



New Zealand Police

2014

# CREWE HOMICIDE INVESTIGATION REVIEW



**Medical Reports on the  
condition of Rochelle CREWE  
on 22 June 1970**

**APPENDIX 4**



## **Appendix 4**

### **Medical Reports on the condition of Rochelle CREWE on 22 June 1970**

- 1. Dr Thomas FOX, Children's Physician to the Auckland Hospital Board**
- 2. Dr Ronald CAUGHEY, Consulting Children's Physician**
- 3. Dr Samuel LUDBROOK, Crippled Children's Society**
- 4. Professor Robert ELLIOTT, Professor of Paediatrics at the University of Auckland**
- 5. Professor Carole JENNY, Consultant Paediatrician, Warren Alpert Medical School of Brown University, United States of America (2013)**



## **Appendix 4**

(1)

**Dr Thomas FOX, Children's Physician to the  
Auckland Hospital Board**

V. 16/1

26th June, 1970.

INTERIM REPORT TO:  
CHIEF DETECTIVE-IN-CHARGE,  
OTAHUHU.

This report was prepared by Thomas Grahame Fox, M.B. Ch.B. N.Z. 1940, M.R.C.P. Edinburgh, London 1947, Children's Physician to Auckland Hospital Board, Department of Health and Karitane Hospital.

RE: Rochelle Crewe,  
Aged Approximately Eighteen Months,  
Born ? December, 1968.

Rochelle Crewe was brought to my office, 11 Mount Street, Auckland 1 by Detective Sergeant Charles and Mrs. Willis at approximately 1400 hours on Tuesday, 23rd June, 1970. The purpose of the visit was to seek an opinion on the following questions:-

1. Had she been left unattended from Wednesday, 17th June, 1970 until 13.30 hours, Monday 22nd June, 1970.
2. Could she have survived unattended during this period.

PREVIOUS HISTORY OF ILLNESS:

No information was available.

BIRTH HISTORY:

Rochelle was thought to have been her mother's first pregnancy. She had been born at Pukekohe. No details were available as to her birth weight and general development of childhood skills. According to a verbal report from the maternal grandfather, she had been 'walking' for three months (possibly from March, 1970).

FAMILY HISTORY:

No details available, although as far as was known, the parents were healthy.

The history was that Rochelle had been found by her maternal grandfather Mr. Demler in her cot at 13.30 hours on the 22nd June, 1970. She was said to have been crying and whimpering as the grandfather approached the house, but to have stopped as he went to the cot side. Her eyes were said to have been 'sunken back'. Mr. Demler took her by car to the home of Mrs. Willis at 14.30 hours.

On arrival at the residence of Mrs. Willis, she was sitting on a blanket in the car. Mrs. Willis noted 'a dreadful smell, that the child was very cold and shaking, that Rochelle just clung to her for the following two hours,

Contd. ....



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that her eyes seemed sunken, that the whites of her eyes were blood shot, that she was frightened and shocked, that she did not seem sick and that she was not desperately ill".

The odour was dreadful and due to bowel motion.

The child was dressed in a woollen singlet and winceyette pyjama top. She was wearing two napkins, covered by domed plastic pants. The napkins were soaking wet, while the bowel motion was foul, dry and dark brown. The area of skin covered by the napkins was inflamed and blistered in parts. In answer to questions, Mrs. Willis suggested that the napkins may not have been changed since Friday, 19th June, 1970.

Mrs. Willis gave her a meal of lightly boiled egg, one finger of bread, one tablespoon of ice cream, one slice of peach and 'marmite jar' of milk (4-6oz.) Rochelle seemed ravenous and repeatedly indicated her desire for more milk, which Mrs. Willis withheld. The child then vomited what seemed to be all the meal.

From the time of arrival at the residence of Mrs. Willis 14.30 hours until 18.30 hours, Rochelle may have taken one pint of milk (20 oz). At 18.30 hours she was put down to sleep with a bottle containing 8 oz. milk which she drank and retained.

At 2200 hours she was changed and her napkins were soaking wet.

As far as could be ascertained, the child may have taken and retained approximately 24 - 26 oz. of fluid. She had no further fluids during the night.

At 0.700 hours, Tuesday 23rd June, 1970 she was picked up. She took 4 oz. of milk with one teaspoonful of added Glucose, but refused toast. Between the hours of 0.700 hours and 1400 hours, the time of interview, she took 5 - 6 oz. of milk on five occasions - a total of 25 - 30 oz. During this same period she clung to Mrs. Willis and was unwilling to be left alone.

During the interview, Rochelle appeared to be very apprehensive. She moved little, preferring to cling to Mrs. Willis.

On physical examination Rochelle was of good build and well covered. The tone of her skin and muscles suggested that she may have recently lost one to two pounds in weight. A marked napkin rash with some blistering was evident. This rash was in marked contrast to her general standard of care. No bruising or other abnormalities were found. Her weight was 27 lbs. 5 oz.

COMMENT:

1. At the time of this first examination, the child had been in the care of Mrs. Willis for twenty-four hours (1430 hours Monday, 22nd June, 1970 - 1400 hours Tuesday, 23rd June, 1970).
2. Mrs. Willis appeared as a very intelligent, experienced, observant, affectionate person.

Contd. ....

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3. The details of the child's intake of food and liquids given by Mrs. Willis and the fact that the child had not been regarded as ill suggested that Rochelle had been without normal care for a maximum of seventy-two hours, the more likely period being forty-eight hours.
4. The description of the contents of the napkins and the napkin rash were consistent with the child being left unchanged for forty-eight hours and possibly seventy-two hours.
5. On the basis of these assessments, the child had been unattended and without food or drink from either:
  - 1400 hours Friday, 19th June, 1970.
  - 1400 hours Saturday, 20th June, 1970.

The latter date, 20th June, 1970 is the more likely.

After further consideration, the writer approached Detective Charles at 0830 hours on Friday, 26th June, 1970 regarding a further examination of Rochelle in the company of Mrs. Willis. It seemed possible that any improvement or otherwise in the child's general condition, weight and napkin rash might assist in assessing the duration of the period she was without attention, food or fluid.

At the time of this second interview and examination at 1100 hours on the 26th June, 1970 a period of sixty-nine hours had elapsed, (approximately three days).

Mrs. Willis was able to itemize the child's intake of 'solids' and fluids and without giving the detail, the totals were somewhat less than average for her size and age.

The napkin rash had almost completely healed. Her weight had increased by 12 oz. from 27 lbs. 5 oz. (on the 23rd June, 1970) to 28lbs. 1 oz. Her general muscle tone was comparable with that at the first examination and this may well be normal for Rochelle. She was a happier child in every way.

The improvement in her condition was regarded as consistent with the previously expressed view that Rochelle had been unattended for approximately forty-eight hours with a maximum of seventy-two hours prior to 1430 hours on Monday, 22nd June, 1970.

The search of literature for further information is to continue. Any relevant material will be brought to your notice.

In considering the period of survival without food or liquids in a well child of eighteen months, the following factors are relevant:

1. No literature on this subject has yet been found, despite a diligent search.
2. The situation has not been encountered previously in an otherwise normal child.

Contd. ....

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3. Rochelle was probably a robust normal child.
4. She probably spent a great deal of the time sleeping and thus conserving her resources of fluid and calories (energy).
5. Being confined to the cot, her activity would be less than usual with reduced losses in energy and perspiration.
6. She was moderately well clothed in an average cot inside a house.
7. The colder atmospheric temperatures would reduce fluid losses by perspiration to a minimum while her good nutrition could withstand a substantial period of deprivation of energy intake in food.

