WHAT HEALTHY CHILDREN THINK ABOUT THEIR BLOOD: DEVELOPING EXPLANATIONS OF LEUKAEMIA FOR CHILDREN.

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RESUMEN

Las explicaciones de la Leucemia que se dan a los niños incluyen habitualmente detalles de la composición y función de la sangre. En el estudio 1 se ha entrevistado a niños de 3, 4 y 8 años de edad acerca de cómo entienden las propiedades de la sangre y de las ocasiones en las que recuerdan haber visto sangre. Se les preguntó también si otros animales y objetos tenían sangre o no y que dieran razones de ello. Los niños justificaron sus razones de tres formas: sólo las personas tenían sangre, habían visto sangre en una ocasión particular, o sólo criaturas que compartían una propiedad humana (hablar o pasear) podían tener sangre. En los estudios 2 y 3, intentamos hacer intervenciones breves para aumentar los conocimientos acerca de la sangre.

Palabras clave: Oncología pediátrica, comunicación y conocimiento.

ABSTRACT

Explanations of leukaemia to children usually include details of blood function and structure. In study 1, 3-, 4-, and 8-year olds were interviewed about their understanding of the properties of blood and any occasions when they remembered seeing blood. They were also asked whether other animals and objects had blood or not, and to give reasons for this. Children justified their
decisions in three ways; only people have blood; they had seen blood on a particular occasion, or only creatures which shared a human property (walking or talking) could have blood. In studies 2 and 3, we attempted brief interventions to increase understanding of blood.

Key words: paediatric oncology, communication, knowledge.

INTRODUCTION

What do healthy children know and understand about cancer? The question is important for a number of reasons. First, with respect to personal health, it is important that children realise the relationship between their own behaviour (for example, smoking and diet) and subsequent risk of cancer. Second, children may be confronted by cancer through the illness of relations, especially grandparents. Third, children learn about cancer through the media, either in episodes in soap operas, or through news items. Fourth, on occasions, children are confronted directly with cancer through illness of their friends. In these cases, they may feel uncertain about how to behave towards the sick child, and this uncertainty may be fuelled by ignorance about the prognosis and implications. Patients report that the reactions of others can be a particular source of stress (Wasserman, Thompson, Wilmis & Fairclough 1987), especially where school-friends teased or criticised. Fifthly, it is important to know how healthy children think about blood and other bodily processes, since it is a proportion of these children who are diagnosed and referred to oncology clinics, needing explanations of their own disease.

The most prevalent cancer in childhood is leukaemia. Treatment is long (2 years, followed by at least 5 years of regular check-ups), painful, and aggressive, but with current regimens, prognosis for many children with this disease is good. (Current figures suggest a 70% survival rate for children with acute lymphoblastic leukaemia, the most common form). Given the good prognosis, it is normally recommended that children try to lead as normal a life as possible during treatment, with the goal being to ensure that adult functioning and academic skills are compromised as little as possible. For these reasons, children are encouraged to attend school or playgroup, and take part in normal childhood activities as far as possible. The extent to which they are successful is in large part determined by the attitudes of others, and the extent to which teachers and healthy peers respond to them in non-stigmatised ways. Teachers may find themselves having to deal with questions from the child as well as healthy peers, about the limitations and treatment of the illness. On occasions,
issues of death and dying are also likely to be raised. In this paper, we focus on more factual issues.

Of special significance in explaining leukaemia to children is a study by Perrin, Sayer and Willett (1991), who describe age related changes in children's understanding of their blood. Children between 5 and 16 years of age were asked a series of questions: "What is blood for?; How does it work?; What does it do?; What would happen if you didn’t have any blood?; What would happen if you had something wrong with your blood or it wasn’t working right?; Why would that happen?"

Children seem to answer questions about how their blood works in the same way as they answer questions about how any body part works:- it keeps you alive. According to Perrin's data, with increasing age, they become more aware of the nature of the circulatory system and the role of the blood in transforming food and nutrients. There is no indication from this work (which was not directed primarily at this question) that children spontaneously give information about the nature of blood, particularly in terms of cells and platelets. Yet it is this information which is the basis of much education about leukaemia. More extensive descriptions of children's understanding of blood and the circulatory system are needed in order to develop more appropriate educational interventions.

