] Transcript of the Inquiry, 19 March 2019, T138.9-T139.9.

312. In considering the link specifically between genetics, infection and cardiac events possibly causing death, Professor Skinner gave evidence that:

> *Infants, as we heard earlier on, repeatedly have upper respiratory tract infections. It's a normal and repeated phenomenon and it wouldn't surprise you to find that a child that had died with one had an infection, if it's routine, to get about eight infections a year, then we're bound to find some of that, yes. And I guess one of the questions that logically would arise from that is did the virus somehow trigger some sort of cardiac event? In our field we've been looking for that, that evidence, and the only evidence really to date that we've found is related to the cardiac sodium channel gene I referred to earlier and it's linked to Brugada syndrome and the fever. However, that tends to really be older children, but I am quite sure that that could happen in the infant as well, high fever and triggering a cardiac event in somebody with Brugada syndrome.*[529]

313. Professor Skinner clarified that he was referring to SCN5A variants as providing a trigger for an event in somebody who is genetically predisposed.[530] None of those variants were found in the Folbigg family.

314. Dr Buckley agreed with Professor Skinner:

> *People with SCN5A pathogenic variants are susceptible to cardiac dysfunction when they have a high, a high temperature. I'm not sure that that has any relevance to the family that we are looking at here because none of the children, as far as either group have been able to define, do have those variants.*[531]

Findings on autopsy

315. Professor Blackwell drew attention to the findings on autopsy, set out above in relation to the forensic pathology evidence.

[529] Transcript of the Inquiry, 16 April 2019, T526.49-T527.10.
[530] Transcript of the Inquiry, 16 April 2019, T533.31-32.
[531] Transcript of the Inquiry, 16 April 2019, T533.46-T534.1.

316. In her 2004 report, Professor Blackwell opined that these findings were not post-mortem contamination.[532] She tempered her view in her oral evidence, by acknowledging that contaminants are a contentious area.[533]

317. In her March 2019 report she referred specifically to the three organisms isolated in Patrick's blood culture.[534] She opined that as the post mortem examination was carried out two hours after his death, "it is difficult to dismiss the findings as contamination as there would have been little time for breakdown of mucosal barriers".[535]

318. Professor Blackwell sought to draw two conclusions from the findings on autopsy of the children.[536] First, they represent an increased relative risk for SIDS of 29[537] and secondly, they are indicative of the children having an infection.[538]

Increased ratio

319. In her March 2019 report, Professor Blackwell referred to a 1992 publication by Gilbert et al to support the proposition that a finding of coliforms in an infant confirmed an increased relative risk for SIDS of 29.[539]

320. Professor Blackwell was taken to that article in her oral evidence.[540]

321. It was put to Professor Blackwell that that odds ratio of 29 upon which she relied in the article was based on coliforms found in the tracheal aspirate.[541] According to that article, that odds ratio was halved when the coliforms were in found in lungs (as was the case in Sarah and Laura) and reduced to three in relation to the spleen (as was found in Sarah and Laura).[542] She agreed that that was the correct

[532] Exhibit T, Report of Professor Caroline Blackwell (5 March 2019) Annexure A, p 6.
[533] Transcript of the Inquiry, 22 March 2019, T318.28.
[534] Exhibit U, Further expert report of Professor Cecelia Blackwell (undated) p 7.
[535] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A pp 9-10.
[536] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A.
[537] Relative risk is the ratio of probability of an event in an exposed group to the probability of an event in a non-exposed group, Miquel Porta (ed), *Dictionary of Epidemiology* (Oxford University Press, 6th ed, 2014).
[538] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) pp 8-9.
[539] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) p 8; Ruth Gilbert et al, 'Combined Effect of Infection and Heavy Wrapping on the Risk of Sudden Unexpected Infant Death' (1992) 67 *Archives of Disease in Childhood* 171.
[540] Transcript of the Inquiry, 22 March 2019, T346.24-T348.3.
[541] Transcript of the Inquiry, 22 March 2019, T347.1-14.
[542] Ruth Gilbert et al, 'Combined Effect of Infection and Heavy Wrapping on the Risk of Sudden Unexpected Infant Death' (1992) 67 *Archives of Disease in Childhood* 171.

reading of the article, although Professor Blackwell did not retreat from the proposition that an increased risk applied.[543]

322. Professor Blackwell also agreed in oral evidence that the abstract of that publication included the finding that "viral infection was not a major risk as long as babies were lightly wrapped. In heavily wrapped babies the presence of a viral infection greatly increased the risk of sudden infant death".[544]

323. There is no evidence in the Inquiry that the children were heavily wrapped.[545]

324. It follows that the particular findings of the publication Professor Blackwell relied upon do not support her conclusion as to the extent of the increased risk of SIDS. The publication provides support for the contrary proposition: that is, the risk was low because the children were not heavily wrapped and the organisms were not found in the tracheal aspirate. Further, if as submitted below, they were contaminants, the article has no application as to risk.