In the absence of previous experience of similar cases and informative literature on the subject, it is difficult to assess the likely period of survival of an otherwise well child of eighteen months of age, deprived of both calories (energy) and fluid.

A child such as Rochelle, living under the conditions outlined above might survive six days, but she would be seriously ill at the end of that time.

*T.G. Fox*

T.G. FOX.



## **Appendix 4**

(2)

**Dr Ronald CAUGHEY, Consulting Children's Physician**

V. 16/5.

FROM RONALD H. CAUGHEY  
M.D., M.R.C.P., F.R.A.C.P., D.C.M.

TELEPHONE 378-986

58 SYMONDS STREET  
AUCKLAND, 1

2nd July, 1970.

The Chief Detective,  
Otahuhu Police Station,  
Otahuhu,  
AUCKLAND, 6.

Dear Sir,

re: Rochelle Janeane Crewe (d. of b. [REDACTED] 12.69.)

On the 1st July 1970 I was requested to see the above child in my Consulting Room at 2.30 p.m. She was accompanied by a neighbour, Mrs. Willis and by a Detective Inspector. I was given a copy of the information about Rochelle Crewe, this detailing some aspects of the child's background and the condition in which she was found at 1.45 p.m. on 22.6.70.

The child was tired at the time I saw her, but was obviously a large well developed and healthy looking child. She was anxious and apprehensive and cried when separated from Mrs. Willis. Because of her apprehension I did not completely undress her but her weight in napkins, a singlet and a dress was 31½ lbs. I would estimate her clothing to weigh no more than 1 lb. so that her actual weight was approximately 30½ lbs. This weight is at the upper limit of the normal range for a child of her age and compares favourably with her height of 33½ ins. which is also at the upper range of normal for her age. Those measurements indicate that Rochelle is a large child whose weight and nutrition are excellent. I detected no abnormality in any of her bodily systems.

I am of the opinion that Rochelle Crewe is a physically normal child but one who is showing anxieties as a result of the experiences to which she has been subjected. It appears that from a physical point of view she has completely recovered from the moderately severe dehydration and weight loss to which she was subjected. When examined on 23.6.70., some 24 hours after she had been found in her cot, her weight was recorded as 27 lbs. 5 oz. One can assume that during this time her maximum weight gain from the re-introduction of food and fluids would be of the order of 1 to 1½ lbs. A reasonable estimate of her lowest weight at the time she was discovered is 26 lbs.

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Her loss of tissue and fluid is thus of the order of 4 to 4½ lbs. indicating a 13 to 15% loss of body weight. A loss of up to 15% of body weight, particularly when occurring under conditions of starvation rather than of ill health is perfectly compatible with life. The weight loss would also be less severe under cold atmospheric conditions which were prevailing at that time. It is reported that the child was very cold and shaking when discovered. I am thus of the opinion that a child who was obviously in such good health and nutrition prior to this disaster was perfectly able to withstand a period of starvation of food and fluids in the absence of ill health or extreme heat for a period of at least 7 days. Although I cannot say that Rochelle was not fed between 17.6.70. and 22.6.70. I would say without hesitation that she could survive this period without food or fluids. The reported state of her skin in the napkin area does not in my opinion add any information as to whether she had had her napkins changed or been fed during her reported period of starvation. I also think it most improbable that from the Detective's description of the cot in which she was found that she was capable of getting out of it on her own.

Yours faithfully,

*Ronald H. Cunningham*

Consulting Children's Physician



## **Appendix 4**

(3)

**Dr Samuel LUDBROOK, Crippled Children's Society**



V 16/4

2nd July, 1970.

The Chief Detective,  
Police Station,  
Great South Road,  
OTAHUHU.

Dear Sir,

I have made a careful study of the information provided by your office about Rochelle Janene Crewe, aged 18 months.

The child was cold and shaking, crying and trying to talk, but when found she stopped crying. Eyes were red and sunken. She immediately took food, warm milk sweetened with honey or glucose. She ate a soft-boiled egg and some peach. More milk was given later, but two hours later she vomited. Later she drank three cups of 5 oz. of milk, and slept all night. Rochelle was afraid and clung to the woman who was caring for her.

On 24th June, 1970, she was seen by Dr. Grahame Fox, who found her weight 27 lbs. 5 ozs.

The Detective told me the background information that the parents, with whom Rochelle was living, had not been seen for a period and the cause for their absence was still not certain.

Their absence was reported and the home entered on 22nd June, 1970, when Rochelle was found, lying on her side in her cot in pyjama top, singlet, two napkins and a plastic cover. Napkins were damp, and there was a considerable amount of faecal matter, some moist and some dry. There was a red rash all over the napkin area.

There was no one else in the house, and Rochelle was in a very distressed state.

I examined Rochelle at 9 Mount Street, Auckland, on 1st July, 1970, when she was accompanied by Mrs. Barbara Willis and a member of your staff whose name I omitted to note. She was apprehensive at first, but settled down to play with some toys, and from then on was fully co-operative.

Her height I found to be  $33\frac{1}{2}$ " and weight 30 lbs. The average  $1\frac{1}{2}$ -year-old New Zealand child is height  $33\frac{1}{2}$ ", weight 24 lbs. 11 ozs., so she is below the average height and above the average weight of a New Zealand girl of her age.

(Contd.)

V 16/4.

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The Chief Detective,  
Police Station,  
Great South Road,  
OTAHUVU.

2nd July, 1970.

Detailed examination showed no abnormality except for some excoriation of the napkin area.

It would seem that Rochelle was left in her cot whilst her parents were out. They completely disappeared and the child was left in her cot without attention, without fluid or food for at least  $4\frac{1}{2}$  days, when she was found in her cot with parched lips and very distressed.

She was given milk, glucose or honey, and an egg which was unsuitable after a long period of starvation, and vomited.

On 24th June, 1970, she was examined by Dr. Grahame Fox, who reported that her weight was 27 lbs. 5 ozs. It may well have been less than this, for when she was first discovered she was given a considerable amount of fluid which would have at least in part replenished fluid lost during the  $4\frac{1}{2}$  days of starvation.

I have been asked to give my opinion as to whether a child of her age would be alive after at least  $4\frac{1}{2}$  days of starvation.

My opinion is that a well-nourished, healthy child could withstand starvation for at least 10 days in cool weather. There are reports of starvation for much longer periods without serious damage to health.

A child resting in its cot will lose only a limited amount of body fluid, and will rapidly respond to administration of water and glucose, followed by skim milk and other cereals.

I trust this report is of value to you in your investigations. If I can help further I will be glad to do so.

Yours faithfully,

*S. L. Ludbrook*

S.L. Ludbrook, M.B., F.R.C.P., F.R.A.C.P.



## **Appendix 4**

**(4)**

**Professor Robert ELLIOTT, Professor of Paediatrics  
at the University of Auckland**

V16/9

This report was prepared by Robert Bartlett Elliott  
M.B.B.S. M.R.A.C.P., Professor of Paediatrics,  
School of Medicine, University of Auckland.

re: ROCHELLE CREWE

I have perused the report of Dr T.G. Fox and spoken  
with Detective Inspector Hutton, and viewed the former  
residence of Rochelle Crewe.

I have been asked to make comment on this information  
to determine the possible time which Rochelle Crewe  
was without food and water prior to 13.30 hrs. on  
22nd June 1970.