While this work has achieved much at a descriptive level, emphasis on stage theories of development has been very limiting. The implication that children are only able to understand explanations which are appropriate for their "stage" has probably contributed to a significant underestimation of children's ability to process illness information. Criticisms of stage models have largely been ignored (Hergenrather & Rabinowitz 1991). Alternative models, which emphasise the role of the environment and personal experience in shaping children's knowledge, (Nelson 1985) are called for. Both Carey (1985) and Hergenrather and Rabinowitz (1991) provide some evidence to suggest that children's understanding of illness is first organised in relation to what they understand about people and human behaviour. Thus, illness is defined by adult actions (you are ill because mum sent you to bed). Over time, these definitions in terms of human behaviours are replaced by increasingly sophisticated understanding of biology.

The impetus for this study came from a playgroup who had admitted a child with leukaemia. Staff were concerned themselves since knowledge was small. They were also concerned about how other children would react (during some phases of treatment the child was tired and irritable and also lost all her hair). There was a genuine concern about how to answer children's questions. The
purpose of this study was to determine children's knowledge about blood and its function and secondly to consider ways of increasing factual understanding among the group.

We chose to focus on the development of the concept of blood in children, since this is the key element in explanations of leukaemia given to young children. We did not feel it was appropriate to introduce discussions of death and dying, particularly as the child in question was very well at the time. Although the initial request came from a playgroup, the issue is one which can occur at any time during school life. An opportunity arose at the same time to work with a class of 8 year olds, who were involved in a more extensive health education course at the time. Our focus is on young children (between 3 and 8 years) in that the incidence of leukaemia peaks among 4-year old children (Siegel 1980). The paper is first an assessment of knowledge in healthy children; while we included some open-ended questions to assess children's knowledge, we also adapted a procedure described by Carey (1985). She attempted to map children's concepts of "animal" by tracing the attribution of animal properties to a range of exemplars. We used this same procedure, but asked children for their attributions about the occurrence of blood in a range of exemplars. The second purpose of the study is to assess a sample intervention designed to increase children's knowledge of the function of blood. Children were given individual explanations of the function and structure of blood using cardboard cut-outs.

STUDY 1

METHOD

Sample and Procedure

Interview schedules were approved by local Ethical Committees and by the Principals of play-groups and schools involved. An explanatory letter was sent to parents of all children in the appropriate age-ranges, who were asked for signed consent for their child to take part in research concerned with children's understanding of their bodies and how they work. Consent forms were returned by 80% of parents. Preschool children attended one of two play-groups. There were twenty five 3-year olds (11 boys and 14 girls) and twenty five 4-year olds (12 boys and 13 girls). The 8-year olds (16 boys and 11 girls) were all drawn from a single class in a local middle school, serving the same community as the play-groups. Children were tested individually in a quiet corner of the room.
Interview schedule

The children were first asked some general questions about their family, their likes and dislikes, to establish rapport. We then asked if they would be willing to help us in our work, which was to find out what children knew about their bodies and how they worked.

Children were first given an outline drawing of a human figure, and asked to draw what they thought they looked like inside. Many children explained their drawings as they were made, and this was recorded by the experimenter. If children said they could not draw, they were asked to describe or name any internal body-parts they knew about.

Understanding of blood was explored in greater detail. Children were asked the colour and function of blood, if they had ever seen it, and what would happen if they did not have blood. Children were asked what happens if blood does not work properly.

Finally, children were asked if it was just people who had blood. They were also asked if any of the following had blood; cats, trees, fishes, meat, cows, flowers, snakes, or dolls. Some children spontaneously explained their reasons; others were prompted for a reason if possible.

RESULTS

Analyses of children’s drawings

The number of body parts children could name or draw were recorded. Almost half (44%) of the 3-year olds treated the task as a colouring project, by simply scribbling inside the body or tracing the edge. This procedure was also adopted by 20% of the 4-year old children, but none of the 8-year olds.

Number of body parts.

The number of body parts drawn increased with age. Among 3-year olds, the mean number of items drawn or named was 0.6 (range: 0-2); among 4-year olds was 1.0 (range: 0-3) and among 8-year olds was 6.26 (range: 2-11). "Blood" is particularly hard to draw. Even so, a proportion of children from all three age-groups either attempted to draw blood or said that they knew they had blood but could not draw it (16% of 3-year olds, 28% of 4-year olds and 19% of 8-year olds).
Knowledge of blood

Knowledge that blood is red increased with age (52% of 3-year olds, 84% of 4-year olds and 100% of 8-year olds reported that blood was red.)