Infection or contaminants?

325. The report of Professor Blackwell was drawn to the attention of each of the four forensic pathologists who gave evidence to the Inquiry. As set out earlier, all the forensic pathologists thought the findings in relation to Patrick, Sarah and Laura probably reflected contamination. Professor Duflou observed that Professor Blackwell is an expert in microbiology; he is an expert in autopsies.[546]

326. Dr Drucker in his report queried whether the organisms found in relation to Patrick arose after death by contamination or before death.[547] He noted that one of the major species he considered to be associated with SIDS was present (*E coli*), but that the other species found were not characteristic of SIDS but of the gut flora.[548] He concluded there was "little evidence of SIDS associated bacteria" and noted also other experts' views regarding encephalitis as the likely explanation for death rather than SIDS.[549]

[543] Transcript of the Inquiry, 22 March 2019, T347.6-43.
[544] Transcript of the Inquiry, 22 March 2019, T346.31-40.
[545] 2 April 2003 T104.17-18, T110.10-14, T128.15-17, T131.51-52; Exhibit E, ERISP of Kathleen Folbigg Q269.
[546] Transcript of the Inquiry, 20 March 2019, T155.18.
[547] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 6.
[548] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 6.
[549] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) pp 6, 8.

327. In his report Dr Drucker noted that in Sarah's autopsy the presence of coliforms together with *S aureus* together was "interesting because both have been associated with SIDS and together their toxins act synergistically having a far greater effect than separate toxins would".[550] He concluded "species associated with SIDS present and after an URIT. It is entirely possible that Sarah died as a SIDS case".[551] He recommended more detailed microbiology interpretation.[552]

328. Dr Drucker also considered the dismissal of the coliforms in Laura's lungs and the presence of coliforms in her spleen as "interesting".[553] He also considered that the *S aureus* present in Laura's spleen did not cause a major infection.[554] He concluded "some evidence of SIDS associated bacteria" and recommended more detailed microbiology interpretation.[555]

329. Professor Clancy gave evidence that there was "strong data" that they were not contaminants in Sarah's lungs, however there was a stronger argument that it could be contamination in the cultures in the spleen.[556]

330. He also opined that the coliforms found in Laura were very different from Sarah and that post mortem contamination was likely to account for them.[557]

331. In relation to the microbiological evidence, Professor Goldwater said that the findings in Sarah's lung, "on the balance of probability, would have played a role in her death".[558] With Laura, he opined "Laura probably died as a result of myocarditis, but *Staphylococcus aureus* was isolated from her spleen; this could have played a role in her death as could the coliforms isolated from her lungs".[559]

332. Professor Blackwell referred to a number of studies to support her opinion that the organisms were not post-mortem contaminants.[560]

[550] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 7.
[551] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 8.
[552] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 1.
[553] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 6.
[554] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 8.
[555] Exhibit BM, Expert report of Dr D.B. Drucker (18 February 2003) p 1.
[556] Transcript of the Inquiry, 22 March 2019, T351.19-22, T351.29-35.
[557] Exhibit W, Supplementary expert report of Professor Clancy AM (17 March 2019) p 3.
[558] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 5.
[559] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 5.
[560] Transcript of the Inquiry, 22 March 2019, T318.28-319.28.