There is little doubt that Rochelle could have  
survived with food or fluid intake for approximately  
five days, as I have personal knowledge of even younger  
children surviving for greater periods under similar  
circumstances. However, for the reasons outlined  
below, I am of the opinion that she was without intake  
for a period of less than 48 hours before 13.30 hrs.  
on the 22nd June.

The child was weighed at 30 lb. approximately two  
weeks before the time it is thought her parents were  
killed.

Assuming this was her minimum weight at about the time  
her parents were killed, her weight after a period of  
about 5 days without food and water would be lessened  
by loss of tissue solids and water.

1. Tissue solids lost in 5 days (assuming a minimum  
activity and room environment, and a Calory equivalent  
of 6 Cals./gm. tissue solid (a generous estimate))  
would have approximated (at minimum) 1 lb. 14 oz.
2. Fluid losses during the same time:  
(calculated from minimum obligatory losses by  
insensible sweating, minimum urine loss and  
minimum faecal water loss) would have been at least  
3 lb. 2 oz.

This amount represents approximately 10% of the  
child's body weight and, as such, is known to be  
consistent with an extremely ill child - ill  
to the degree where spontaneous activity such  
as sitting and clinging would have been impossible.

It should be emphasised that these minimum losses were  
exceeded - the cot mattress, bedding and napkins were  
soaked with fluid, and large amounts of faecal material  
were noted.

The maximum weight that the child would have been at  
13.30 hrs. on the 22nd. of June was 25 lb. - if no food  
and water had been given for about 5 days. On the  
following day she weighed 27 lb. 5 oz. If this 'weight gain'  
had been due to retention of fluid (54 oz. were given)  
again, a state of at least 8% dehydration would have  
existed. This is again inconsistent with the child's  
stated activity on the 22nd June.

V16/2.

The child passed a large quantity of urine between 18.30 hours and 2200 hours after receiving only about 23 oz. of fluid. This, again, is not likely to have occurred if serious dehydration (i.e. 5% of body weight) existed at 14.30 hours.

On this basis (of degree of dehydration) it seems likely that the child was less than 48 hours without fluid.

Weight gain noted between the 1st and 3rd examination of the child by Dr H. Fox, together with his observation of apparent tissue loss, suggests that the child's food intake may have been inadequate for a period exceeding 48 hours before 14.30 hrs. 22nd June.

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R. B. Elliott  
Professor in Paediatrics



## **Appendix 4**

**(5)**

**Professor Carole JENNY, Consultant Paediatrician,  
Warren Alpert Medical School of Brown University  
United States of America (2013)**

## Carole Jenny, MD, MBA, FAAP

### REPORT ON ROCHELLE CREWE

I was recently asked by Detective Superintendent Andrew J Lovelock to review records relating to the health status of Rochelle Crewe (date of birth December 1968) in June of 1970. I am a Professor of Pediatrics at the Warren Alpert Medical School of Brown University. I am a specialist physician certified by the American Board of Pediatrics in General Pediatrics and Child Abuse Pediatrics. I have worked clinically with abused and neglected children since 1983. A copy of my curriculum vitae is provided with this report.

I reviewed many records, interviews, and transcripts of testimony related to the death of Rochelle's parents, Harvey and Jeannette Crewe. I will emphasize, however, the material that relates to the health of the child during the first 18 months of her life.

#### INTRODUCTION TO THE CASE FROM DET. LOVELOCK

Det. Supt. Lovelock provided a summary of the case to me at the beginning of the review. The overview he provided was found to be an accurate overview of the records I reviewed. I will include his review in my report to set the background for the case.

1. Police are satisfied that husband and wife, Harvey and Jeannette CREWE were both shot once with a single .22 bullet to the head, in the lounge / dining room of their Pukekawa, South Auckland farmhouse on Wednesday 17 June 1970.
2. The reconstruction indicates that Harvey CREWE was shot and killed whilst sitting in his armchair in the lounge.
3. Jeannette CREWE, who was sitting in an adjacent settee, immediately stood up and confronted the gunman, who by necessity entered the lounge / dining room via the kitchen. A broken cheek bone indicates that Jeannette was the subject of an assault prior to being shot.
4. The bodies of the CREWE couple were removed from the farmhouse and disposed of by placing them in the nearby Waikato River, from where they were recovered on 16 August and 16 September 1970, respectively.
5. At the time of the killings, their 18 month old only child, Rochelle CREWE, was believed to have been in her cot, in her bedroom. She was located in this location at about 1:00pm, Monday 22 June 1970, by her grandfather.



6. Rochelle showed signs of distress. Her grandfather delivered her to a nearby family who were experienced parents and tended to her.

7. Some 24 hours later, Rochelle was examined by a medical practitioner.

A significant focus of the original homicide investigation was to determine whether or not Rochelle had been attended to in any way, between the time of her parents' murder and when she was discovered, some four and half (plus) days later.

To arrive at a definitive determination on this point will be of extreme value to the Review team, since it will indicate (or not), that (i) the murderer returned to the crime scene to tend to Rochelle; or (ii) an accomplice of the murderer did so on his or her behalf.

#### RECORDS OF ROCHELLE CREWE

Rochelle's parents had been married for four years when they died. Mrs. Crewe's maternity records were not provided, but there is no indication that her pregnancy or delivery was abnormal. Rochelle was the couple's first child. She weighed 8 lb 5 oz at birth. In the extensive records, Mr. and Mrs. Crewe are described by all observers to have been devoted, involved parents. The child's "Plunkett Record Book" provides the most detailed view of the child's health prior to June 17, 1970. Her first medical visit was on December [REDACTED] 1968. The child was [REDACTED] days old. Her weight is recorded as "9 0 9 6". I am assuming this was a corrected weight after the child was weighed in her diaper. The nurse described her as, "A lovely little girl" who was successfully breast feeding. The nurse recommended rosehip syrup (probably as a vitamin C supplement). Mother's confinement was described as "normal". Mother's health was "well". The child was sleeping in a canvas bassinette.

The next visit recorded in her book occurred on January 9. Her age was [REDACTED] weeks and weight was "10 10 11 4". She was described as "very contented", with good weight gain and "normal motions." At 7 ½ weeks she was described as "smiling". Mother was still breast feeding but was provided a recipe for supplemental formula.

On February 13, 1969 her weight was 13 lb 2 oz. The nurse recommended supplementation with vitamins A, C, and D. She said the baby was doing well with a supplemental bottle of formula before bedtime. On February 27<sup>th</sup>, she was again growing well. Her length was 24 inches and head circumference was 16 inches. At this point she was at the 75<sup>th</sup> percentile for age for height, weight, and head circumference on current World Health Organization Growth Charts. Other feeding recommendations were made that I did not understand.

On March 27<sup>th</sup> the nurse recommended the infant be started on solid foods. By April she was advanced to three solid feeds a day. In May she was sitting up with support. The nurse recommended twice-baked toast for her to chew on. She suggested starting the baby on a cup.

By June the child was "mobile on floor." She was started on fluoride supplements. After starting solid foods, the infant's weight accelerated to the 98<sup>th</sup> percentile for age.

At her 8 month exam on July 24, 1969 Rochelle was noted to have good weight gain. Mother was told to lock away cleaning supplies, and to expand the child's diet. At that point (on current WHO Growth Charts) Rochelle exceeded the 98<sup>th</sup> percentile in weight. At 9 months-of-age Rochelle was saying "Dad" and "Mum" and was mobile. Her growth parameters were 95<sup>th</sup> percentile weight for age, 90<sup>th</sup> percentile for height, and 90<sup>th</sup> percentile for head circumference. Her growth was normal and robust.