Function of blood.

Frequency of "don't know" responses decreased with age (18 of 3-year olds, 14 of 4-year olds and 3 of the 8-year olds) gave no response. Three of the 3-year olds and three of the 4-year olds said that blood hurt. This confusion was not evident in the responses of any of the 8-year olds. Among the 3-year olds individual children connected that blood was the result of an accident (my cat cut his tail; my nose bled; when you bump into things; if you cut yourself). Thus knowledge in the 3-year olds was either confused (blood itself hurts), or related to instances when the child saw blood.

Among 4-year olds, there was again a preponderance of responses based on individual experience (I cut my knee; I fell over; I cut my foot, it comes out when you cut yourself). Four other children had the beginnings of an awareness that blood was essential for life (it helps you live; without it you are like jelly; it's inside you; the heart beats the blood around).

Only three 8-year olds gave no response at all. The rest expressed a basic understanding that blood is essential for life and circulates through the body. Some children were able to elaborate further on this basic information. Five understood that by circulating, the blood carried food or oxygen round the body. The 8-year olds were also asked what they thought could be done if blood was not working properly. Although six children would not answer this question, the remainder had a variety of suggestions. Four children had very general ideas, involving going to the hospital or doctor, having injections or medicines. The rest favoured the removal of bad blood, and replacement with someone else's. Children were asked if they had ever cut themselves and what they did afterwards. Only 16% of 3-year olds remembered cutting themselves, against 40% of the 4-year olds and all the 8-year olds. There was a comparable increase with age in children's knowledge of what to do if they cut themselves. Among the 3-year olds, 24% offered an appropriate response (clean it, put on a plaster), 52% of 4-year olds responded appropriately, and all 8-year olds.
Attribution of blood to other species/objects

These data are summarized in table 1. Attribution of blood to people increased with age. Almost one-quarter of both 3- and 4-year olds attributed blood to inanimate objects (dolls), although only one of the 8-year olds made this mistake. At all ages, a small number of children attributed blood to plants (flowers and trees). Children's rationalizations for this were that trees had sap, and this served the same function as blood in keeping the tree alive. There was a comparable increase with age in children's attributions of blood to cold-blooded creatures (snakes, fishes), although attribution of blood to this group does not reach 100% even among 8-year olds. In contrast, knowledge of blood as a property of mammals increases with age, and is complete among the 8-year olds. Awareness of blood still being present in dead animals (meat) also increases with age, but again does not reach 100% even among 8-year olds.

Twelve of the 25 3-year olds offered explanations for their decisions about whether or not the different exemplars had blood or not. Three explanations were most common. For some children, no explanation was necessary other than that only people have blood (n: 5). Other children based their decision on personal experience (n: 3); (I saw grandad chop a tree and there was no blood; I caught a fish and blood came out of its mouth; my teeth bled when one fell out). This same kind of reasoning could also be used to attribute blood to an inanimate object; for example, dolls have blood because you take them to the doll hospital when they are ill. Similarly, dogs have blood because they go to the vet. The third type of explanation involved justifying the decision that an exemplar did not have blood on the grounds that it did not share some other human property (n: 4); (fish don't talk; cars don't walk; frogs jump).

Fifteen of the 4-year olds offered explanations for their responses. Only three of these children simply said that only people have blood. The rest offered personal experiences similar to those offered by the 3-year olds (n: 5) or justification on the grounds that the exemplar did not share some property with people (n: 11). (Four children offered both explanations).

All 8-year olds offered reasons for their decisions, although there was much overlap in the kind of reasons offered by this age-group with the reasons given by younger children. There was, however, evidence of greater confusion in this age-group, especially in considering flowers and trees, and meat. With regard to flowers and trees, the knowledge that plants were alive seemed to lead children to believe that something must keep them alive, and therefore they were confused about the relationship between this substance and blood; (a flower has blood because it dies like a human; a flower has got veins with water, not...
blood; a flower has different blood, sort of juicy stuff; a tree has got a brownreddy colour of blood). Similar confusion was evident in children's reasoning about meat (Meat has got it first, then you wash it out; meat has blood because it used to be an animal; meat doesn't have blood unless it isn't cooked). There was less evidence that children base their decisions on personal experience; only one child reported that "fish have blood because I've seen it". Few children justified their other decisions; it seems that awareness that inanimate objects like dolls have no blood, and that mammals and reptiles do, is so obvious to children in this age-group that they feel that no explanation is necessary.