333. Professor Blackwell relied, in part, on a 2008 article by Weber et al which reported on a review of autopsies done at one specialist centre between 1996 and 2005. The authors interpreted the results of the case review thus:

> *Although many post-mortem bacteriological cultures in SUDI yield organisms, most seem to be unrelated to the cause of death. The high rate of detection of group 2 pathogens, particularly S aureus and E coli, in otherwise unexplained cases of SUDI suggests that these bacteria could be associated with this condition.*[561]

334. In a related 2010 publication Weber et al noted in summary that the contribution of contaminants remains controversial.[562]

335. Professor Blackwell was taken to a 2006 article by Weber et al in which it was noted that:

> *A pure growth of a pathogen in a blood or cerebrospinal fluid should be regarded as a possible contributing factor to death at all ages, but corroborative evidence should be sought using a range of techniques.*[563]

336. Professor Blackwell accepted that that was a "valid point".[564]

337. When asked whether the Inquiry should prefer the studies to which she referred to the evidence of four forensic pathologists, two of whom had conducted the autopsies, she said "I would not say 'prefer' I would say 'consider'."[565] Asked what the finding should be, following that consideration, Professor Blackwell gave evidence that the microorganisms "probably contribute to a proportion of those deaths."[566]

[561] M A Weber et al, Infection and Sudden Unexpected Death in Infancy: A Systematic Retrospective Case Review (2008) 371 *Lancet* 1848.
[562] M A Weber et al, 'Postmortem Interval and Bacteriological Culture Yield in Sudden Unexpected Death in Infancy (SUDI)' (2010) 198 *Forensic Science International* 121, 125.
[563] Transcript of the Inquiry, 22 March 2019, T348.11-14.
[564] Transcript of the Inquiry, 22 March 2019, T348.48.
[565] Transcript of the Inquiry, 22 March 2019, T320.42.
[566] Transcript of the Inquiry, 22 March 2019, T320.48-49.

Other matters raised by Professor Blackwell

Patrick

338. In her 2004 report with respect to Patrick, Professor Blackwell stated that there was no evidence that an infective process had taken place.[567] In her March 2019 report, she noted that Patrick had had a fever the night before he died.[568] In her oral evidence she described Patrick as being "very ill" the night before he died.[569]

339. A record made by Dr Colley when consulting with Mr and Ms Folbigg after Patrick's death noted that the night before Patrick's death on 13 February 1991 he had a raised temperature, was sweating, vomiting and clinging.[570] However, contemporaneous hospital notes record that the night before he may have had a seizure and had a mild temperature but otherwise had "no problems".[571]

340. In our submission there is no factual basis for the opinion expressed by Professor Blackwell that Patrick was "very ill".

Sarah

341. In her 2004 report, Professor Blackwell opined in respect of Sarah that "there is little evidence that the swollen uvula in Sarah was associated with her death".[572]

342. However, in her March 2019 report Professor Blackwell opined that Sarah's swollen uvula might have resulted from inflammatory responses to respiratory infection.[573] In her oral evidence, Professor Blackwell explained that her more recent opinion followed a more detailed consideration.[574] In oral evidence Professor Blackwell further refined her opinion to say that the swollen uvula "might have been caused by the inflammatory response to the bacteria" isolated on autopsy.[575]

343. For the reasons given at the end of this Chapter, we submit that that bacteria was likely to be post-mortem contaminants.

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[567] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A p 3.
[568] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) p 3.
[569] Transcript of the Inquiry, 22 March 2019, T337.48.
[570] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure G.
[571] Exhibit S, Section of Patrick's medical records p 507.
[572] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A p 3.
[573] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) p 3.
[574] Transcript of the Inquiry, 22 March 2019, T316.20-22.
[575] Transcript of the Inquiry, 22 March 2019, T316.28-29.

All children

344. In her 2004 report, repeated in her March 2019 report, Professor Blackwell opined that there were indications in the children's medical histories to indicate that they had more frequent or more severe bouts of infection.[576] In her oral evidence, she said:

> *From the medical histories they seem to have attended the doctor for various coughs, colds and flu. I've never had any young children so I don't know if that was normal or if that was more frequent but certainly infection and referral to the GP for treatment seemed to come up in some of the material that I read.*[577]

345. She gave evidence that the children did not have any classical immunodeficiencies, by which she meant that the children did not have any pre-existing immunodeficiency which would have explained their death.[578]

346. Contrary to Professor Blackwell's opinion in her report which was again implied in her oral evidence, evidence of the medical histories of the Folbigg children given at trial and before the Inquiry was that the children were normal and healthy and did not have more than expected infections for children of their ages. Professor Blackwell's opinion lacked any accurate foundation and should not be accepted.