Rochelle was again seen at 10 ½ months of age. The nurse said she "pulls up". She had two teeth. At one year of age the nurse says the child is, "Doing very well . . . Eat's well." She was walking at that time. On June 11, 1970 Mrs. Crewe took little Rochelle to the last nursing care visit before mother was killed. She weighed 30 pounds and was 33 ½ inches long. The nurse recorded the following comments: "Fine little girl. Rather shy. 9 teeth."

The overall record describes a healthy, sturdy little girl whose mother took very good care of her. Her development was normal. Reading these records reinforces the sadness of a delightful little girl losing her adoring parents.

#### DESCRIPTIONS OF THE CHILD IN VARIOUS RECORDED STATEMENTS

*Statement of Lenard William Demler, the child's maternal grandfather, June 22, 1970:* He lived on the farm next door to the Crewes. He had tea with the couple the day before they disappeared. Rochelle was asleep. He went to the farm on June 22<sup>nd</sup> at 1:00 pm. He looked around the house. He went to the baby's room and found the baby not to be crying or upset. He returned to his house to make phone calls.

He then came back to the house to look for Harvey and Jeanette. At the end of the search, he took the baby away.

*Statement of Lenard William Demler, June 22, 1970:* He has one 18-month-old granddaughter, Rochelle. "She has been walking for three months." (This is not actually the case, as recorded in the Plunkett Book.) She usually sleeps in a cot in the front bedroom of the house. Rochelle was born in December of 1968. She was baptized at 8 months of age. Her parents are in good health. He visited the Crewes twice a week, usually for tea at night. They were happy and devoted to their baby.

He arrived at the Crewe farm at 1:00 pm on June 22<sup>nd</sup> and left his car at the gate on the road. He called out and heard no reply. He heard the child chattering before entering the house. After entering the house, he went to front room and Rochelle was lying down in her pajamas. The bed smelled badly of urine and she was very dirty. She had excrement on clothes. She was not distressed and not crying. He left her there and returned to his home.

After he returned to the Crewe home, he picked up the child. She was wrapped in a blanket and put in the front seat of the car. He took her to the home of Mr. and Mrs. Willis, Jr. three miles away. A District Nurse came to the house and attended to Rochelle.

*Statement of Owen Lawrence Priest, July 23, 1970:* Mr. Priest was brought back to the Crewe home to help Mr. Demler search for the parents. "I then went into the front room and found the baby in the cot. As soon as she saw us she stopped crying and whimpering. We did not touch her at that stage. She could have stopped crying because we had appeared. Her eyes were sunken as if she had been neglected, for a few days."

"At this stage I told Len that I was going to report. We went back to the house and Len picked the baby up. . . . I did not notice any crumbs or foodstuffs in the cot. The baby smelt, was dirty, and obviously had not had her nappies changed for a few days."

*Statement of Owen Lawrence Priest, July 26, 1970:* When Mr. Demler picked him up on the afternoon of June 22, 1970, he said he did not recall Mr. Demler saying that the Crewe's baby was still at the house. When nearing the gate at the front of the house he heard the baby crying and whimpering. "I said, 'They can't be far away,' to which Len replied, 'I cannot find them.'"

"I went into the kitchen and saw a mass of dishes on the table. I could still hear the baby whimpering. I just looked at the blood at this stage, stepped around it and walked through into the hallway. I walked straight into the front room where the baby was. Len was with me. The baby was lying on her hip looking up at us with a sort of pleading look. She stopped making any noise as soon as we came into the room." "Neither of us touched the baby, we just left her in the cot. I can only describe the baby's cry as being of seeking help, not of distress. It wasn't a weak cry."

"Len walked into the room where the baby was. Len came with me and he picked her up out of the cot, wrapped in a blanket. I gave him another blanket whilst he was holding her and he said, 'We'll take the teddy too.' I could see that the baby's eyes were sunken. She was wearing naps, a plastic cover and a pajama top.

*Statement of Owen Lawrence Priest, September 29, 1970:* "As we approached the front gate to the house section I heard the baby crying. I can only describe the baby's cry as being of seeking help, not of distress. It wasn't a weak cry. I don't remember hearing the baby crying when I walked in the back door."

"I was standing in the lounge, taking everything in, and Len appeared behind me. When I did remember the child I think I said to Len, 'Have you seen the baby?' and he said, 'Yes, she is in there,' indicating the bedroom. I went into the bedroom first, with Len behind me.

"Rochelle was in her cot, lying on her right side, and I have the impression she was propped up on her right elbow. She looked up at us and I saw she had stopped crying. I couldn't say now whether there were any tears on her face, but I don't think there were. She didn't appear to be greatly distressed, but seemed to be glad to see us. I saw that her eyes were sunken."

"She was in this little nest of rumpled bed clothing. I saw she was wearing a pajama top, napkins with plastic overpants. I stood beside the cot, noticed a general soiling of her clothing probably by urine and excreta. She made no sound that I remember. She didn't stand or sit up. Her hair was ruffled as if she had just woken from a sleep. She didn't reach her arms up to be picked up."

"She could see us both equally well, and she didn't pay any more attention to one than the other. Her general expression seemed to one of bewilderment. Neither of us attempted to pick her up and we were with her for only a matter of a minute or so. I was not greatly concerned about the baby at this stage. I looked through the house, and I don't think I heard anything of the baby during this time. She remained in her cot."

"We would have been away for about 15 minutes, then we went back inside the house. I think the baby was crying when we went back, but know she wasn't crying when we went in to her. She was virtually in the same position in the cot as when I had last seen her. She might have moved onto her back, or made some other movement, I couldn't say. I had too much on my mind at that stage."

"Both Len and I went in to the room where the baby was, and he picked her up out of the cot. As he picked her up she put one arm around his neck, and I could see she was pleased to be picked up. There was not any great show of affection or relief."

"Len had picked up a cuddly rug or something like that when he had picked the baby up, and I reached in and got a blanket to wrap around her. Len carried her out and I opened the passenger's side front door for him. He put her in on the seat, sitting up, and I remember reaching in and putting the teddy bear in her arms. There was no real reaction when I gave it to her. He dropped me off and carried on with Rochelle."

"Going back to when I first saw the baby, I noticed that the little 'nest' she was in was generally soiled, but not with recognizable excreta. I wouldn't know what was in her pants. I did not see any stool, or any solid portion of excreta. I have never seen a starving child, but I am of the opinion that the baby had not been without sustenance of some sort for any great length of time. Len told me the baby smelled pretty badly."

"Mrs. Willis said that Len arrived with the baby at her home between 2:15 and 2:35 pm. She undressed the baby. The baby had been wearing some pajama tops, a singlet, and two nappies. They were soiled to such an extent that it was obvious to her that the child's nappies had not been changed for a few days. Rochelle also smelt."



"Willis said that she burnt the nappies and bathed the baby. She then gave her some food, namely an egg, ice cream and milk. Baby was then sick. Also, she found that the baby could not stand up or did not want to. Her eyes were sunken. There were a number of blisters about her private parts and buttocks . . ."

*Testimony of Owen Lawrence Priest:* Question: Did Rochelle look to you as if she had been starved for several days? Answer: I didn't think so, no. Question: Did you see any signs of food about her? Answer: I didn't see any. Question: She looked in good condition didn't she? Answer: She appeared to be.