Table 1. Attribution of "blood" to animals, plants and objects by 3-, 4- and 8-year olds. (Percentage)

<table>
<thead>
<tr>
<th>Items</th>
<th>3-years</th>
<th>4-years</th>
<th>8-years</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>44</td>
<td>72</td>
<td>100</td>
</tr>
<tr>
<td>Cats</td>
<td>32</td>
<td>56</td>
<td>96</td>
</tr>
<tr>
<td>Hamsters</td>
<td>28</td>
<td>52</td>
<td>100</td>
</tr>
<tr>
<td>Snakes</td>
<td>32</td>
<td>36</td>
<td>78</td>
</tr>
<tr>
<td>Fishes</td>
<td>32</td>
<td>48</td>
<td>85</td>
</tr>
<tr>
<td>Flowers</td>
<td>16</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>Trees</td>
<td>16</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Meat</td>
<td>28</td>
<td>20</td>
<td>70</td>
</tr>
<tr>
<td>Dolls</td>
<td>24</td>
<td>24</td>
<td>4</td>
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</tbody>
</table>

DISCUSSION

There was considerable variability in children's reported experiences with situations in which they had seen blood, as well as their understanding of the function of blood. It could be predicted that experience could be beneficial when explaining concepts of blood to children, as they would be able to assimil-
late the new information with existing structures (Carey 1985). In the next study, we attempted to test this hypothesis with the 3- and 4-year old children.

STUDY 2. COMPREHENSION OF INFORMATION ABOUT BLOOD IN PRE-SCHOOL CHILDREN

METHOD

Following the interview described in study 1, 3- and 4-year olds (but not 8-year olds) were given a brief explanation about the structure of blood, and the function of different blood cells. (One 3-year old who had been treated for leukaemia was excluded from this part of the study, as she was well informed about the structure of blood and function of different blood cells). It was not possible to adopt the same procedure with the 8-year olds because of time restraints in the classroom.

Children were shown an outline drawing of a human body, and some red cardboard shapes (red cells), white shapes (white cells) and orange shapes (platelets). Children were given the following explanation:

"You've told me a lot about blood already, but now I'd like to tell you a bit more. You know that blood is red? Well, the reason blood is red is because it's full of red blood cells. They are full of energy and always bouncing around. How do you think a child would feel if they did not have lots of red blood cells?

There are also white blood cells. They are the fighters. They can fight germs, coughs and things like chicken-pox. How do you think a child would feel if they didn't have enough white cells?

There are also platelets. They are important to stop you bleeding if you fall over and cut yourself. They make a wall over the cut so that the dirt can't get in, like a scab."

At appropriate points in the story, the red or white cells or platelets were placed on the figure drawing. At the end of the session, children were asked to put all the "cells of the same colour in separate piles", and those who could were asked to count them. These data were not recorded, but simply used to assure children that they had done very well and been very helpful.
RESULTS

Understanding of the function of blood cells

As shown in table 2, the children had difficulty understanding the information, both when asked about the function of blood cells during the explanation, and when asked again immediately afterwards. The percentage of children giving correct responses increased from 3- to 4 year olds. However, a number persisted with their own views about blood. (If you don’t have platelets it will hurt even more; blood is only in your tummy; even with platelets you still need a plaster).

Relationship between personal experience and understanding of the explanation.

Twenty five 3- and 4- year olds were able to recall at least some elements of the explanation whereas the remainder failed to do so. Nineteen of those who recalled some elements of the explanation had previously mentioned a personal experience when describing what they knew about blood, compared with only 6 of those who showed no recall; of the 24 who recalled no elements of the explanation, 17 had no previous experience while the remaining 7 did ($\chi^2 (1): 17.31, p < 0.001$).

Table 2. Percentages of appropriate responses given by 3- and 4- year olds during and following the explanation.

<table>
<thead>
<tr>
<th></th>
<th>3-years</th>
<th>4-years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During</td>
<td>After</td>
</tr>
<tr>
<td>red cells</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>white cells</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>platelets</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

DISCUSSION

The single explanation attempted here was insufficient to make a measurable impact on many of the children; they persisted in their initial views about blood and did not revise their beliefs. However, as we expected, children who
did understand the new information (as measured by recall) were also more likely to have previously mentioned a specific incident in which they had seen or learned about blood. Thus, new information was more readily assimilated where children could relate to a previous tangible experience.