Causes of death

347. Each of Professor Blackwell, Professor Clancy and Professor Goldwater have qualifications relating to immunology and microbiology. Professor Blackwell is not a clinician while Professor Clancy and Professor Goldwater were medically trained. None of them had any training, study or expertise in cardiology, forensic pathology or neurology.

348. Notwithstanding the fields that are – and are not – covered by those areas of study and training, each opined as to the causes of death of the children.

[576] Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) Annexure A p 3; Exhibit T, Expert report of Professor Cecelia Blackwell (5 March 2019) p 4.
[577] Transcript of the Inquiry, 22 March 2019, T317.23-27.
[578] Transcript of the Inquiry, 22 March 2019, T317.22-27; T340.13-42.

349. Professor Clancy concluded that two of the children died from SIDS, one likely had an ALTE leading to brain damage and Laura died from arrhythmia secondary to significant myocarditis.[579] He then emphasised by use of capitals that there is "NO evidence of any alternate cause of death".[580]

350. He also opined that "there are many reports of multiple cases of SIDS within a family".[581] He cited no publications to support this statement.

351. In his first report Professor Clancy referred to the histology findings as '"real" with respect to all three children and provided a different opinion when presented with the microbiology reports.[582]

352. On the basis of the reports of Professor Blackwell and Professor Clancy, Professor Goldwater concluded that "there is cogent and persuasive evidence that the Folbigg children died of natural causes. This conclusion is upheld by historical, pathological and microbiological evidence".[583]

353. Professor Goldwater was not given any of the primary evidence as to the causes of death, including autopsy reports, reports and evidence of treating practitioners and the forensic pathologists, medical records of the children and reports of others with different and pertinent expertise.[584]

354. He also was not provided with any evidence as to the environmental and historical circumstances of the children. For example, he did not know that none of the children were found prone. Professor Blackwell's observations, upon which he relied as accurate, as to the frequency of infections in the children and the nature of Patrick's fever, were contrary to the primary evidence.

355. In our submission, their opinions as to cause of death should not be accepted.

[579] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) p 3.
[580] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) p 3.
[581] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) p 3.
[582] Exhibit W, Expert report of Professor Robert Clancy AM (13 March 2019) p 2.
[583] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 5.
[584] Exhibit AU, Expert report of Professor Paul Goldwater (29 March 2019) p 2.

Submissions

The witnesses

356. In our submission, the Judicial Officer should treat with caution the evidence of the immunologists. Professor Blackwell made significant errors in forming and expressing her opinions. She expressed a view on the number of infections each of the children had experienced without any evidence or knowledge. Her opinion was based on incorrect facts; she wrongly referred to Patrick being "very ill" on the night he died; she selectively referred to literature which, when read fully, was against the proposition she sought to proffer; and she gave evidence well outside her areas of expertise. When her attention was drawn to her errors, she declined to alter her opinion. Her unpreparedness to make appropriate concessions was unreasonable.

357. Professor Clancy had limited material before him and also expressed opinions outside his area of expertise, with an emphasis which demonstrated a lack of balance and objectivity. The same can be said for Professor Goldwater. Each of them relied on Professor Blackwell's reports and assumed their accuracy.

358. By contrast, the forensic pathologists were each provided with the same brief and none of them exceeded the areas in which they were expert.

Contaminants?

359. Evidence concerning the histology findings and presence of infection found on autopsy was given at the trial by forensic pathologists as well as treating practitioners.

360. The evidence was that there were signs consistent with mild infection in Sarah and Laura and the organisms found were largely thought to be post-mortem contaminants. None of the findings on autopsy were considered significant or causative of death.

361. The forensic pathologists who gave evidence at the Inquiry were all of the view that those findings were post-mortem contaminants.

362. The immunologists who gave evidence were not, by contrast, at one in interpreting the organisms found on autopsy. In relation to Laura, Professor Blackwell opined they were not contaminants, however, did not

specifically attribute Laura's death to them. Professor Goldwater opined that Laura probably died from myocarditis, however, the organisms could have played a role in her death. Professor Clancy in his first report said they were "real" findings (without having read the microbiology reports) and then in his second report, adopted the contrary view that post-mortem contamination was likely to account for Laura's histology results.[585]

363. Professor Blackwell, Professor Goldwater and Professor Clancy expressed the opinion that the findings in Sarah's lungs on autopsy were likely indicators of infection, with again, only Professor Goldwater opining directly that they would have played a role in her death. Professor Clancy differed from his colleagues in finding that the organisms found in Sarah's spleen suggested contamination. However, again in his first report he had said they were "real" findings.[586]

364. Dr Drucker was equivocal in his opinions and ultimately recommended more information be sought.

365. It is submitted that the Judicial Officer should prefer the evidence of the four forensic pathologists who gave evidence at the Inquiry. They are trained clinicians who have performed autopsies and reported upon them for decades. They were unanimous in their view and their evidence was consistent with that given at trial. The evidence of the immunologists suffered from the deficiencies set out above and should be rejected.