*Testimony of Ms. Willis:* "Rochelle put her arms around me and clung to me. She was shaking, cold and rigid. The shaking went on all that day. She was very drawn in the face, her eyes were very sunk, and she had dark rims, and the whites of her eyes were very bloodshot. She had blisters around the front part between her legs, and I rang the doctor and got cream, apart from that I didn't think she needed medical attention. Her buttocks were red as if she had a rash but they weren't blistered."

"I gave her a lightly boiled egg, bread and butter, ice cream and peaches, and milk. She was very thirsty. I gave her one glass of milk with her meal and she wanted more. I gave her some more then she was sick. She didn't like me speaking on the telephone and she would push the telephone away if I went."

*Testimony of Nancy Hazel Crawford:* Ms. Crawford was the Public Health Nurse for the district at the time. She took cream to Ms. Willis on June 22<sup>nd</sup>. The child's general appearance was that she was sunken in eyes, she had the appearance of losing weight, she was dehydrated, and her buttocks were scalded. "She was very upset when I examined her and she was clinging to Mrs. Willis and Mrs. Willis undressed her." Nurse Crawford didn't think the child needed medical care.

#### EXPERT PHYSICIAN REPORTS

*Police reports about Dr. Grahame Fox's examination of Rochelle on June 23, 1970:* "Dr. Fox took down notes from Mrs. Willis about the state in which she received the baby and what the baby has consumed since. He found the baby weighed 27 lb 5 oz without nappies and her height was 33 inches. Bearing in mind what Mrs. Willis said about the state she found the nappies in, Dr. Fox said that the baby would have been wearing them for at least 48 hours and maybe more."

"Said that upon feeling her rib cage he is of the opinion that the baby had lost some weight but cannot say how much. Said that a baby of 18 months could possibly survive for 5 days without food or water but he would expect signs of dehydration which were not apparent."

*Report of Dr. Thomas Grahame Fox:* Rochelle was found by her maternal grandfather at 13:30 on 22<sup>nd</sup> June, 1970. She was said to have been crying and whimpering as the grandfather

approached the house, but to have stopped as he went to the cot side. Her eyes were said to have been 'sunken back'. He took her to the home of Mrs. Willis.

On arrival, Mrs. Will found the child sitting on a blanket in the car. Mrs. Willis noted a dreadful smell, that the child was very cold and shaking, that Rochelle just clung to her for the following two hours, that her eyes seemed sunken, that the whites of her eyes were blood shot, that she was frightened and shocked, that she did not seem sick and that she was not desperately ill. The odour was dreadful and due to bowel motion.

The child was wearing two napkins, covered by domed plastic pants. The napkins were soaking wet, while the bowel motion was foul, dry and dark brown. The diaper area was inflamed and blistered.

Mrs. Willis fed the child lightly boiled egg, one finger of bread, one tablespoon of ice cream, one slice of peach and 'marmite jar' of milk (4-6 oz). The child seemed ravenous and repeatedly indicated her desire for more milk, which Mrs. Willis withheld. The child then vomited what seemed to be all the meal.

From 4:30 pm until 6:30 pm, Rochelle may have taken 20 oz milk which she drank and retained. At 6:30 pm she was put down to sleep with an 8 oz bottle of milk which she drank and retained. At 10:00 pm she was changed and her napkins were soaking wet.

Dr. Fox's report said that the child may have retained approximately 24-26 ounces of fluid that day. The next morning the child had 4 oz milk with added glucose, but refused toast. Between 7:00 am and 2:00 pm the child took 5 to 6 oz of milk on 5 occasions, a total of 25 to 30 oz. During this time, the child clung to Mrs. Willis and was unwilling to be left alone.

During the visit, the child was apprehensive and clinging to Mrs. Willis. On physical examination, Rochelle was "of good build". Her tone and muscles suggested she may have recently lost one to two pounds of weight. She had a marked napkin rash, which was in contrast to her general standard of care. Her weight was 27 lb 5 oz.

Dr Fox's comments:

1. The child had been in the care of Mrs. Willis for 24 hours before being seen. Mrs. Willis was a competent caretaker.
2. The history suggests that Rochelle had been without normal care for a maximum of 72 hours, and more likely period being 48 hours.
3. The description of the napkins were consistent with the child being left unchanged for 48 hours and possibly 72 hours.
4. On the basis of these assessments, the child had been unattended and without food or drink from with 2 pm on June 19<sup>th</sup> or June 20<sup>th</sup>, 1970. The latter date is more likely.

The child was again examined by Dr. Fox on June 26, 1970, 69 hours after the child was discovered uncared for. Her intake of solids and fluids had been somewhat less than average for her size and age. Her napkin rash had almost healed. She had gained weight to 28 lb 1 oz. Her muscle tone was unchanged. She was "a happier child in every way."

"The improvement of her condition was regarded as consistent with the previously expressed view that Rochelle had been unattended for approximately 48 hours with a maximum of 72 hours prior to 14:30 on Monday, June 22, 1970."

Dr. Fox's literature revealed the following:

1. No literature on the subject was found
2. The situation has not been encountered previously in an otherwise normal child.
3. Rochelle was probably a robust, normal child.
4. She probably spent a great deal of time sleeping and thus conserving her resources of fluids and calories.
5. Being confined to the cot, her activity would be less than usual with reduced losses in energy and perspiration.
6. She was moderately well clothed in an average cot inside a house.
7. The colder atmospheric temperatures would reduce fluid losses by perspiration to minimum.

"A child such as Rochelle, living under the conditions outlined above might survive six days, but she would be seriously ill at the end of that time."

Dr. Fox did some experiments to determine how long it would take for milk to sour and diapers to dry.

*Expert report of Dr. Ronald H. Caughey, July 2, 1970:* He saw Rochelle on July 1, 1970 at 2:30 pm. She appeared tired when she was seen. She was large, well developed, and healthy. She was anxious and apprehensive. The physician did not undress her to weigh her. Her weight was 31.5 lb (upper limits of normal). Her weight and nutrition were excellent. There were no abnormalities in her bodily systems.

In this physician's opinion, Rochelle was physically normal, but showing anxieties from her experiences. She has recovered from moderately severe dehydration. "A reasonable estimate of her lowest weight at the time she was discovered is 26 lb. When examined 24 hours after she had been found her weight was 27 lb 5 oz. Her maximum weight gain from the reintroduction of food and fluids would have been 1 to 1 ½ pounds. "A reasonable estimate of her lowest weight at the time she was discovered is 26 lb." This corresponds to a 13 to 15% loss of body weight. "A loss of 15% of body weight, particularly when occurring under conditions of starvation rather than of ill health is perfectly compatible with life. The weight loss would also be less severe under cold atmospheric conditions which were prevailing at that time. It is reported that the child was very cold and shaking when discovered. I am thus of the



opinion that a child who was obviously in such good health and nutrition prior to this disaster was perfectly able to withstand a period of starvation of food and fluids in the absence of ill health or extreme heat for a period of at least 7 days." He could not rule out that she could have been given food and fluids in the time period between June 17<sup>th</sup> and June 22<sup>nd</sup>. He also thought she was incapable of climbing out of the crib by herself.

*Expert report of Dr. Robert Bartlett Elliott:* "There is little doubt that Rochelle could have survived without food or fluid intake for approximately five days, as I have personal knowledge of even younger children surviving for greater periods under similar circumstances. However, . . . I am of the opinion that she was without intake for a period of less than 48 hours before 13:30 on the 22<sup>nd</sup> of June."