**STUDY 3. EVALUATION OF AN INFORMATION VIDEO ABOUT BLOOD IN 8-YEAR OLD CHILDREN**

**METHOD**

Following the interview described in study 1, the 8-year old children were shown a short video about the function of blood. The video was shown to groups of four children who were taken outside the main classroom setting. They were asked to watch the video, and then tell us whether they thought it was suitable to show to children in hospital who had something wrong with their blood. Six groups of children were shown the video.

The video itself lasted for 2 minutes. It consists of a series of cartoon sequences. Information is given that "there are lots of different cells in your body; muscle cells help you walk and run; other cells do different jobs; those in your eyes help you see. Cells are made from the food you eat; food is broken down in your stomach. Blood is pumped round by your heart and is made in a sort of factory called the bone marrow. Different cells are made in the bone marrow; red cells carry oxygen and water round your body, white cells fight germs and platelets stop you bleeding if you cut yourself. In the cartoon, the red cells are represented by red cartoon figures, dressed as waiters carrying food and water. The white cells are depicted as nurses and the platelets are shown as orange figures with needle and thread, sewing up cuts.

Immediately after seeing the video, the children were asked to discuss together what they thought of the video, what they learned from it and how suitable they thought it was for children their age or younger.

**RESULTS**

All six groups reported that they liked the video.

In the discussion after the video, the children said they learned that blood contained red cells and white cells, as well as the function of red and white cells. They also learned about platelets, and that blood cells were made in the
bone marrow. None of them were previously familiar with the terms "bone marrow" or "platelets". Although they remembered hearing about these terms, they could not remember the function of either.

The children were divided in their beliefs about the appropriateness of the video for younger children. Two groups thought the video was good for their own age and would also be suitable for younger children. Although they felt that the use of cartoons was good for young children, they also felt that the cartoon figures created some confusion. They suggested that more effort should be made to inform the children that the cartoon figures were imaginary and did not really exist.

The remaining four groups felt that the video was appropriate for children their age, but not for younger children. All felt that the information was too complex for younger children. Two groups were specifically concerned that the use of cartoon figures would confuse small children (they would want to open themselves up to see inside; they would be frightened by the little men). One of these groups felt the use of cartoon men was especially appropriate for their age group or older children, as showing real blood was "yukky".

DISCUSSION

These 8 year old children were prepared to say that they learned some facts from the video about the structure and function of blood cells. None of them was able to understand that blood cells are made in the bone marrow, and they remained confused about platelets and their function. Apparently, even this very brief video contained too much information to be readily assimilated by the 8-year olds. There was general agreement that the use of cartoon figures was confusing, especially for younger children.

CONCLUSIONS

It has frequently been suggested that explanations of illness to children need to be directed at the appropriate level of the child's understanding (Whitt, Dykstra & Taylor 1979). Our study was a preliminary attempt to describe more systematically what children typically know about body functioning and the role of blood, since this is crucial in explanations of leukaemia. More than half the 3-year olds tended to deny that they had seen or heard of blood. Although this
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figure seems high, it complements findings of Peterson, Harbeck, Farmer and Zinc (1991) who also report that preschool children commonly deny ever having seen blood or cut themselves.

Slightly less than half the 3-year olds we questioned had heard of blood before, and could talk a little about blood, mostly through some specific incident that had happened to them, another child or to a pet. However, sometimes previous experiences could interfere with children’s abilities to assimilate new information. For example, one 3-year old, asked after the explanation about what the three types of blood cells do, replied "everybody is going sick; you’ve got to be careful. When you get ill, you got to go home quickly. When you feel ill, you lie on the couch, and you feel better, or you go the hospital". Another 4-year old, asked what platelets do, said, "they stop bleeding if you have a plaster".

A small group of the 3- and 4-year old children were under the impression that blood itself hurt; professionals need to be aware of this confusion. There was, nevertheless, a significant increase in knowledge and experience among the 4-year olds. There was a comparable increase in percentage of children reporting that they had previously cut themselves (from 16% in 3-year olds to 40% in the 4-year olds and 100% in the 8-year olds).