366. However, should there be any doubt as to the nature of those organisms, we submit that that there is no reasonable possibility that those organisms, if not contaminants, caused the deaths of any of the children.

Role of infection in the deaths

367. In our submission, the Judicial Officer should be comfortably satisfied on the basis of evidence received in the Inquiry that a mild infection may be a risk factor when considering a diagnosis of SIDS. However, the evidence does not, on the whole, permit a conclusion that a mild infection can and does of itself cause sudden unexplained death in infants.

[585] Exhibit W, Expert report of Professor Robert Clancy (13 March 2019) p 2; Supplementary expert report of Professor Clancy (17 March 2019) p 3.
[586] Exhibit W, Expert report of Professor Robert Clancy (13 March 2019) p 2.

368. As set out earlier in these submissions, Sarah and Laura each had a mild infection in the 24 hours before they died and Patrick had a mild temperature.

369. Two questions arise. First, the extent to which, if at all, on the basis of evidence received in the Inquiry, the presence of infection in any of the children caused their death by sufficiently increasing their risk of SIDS. The second is the extent to which, if at all, infection otherwise contributed to their death. For the reasons which follow, we submit the presence of infection created no more than a theoretical possibility of an increase in SIDS risk, and also of contributing more directly to any of the deaths.

370. The Folbigg children were at low risk for SIDS, having none of the major identified risk factors. Importantly, they all slept alone on their backs, appropriately covered and their mother did not smoke. The article on which Professor Blackwell sought to rely for the proposition that they were at a higher risk of SIDS establishes to the contrary – a viral infection was not a major risk as long as babies were lightly wrapped.

371. In her oral evidence Professor Blackwell referred to susceptibility to infection being associated with two to four months of age, presence of older siblings, exposure to cigarette smoke, sleeping in a prone position, night time body temperature cycle and not being immunised.[587]

372. None of the children were in the two to four months age range when they died (nor was Patrick when he had his ALTE), none of them had older siblings who were alive, their mother did not smoke and their father smoked outside, they all slept supine and were immunised. Laura and Patrick were asleep during the day time when they died, while the other two were sleeping at night and Patrick's ALTE was also during the night.

373. In addition, evidence in the Inquiry establishes that none of them had genetic susceptibility to infection, impaired inflammatory response, or cardiac dysfunction. Further, it is clear that developmentally each was normal and prior to their death or in Patrick's case, his ALTE, each was healthy. In particular, none of them suffered from infections in excess of what may be expected in healthy children.

[587] Transcript of the Inquiry, 22 March 2019, T341.28-T344.12.

374. Applying the risk factors set out by Professor Opdal: none of the children was at a vulnerable developmental stage at their death, none of them had a genetic predisposition and none had any significant risk factor. All they had was a mild infection.

375. No forensic pathologist who gave evidence at the trial or in the Inquiry opined that any death or the ALTE was caused by infection. Indeed, even Professor Blackwell accepted that infection alone did not cause any of the deaths.

376. In our submission, the Judicial Officer should accept the evidence of Professor Elder that whereas the reason maternal smoking may cause an asphyxia insult is reasonably well-documented, the final mechanism where the risk is exposure to infection is not completely understood.[588] None of the experts identified a final mechanism connected with the role of infection that may have applied to any of the Folbigg children's deaths or ALTE.

377. In our submission, particularly in the absence of any identified mechanism in this case and given that genetic susceptibility has been excluded, evidence received in the Inquiry goes no further than raising for the Judicial Officer's consideration a theoretical possibility that slight infection in each of the older children may have contributed to their deaths. The evidence does not support a finding that this was reasonably possible or indeed, that any possibility was higher than theoretical.

[588] Transcript of the Inquiry, 18 March 2019, T52.43-45.