1. Tissue solids lost in 5 days (assuming minimum activity and room environment, and a calorie equivalent of 6 Cals/gm tissue solid) would have approximated (at minimum) 1 lb 14 oz.
2. Fluid losses must have been 3 lb 2 oz. This amount represents approximately 10% of the child's body weight and, as such, is known to be consistent with an extremely ill child. Spontaneous activity such as sitting and clinging would have been impossible.

These minimum losses were exceeded.

*Testimony of Thomas Grahame Fox:* "I specialize as a child physician. I examined the child on June 23, 1970. She was a good build, well covered, the tone of her skin and muscles suggested she had recently lost 1 or 2 pounds in weight. She had a mark or napkin rash with a blister. The rash was in marked contrast to her general standard of care. On June 26<sup>th</sup> she had gained 12 ounces in weight. The napkin rash was almost gone. On 16 July her weight was 30 lb. 8 oz. It was my view that she would have been without food or drink for a maximum of 1 period of 48 hours, conceivably 72 hours. If she had been unfed from June 17<sup>th</sup> till found on the 22<sup>nd</sup>, I would have expected her to have lost more weight and I would have expected her general condition to be less satisfactory than it was."

"She couldn't get out of the cot by herself."

Ms. Willis: If I put her down she wouldn't stand. I don't know if she wouldn't or couldn't, but this happened for several days. Question: After she had been sick was she still thirsty? I don't think I gave her anymore to drink. She had a bowel movement on the first night in Ms. Morris's house.

Dr. Fox: Question: Had the child been left without food for a longer period and particular from the evening of the 17<sup>th</sup> of June, a Wednesday, until she was found on the Monday, what difference would you have expected? I think her general condition would have been worse; I think the people on first contact with her would have sought medical advice.

The average baby of this age under normal circumstances would require about 120 mm of fluid per kilogram per day and about 100 calories per kilogram per day. She would lose about 84 ml of fluid per day in urine and insensible perspiration and thru the motions. From when she was found, she had 2 to 2 ½ pints of fluid. On Wednesday the 24<sup>th</sup> of June Mrs. Willis observed the child's napkin being dry all day, in daylight hours that is. The napkin in the crib was damp.

Examination of Ronald Hugh Coyle, MD: Saw Rochelle Crewe at 2:30 pm on July 1<sup>st</sup>. She was anxious and apprehensive and cried when separated from Mrs. Willis; she was a large healthy, well developed girl; I examined her fully and found no abnormality on complete physical examination. She weighed 30 ½ pounds. Her height was 33 ½". Both were the upper level of normal for age. He estimated she lost 4 to 4 ½ lbs. Mild dehydration is 8-12% body weight, moderate dehydration is 12-16% requiring hospitalization, death from 16-20% of body weight. Her condition as described is consistent with 4-5 days of total restriction. Gamble, Darrow, Butler, and Nathan described losses children suffer in total starvation. Her kidneys would have shut down, to 100 ml per day. Loss of 9 ml per pound every day, 275 ml per day. Was the house heated? Loses 25-30 ml per day in non-diarrheal stool. She lost 400 ml per day (400 grams). 4 ½ days would be actually morning of 18<sup>th</sup> until early afternoon on the 22<sup>nd</sup>. Her state was consistent with her not having been fed. It's unlikely she can get out of the cot.

## CONCLUSIONS:

Prior to June 17, 1970, Rochelle was a very healthy and well cared for child. On a standard World Health Organization growth charts, her weight-for-length ratio was above the 95<sup>th</sup> percentile. Since she was healthy and not underweight, she would be able to tolerate deprivation better than a frail child. There are three separate issues regarding her health status when she was found on June 22, 1970: Starvation, dehydration, and psychological stress.

## Starvation

There is very little literature on the response of children to starvation. Most of the studies are done in developing countries where chronic starvation and malnutrition is common. Natural disasters have been studied to assess the relative death rate from starvation in children versus adults. For example, McCurdy studied the fate of the Donner party, a group of 87 American pioneers who set out from Missouri by wagon train in 1846.<sup>1</sup> They became trapped in the Sierra Nevada Mountains in the winter of 1846-1847, and they ran out of food. Very young children and older men were found to be the most vulnerable to starvation. They experienced a much higher death rate.

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<sup>1</sup> McCurdy SA. Epidemiology of disaster: The Donner party (1846-1847). *Western Journal of Medicine* 1994; 160(4):338-342.

Studies have been done in adult humans who volunteered to consume no or minimal food over short or extended periods of time.<sup>2,3,4,5</sup> When deprived of food, the body quickly adapts to mobilize fat stores and to produce glucose for brain function. On prolonged fasting, ketone bodies, specifically  $\beta$ -hydroxybutyrate and acetoacetate, displace gluconeogenesis and spares body protein.<sup>6</sup> The length of time one can stand total starvation depends on initial mass of body protein and fat.

Human bodies also respond to lowered food intake by a series of physiological and behavioral responses as an adaptation to reduced energy intake.<sup>7</sup> While experiments have been conducted on adults, subjecting them to starvation, it would be considered unethical to purposely expose a young child to starvation to measure the metabolic effects of deprivation. In adults, the metabolic response to lack of food varies markedly depending on the person's baseline state. The response to acute starvation in a previously well-fed healthy individual is much different than that of a chronically malnourished individual. In children, the literature is mostly limited to observations of seriously malnourished children. In addition, these children often have co-existing infections and other chronic illnesses.

Even mildly malnourished children have been shown to decrease their physical activity compared to well nourished children. They are more likely to sit and stand still, while their well-nourished peers will be more physically active.<sup>8</sup> Rochelle most likely reacted to her lack of food by being very still and not expending energy. In addition, she was confined to a very small space.

In human starvation studies, metabolic acidosis develops after 2 to 3 days of starvation. We have no laboratory data on Rochelle, but if not fed she should have experienced the ketoacidosis of starvation. This occurs because the decrease of food intake leads to a decrease in insulin secretion, which leads to lipolysis and ketogenesis.<sup>9</sup> Starvation usually causes a decrease in stress hormones such as catecholamines and cortisol, growth hormone, and glucagon. The augmented ketoanion production increases the severity of metabolic acidosis. Hyperketonemia develops after 1 day of starvation in infants and children, while it takes 3 days

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<sup>2</sup> Cahill GF Jr. Starvation in man. *New England Journal of Medicine* 1970; 282(12):668-675.

<sup>3</sup> Benedict FG: A Study of Prolonged Fasting. Carnegie Institute, Publication No. 203, Washington, DC. 1915.

<sup>4</sup> Keys A, Brozek J, Henschel A, Mickelson O, Taylor HL. The Biology of Human Starvation. University of Minneapolis Press, Minneapolis, 1950. pp. 303-364.

<sup>5</sup> Gamble JL. Physiological information gained from studies on the life raft ration. In: The Harvey Lectures, 1946-1947. Science Press Publishing Co., Lancaster, PA, 1948.

<sup>6</sup> Owen OE, Morgan AP, Kemp HG, et al. Brain metabolism during fasting. *Journal of Clinical Investigation* 1967; 46:1589-1595.

<sup>7</sup> Shetty PS. Adaptation to low energy intakes: The responses and limits to low intakes in infants, children and adults. *European Journal of Clinical Nutrition* 1999; 53(S1):S14-S33.

<sup>8</sup> Torun B. Energy cost of various physical activities in healthy children. In: Schurch B, Scrimshaw NS, eds. Activity, Energy Expenditure and Energy Requirements of Infants and Children. International Dietary Consultancy Group, Lausanne, Switzerland, 1990.