Although all the 8-year olds had previously seen or heard about blood and knew basic facts about colour and function, the quality of children’s explanations varied considerably. Very simple explanations were "keeps you alive". More sophisticated explanations were as follows:-"It circles around. When it’s being used it changes colour and goes back to the heart" "it circulates and has got cells".

Development of children’s attributions of blood to inanimate and non-human species showed some age-related progressions, with 100% of the 8-year olds attributing blood to humans. Even at this age, blood is seen to be a uniquely human property; about 25% of 8-year olds did not attribute blood to cold-blooded creatures.

At each age-level, there was considerable variability in the quality of children’s explanations. Decisions about what to tell children can not, therefore, be based on information about chronological age alone. At least among the preschool children, we were impressed by the importance of personal experience in directing children’s understanding. It is in fact only children who recalled some personal experience who reliably extracted information from the intervention. Our data suggest that explanations of leukaemia may be more successful if they can build on tangible incidents in the child’s experiences; those who recall no previous experience appear to have nothing around which to assimilate new information.
At the initial interview, none of the children at any age told us about red cells, white cells and platelets. They also had some difficulty understanding this information. However, the situation was not ideal in that the playgroup was quite noisy and the children's attention may have wandered. In addition, it was only possible to offer the explanation once, whereas in a hospital setting it is usual to repeat the information a number of times. However much they wanted to help us, they possibly saw the information to be irrelevant to their own lives. It is possible that children would more readily assimilate the information where it was personally meaningful, as in the case of hospitalized children.

Explanations given by a 3-year old with leukaemia

As discussed in the introduction, one reason for this study was that a 3-year old with leukaemia was attending one of the play-groups. The child had been diagnosed 21 months earlier, and was in fact about to finish treatment. She was very pleased to be asked about her hospital experience and how her body worked, as she had a great deal to say. About blood itself, she knew that blood was red, and "that it makes you better". "Blood is full of red cells, which make new blood; white cells which fight infection; and platelets, which stop bleeding. Sometimes the platelets don't come and then you keep bleeding." About the leukaemia, she said that she was "full of bad cells- they just come. Doctors took the blood out of her body to get rid of the leukaemia cells. Then they took an enormous syringe and put new blood in. She had bone-maries and lumbar punctures, but "it doesn't hurt ever".

There was a general agreement in the clinic that this was a child who coped very well. Her mother felt that leukaemia had been explained, and she was generally well informed about the disease and treatment. On the surface, her spontaneous explanation of the structure of blood and function of different blood cells was far superior to that of any other child in the study. However, it is possible that she was repeating words that she had heard adults use, rather than really understanding the processes involved, (the statement that "white cells fight infection" is not the way in which a 3-year old would be expected to talk). Although the child had always been very accepting of treatment and taken medicines without complaining, she does not seem to understand their role in treatment, since she seems to assume that treatment involves the removal of bad blood and its replacement with new blood.

Although the healthy 3- and 4-year old children interviewed in this study had relatively little understanding of blood and its function, this may largely reflect their limited experience and the fact that such information is not an inte-
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gral part of their everyday lives. In contrast, the 3-year old treated for leukaemia was familiar with the idea that blood is made up of different cells, and the function of these cells. Thus, it is possible for a 3-year old to understand this kind of information, in situations where it is perceived to be important. Future work needs to establish if the level of understanding shown by this child is typical of other 3-year olds under treatment.

Explanations of leukaemia to children generally involve some account of the structure of blood, the function of blood cells, and a rationale for treatment and procedures. Our data suggest that approximately half the 3- and 4-year olds in our study had little previous experience round which to assimilate this information. For the 3- and 4-year olds, assimilation of the new material about the structure and function of blood was dependent on their recall of previous situations in which they had seen blood. Our data suggest that decisions about informing children about cancer should not be based on chronological age alone, but that success may be dependent on being able to map the information onto previous experiences.

Playgroup leaders and teachers who find themselves with a child with leukaemia in their care face many difficulties, including their own emotional response to a child with potentially life threatening disease. There is invariably confusion about how to relate to the child and family, as well as decisions to be made about how far the child should take part in any regular activity. Problems can also arise from the responses of other children, who may be afraid of how the child looks, or resent the extra adult attention which is invariably given. Teachers need to be aware of the potential concerns of other children, and learn to respond sympathetically to their questions.

REFERENCES


**Footnotes:**

1 This procedure is based on a technique developed by Andy Katz.

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