<sup>9</sup> Felig P, Lynch V. Starvation in human pregnancy: Hypoglycemia, hypoinulinemia, and hyperketonemia. *Science* 1970; 170(3961):990-992.

to develop in adults.<sup>10</sup> The associated metabolic acidosis from starvation is usually mild, but a number of factors, including stress may exacerbate the severity of the metabolic acidosis.<sup>11,12</sup>

Clinical signs of metabolic acidosis are non-specific, depending on the underlying cause of the acidosis. Generally, vomiting, nausea, poor perfusion and respiratory distress occur. An infant or toddler with metabolic acidosis should show an increased respiratory rate, as their bodies compensate for the excess acid in their blood by releasing increased amounts of CO<sub>2</sub> from their lungs.

According to Askew, short term starvation is tolerated in young children (3-5 days).<sup>13</sup> People starved for short periods of time do not develop the "re-feeding syndrome", the severe metabolic abnormalities that develop after feeding in people who are starved or malnourished for long periods of time. In fact the most frequent complication of refeeding after short term starvation is that the person eats too much when food becomes available and is uncomfortable or vomits.

Of note, children who are in a state of starvation are exhaling ketones in their breath. This gives their breath a peculiar sweet smell. No one mentioned this child having unusual smelling breath.

In summary, in the Crewe case, the available evidence shows that the child could have survived for five days without being fed, but I would have anticipated that the people caring for her would have noted the increased rate of breathing associated with metabolic acidosis.

### Dehydration

A more threatening complication of deprivation in young children is dehydration, the loss of water and salt from the body. Again, most of the available literature in infants and children concerns dehydration that results from diarrhea and/or vomiting, rather than dehydration caused by lack of access to water. In looking at the literature, one must keep in mind that this difference could affect the interpretation of signs and symptoms.

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<sup>10</sup> Laffel L. Ketone bodies: A review of physiology, pathophysiology and application of monitoring to diabetes. *Diabetes Metabolism Research Review* 1999; 15(6):412-426.

<sup>11</sup> Owen OE, Caprio S, Reichard GA Jr, et al. Ketosis of starvation: A revisit and new perspectives. *Clinical Endocrinology and Metabolism* 1983; 12(2):359-389.

<sup>12</sup> Toth HL, Greenbaum LA. Severe acidosis caused by starvation and stress. *American Journal of Kidney Diseases* 2003; 42(5):16-19.

<sup>13</sup> Askew EW. Nutrition, malnutrition and starvation. In: Aurbach PS. *Wilderness Medicine*, 6<sup>th</sup> Ed. Mosby, Philadelphia, 2011. pp. 1374-1392

Infants and children are more vulnerable to dehydration because of their increased surface area to body mass ratio. Their insensible losses of water through the skin are greater than in adults.

When evaluating dehydration in children, the severity of the dehydration is measured using clinical signs and symptoms. With more severe dehydration, the child develops worsening symptoms. The percent decrease in body weight is the "gold standard" used to calculate the degree of dehydration in children, but baseline hydrated weights are rarely available.<sup>14</sup> Many of the signs of dehydration are subjective, and different people interpret the signs inaccurately. One study showed that the physicians' clinical estimation of degree of dehydration in children was accurate only 33% of the time.<sup>15</sup>

Several different scales have been developed to assess degrees of dehydration.<sup>16</sup> All of them involve observing some combination of signs and symptoms of dehydration. These include:

- General appearance. Does the child appear normal? Is the child thirsty, restless, or irritable? Is the child drowsy, limp, cold, sweaty, or comatose?
- Eyes. Dehydrated children's eyes appear slightly sunken or very sunken.
- Tear production. If a child is producing tears normally, the chance of significant dehydration is low.<sup>17</sup>
- Mucous membranes. The mouth is normally moist. With worsening dehydration the mucous membranes become sticky and then dry.
- Heart rate. If a child is seriously dehydrated and their blood volume is decreased, the heart rate increases.
- Respiration. With dehydration, the respiratory rate and depth increases.<sup>18,19</sup>
- Skin turgor. Skin turgor is assessed by pinching the abdominal skin lateral to the umbilicus between two fingers. Normally, the skin immediately recoils to its original state. As dehydration increases, the skin takes longer to return to normal or actually stays tented.<sup>18,19</sup> Decreased skin turgor is seen when dehydration is  $\geq$  4% of body weight.<sup>20</sup>

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<sup>14</sup> Kinlin LM, Freedman SB. Evaluation of a clinical dehydration scale in children requiring intravenous rehydration. *Pediatrics* 2012; 129(5):e1211-e1219.

<sup>15</sup> Vega RM, Avner JR. A prospective study of the usefulness of clinical and laboratory parameters for predicting percentage of dehydration in children. *Pediatric Emergency Care* 1997; 13(3):179-182.

<sup>16</sup> Friedman JN, Goldman RD, Srivastava R, Parkin PC. Development of a clinical dehydration scale for use in children between 1 and 36 months of age. *Journal of Pediatrics* 2004; 145(2):201-207.

<sup>17</sup> Porter SC, Fleisher GR, Kohane IS, Mandl KD. The value of parental report for diagnosis and management of dehydration in the emergency department. *Annals of Emergency Medicine* 2003; 41(2):196-205.

<sup>18</sup> Gorelick MH, Shaw KN, Murphy KO. Validity and reliability of clinical signs in the diagnosis of dehydration. *Pediatrics* 1997; 99(5):E6.

<sup>19</sup> Duggan C, Refat M, Hashem M, et al. How valid are clinical signs of dehydration in infants? *Journal of Pediatric Gastroenterology and Nutrition* 1996; 22(1):56-61.

<sup>20</sup> Mackenzie A, Barnes G, Shann F. Clinical signs of dehydration in children. *Lancet* 1989; 2(8663):605-607.



- Capillary refill time. The child's finger tip is held at the level of the heart and squeezed to push the blood out the capillaries. The finger tip turns white for a few seconds. Within two seconds the blood should return to the finger tip and the color should turn back to red. If it takes longer than two seconds for color to return, the capillary refill is delayed. This is a sign of poor peripheral perfusion.<sup>18,19</sup>

One study showed the three most predictive factors of dehydration greater than 5% were abnormal capillary refill time, abnormal skin turgor, and abnormal respirations.<sup>21</sup> Another study found capillary refill > 2 seconds, absence of tears, dry mucous membranes, and a general ill appearance to be most predictive of dehydration > 5%.<sup>18</sup>

Most studies of the validation of clinical prediction scales have found that the scales are more accurate in distinguishing mildly or moderately dehydrated children from non-dehydrated children, and are less reliable in distinguishing moderately dehydrated children from seriously dehydrated children.<sup>22</sup>

Laboratory studies are very helpful in determining the extent of a child's dehydration, including the levels of sodium, chloride, bicarbonate, and urea in blood. These factors are irrelevant in this case because no medical care was sought.

In most cases of dehydration in children resulting from diarrhea and/or vomiting, most of the volume loss in their bodies is from extracellular fluid (fluid in plasma, lymph, and interstitial fluid). In this case, the child did not have evidence of abnormal losses such as vomiting and diarrhea. This would indicate her losses would most likely have been loss of water alone. Because sodium is restricted to the extracellular space, the typical signs of dehydration are less pronounced when only water is lost. Significant circulatory disturbances are not likely to be noted until dehydration reaches 10%. Hypernatremia can lead to "doughy" feeling skin (rather than tenting) increased muscle tone, irritability, and high pitched cry.<sup>23</sup>

In assessing the severity of dehydration in children, most experts use clinical signs to estimate dehydration as a percentage of body weight. In mild dehydration (3-5% loss), clinical signs may be absent. With moderate dehydration (6-9% loss), tachycardia (rapid heart rate), decreased blood pressure upon standing, decreased skin turgor, dry mucous membranes, irritability, delayed capillary refill, and deep respirations are present. Urine output decreases and tearing decreases. With severe dehydration ( $\geq$  10% loss, children present in near-shock, with

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<sup>21</sup> Friedman JN, Goldman RD, Srivastava R, Parkin PC. Development of a clinical dehydration scale for use in children between 1 and 35 months of age. *Journal of Pediatrics* 2004; 145(2):201-207.

<sup>22</sup> Kinlin LM, Freedman SB. Evaluation of a clinical dehydration scale in children requiring intravenous rehydration. *Pediatrics* 2012; 129(5):e1211-e1219.

<sup>23</sup> Conley SB. Hypernatremia. *Pediatric Clinics of North America* 1990; 37(2):365-372.

hypotension, decreased peripheral perfusion, capillary refill > 3 sec, cool and mottled extremities, lethargy, deep respirations, and an increased respiratory rate.<sup>24,25</sup>

In this particular case, several of the parameters we use to judge the degree of dehydration are not described. The table below lists descriptions of Rochelle's condition on June 22, 1970.

**Descriptions given of Rochelles state when found on June 22, 1970**

Characteristic	Description	Reporter
General	Baby not crying, not distressed or upset. Baby's cry was seeking help, not distressed. Cry wasn't weak.	Mr. Demler
	She stopped crying and whimpering when she saw us. She looked up at us with a pleading look. Cry was seeking help, not of distress. Cry wasn't weak. She didn't look like she'd been starved for several days. She appeared in good condition.	Mr. Priest
	She was shaking, cold, and rigid. She was very thirsty.	Mrs. Willis
	She had the appearance of losing weight, she was dehydrated. Didn't think she needed medical care.	Mrs. Crawford
Eyes	Her eyes were sunken.	Mr. Priest
	Her eyes were very sunk.	Mrs. Willis
	She was sunken in the eyes.	Mrs. Crawford
Tear production	Can't say if there were tears on her face, but I don't think so.	Mr. Priest
Mucous membranes	No data.	
Heart rate	No data.	
Respiration	No data.	
Skin turgor	No data.	

<sup>24</sup> Practice parameter: The management of acute gastroenteritis in young children. American Academy of Pediatrics, Provisional Committee on Quality Improvement, Subcommittee on Acute Gastroenteritis. *Pediatrics* 1996; 97(3):424-435.

<sup>25</sup> King CK, Glass R, Bresee JS, Duggan C; Centers for Disease Control and Prevention. Managing acute gastroenteritis among children: Oral rehydration, maintenance, and nutritional therapy. *MMWR Recommendations and Reports* 2003; 52(RR-16):1-16.



Capillary refill	No data.	
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Many important variables were not mentioned by observers such as presence or absence of tears or dry mouth. No one described her respirations as rapid or unusually deep. The unusual tenting or doughy feeling of the skin was not noted. Given her overall described state, I would estimate her dehydration was in the moderate range, from 6 to 10 percent.

Her weight the next day was 9% below the weight that was reported two weeks earlier. The two weights were done on different scales, and wide variations in individual scales are not unusual. In addition, she vomited once and had two large stools in the interim between the two weights, as well as several feedings.

With the limited data that exists, one fact stands out. The investigators described her cot mattress and bedding as very wet. A diaper found in her cot was also described as wet. When children are deprived of fluid, their urine output quickly decreases to almost nothing. As volume decreases and osmolality increases, ADH is released and promotes the reabsorption of free water from the distal nephron. This decreases urine output.

If this child were completely deprived of food and water for almost five days, it would have been impossible for her to have soaked her mattress and bedclothes to the extent described by the observers.

This fact combined with the fact that no one noted the child to be breathing deep or fast leads me to conclude that the child was given food and/or drink between the time her parents died and the time she was found by her grandfather.

### Psychological stress

Clearly, a child who is accustomed to being cared for and nurtured would find the sudden withdrawal of her loving parents to be very distressing. It is an incomparable loss to a child. Her passivity and inactivity is consistent with adaptation to her circumstances. Children will conserve their energy by biologically adapting to the lack of food. Engel and Schmale defined conservation-withdrawal as "biological threshold mechanisms where survival of the organism is supported by processes of disengagement and inactivity vis-à-vis the external environment."<sup>26</sup> Infants will conserve their energy by biologically adapting to lack of food.

This child's psychological state is completely consistent with a terrible shock and abandonment. Her clinging to Mrs. Willis even though she had not previously been close to her would indicate

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<sup>26</sup> Engel GL, Schmale AH. Conservation-withdrawal: A primary regulatory process for organismic homeostasis. In: Porter R, Knight J, eds. *Ciba Foundation Symposium 8 - Physiology, Emotion and Psychosomatic Illness*. John Wiley & Sons, Ltd., Chichester, UK, 2008.

she was acutely stressed, and glad of any caring individual offering her comfort. This is consistent with an acute trauma and stress reaction.

**Answers to the questions posed by Detective Superintendent Lovelock**

1. Is it possible for a child of Rochelle's age to have survived if left unattended until 1:00 pm, Monday, 22 June, 1970, when she was found by her grandfather in her cot? My answer is yes, it would have been possible she could have survived, but I would have expected her state to be to have been quite different when she was found.

2. If so, what is the level of this possibility:

- i. a remote possibility?
- ii. a reasonable possibility?
- iii. a likelihood?
- iv. other definition?

My answer is iv. The child's state when found was clinically incompatible with complete starvation and lack of fluid for five days.

3. Is Rochelle's physical and emotional state when found consistent with your identified level of possibility (if one exists)?

The child could have survived but her state would have been quite different than what was described at the time she was recovered. I am certain she was provided food and/or drink during the time she was alone after her parents died.



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May 9, 2013

Andrew J Lovelock  
Detective Superintendent: Upper North  
Harlech House  
482 Great South Road, PO Box 22142, Otahuhu, Auckland 1640

Dear Detective Superintendent Lovelock,


I am providing the following summary of my February 11, 2013 report on the Crewe matter as you requested. I will reaffirm my opinion about whether it would have been possible for a child to survive having been deprived of food and or drink for five days, and if so, what state would I have expected her to be in when she was found.

I confirm that the child could have survived but her condition would have been quite different than what was described at the time she was found. This is my response to the question, "What would an 18-month-old child be like if not given food or drink for almost 5 days?"

In my opinion, her condition would have been as follows:

1. She would be lethargic.
2. She would have a peculiar odor to her breath (ketosis)
3. She would be very dry, with a profoundly dry mouth and parched, cracked lips.
4. The bed and bedding would be urine stained and smelly, but dry not wet.
5. She would be breathing deeply and rapidly.
6. Her pulse would be rapid and thready.
7. When the child cried there would be no tears produced.
8. Her skin would feel doughy and odd.

Please contact me if I can provide any other information concerning this matter.  
Sincerely,

A handwritten signature in cursive script that reads "Carole Jenny".

Carole Jenny, MD, MBA, FAAP  
Professor of Pediatrics  
Warren Alpert Medical School at Brown University  
Providence, Rhode Island, USA

