[back] Chickenpox

Bringing Chickenpox to the Boil

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[Chapter 48] From One Prick to Another

[pdf version]

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Avid readers of dramatic novels from yesteryear will recall stories from the days when fevered patients were watched over by family, and the oldies in the group just "knew" that a proper fever would "break" with a sweat. When that happened, they knew that the prognosis would be good. Of course, such sentiments today would be greeted with alarm, or scepticism, by those who consider illness should never be endured.

Isn't that why acetaminophen (in all their different brand names) is reached for, at the first sign of a fever?

In 2001, a headline[1] made me look twice. *"Sweat has the power to fight off disease."* We were told that sweat contains a versatile antibiotic that may be on the front line against disease-causing bacteria and that: "The researchers said dermcidin probably plays a key role in the innate immune responses of the skin". A news roundup from the *British Medical Journal* told us[2] that dermcidin killed *escherichia coli, enterococcus faecalis, staphylococcus aureus* and *Candida albicans*. It was active at high salt concentrations and the acidity range of human sweat. In concentrations of 1–10 μg/ml, it killed all of the *staph aureus* colonies in only four hours. Unsurprisingly, the scientists didn't know how dermcidin worked.

Up until the late 1990s the skin was simply thought to be a "barrier" with no active participation in the immune system. The original 2001 paper[3] said that during some inflammatory skin disorders and wound healing, skin cells functioning within a salty sweat with a pH of 4–6.8, produced many effective pharmacologically active substances, such as immunoglobulin A, interleukin 1, 6 and 8, tumour necrosis factor, transforming growth factor β receptor, epidermal growth factor, and a prolactin-inducible protein.

As time has gone on, other researchers have taken a closer look at skin, and have found that the neutrophil,[4] which is the professional phagocyte of fundamental importance for defence against micro-organisms, provides instant help, not only in microbial infection,[5] but to the growth factors when the skin is broken and there is a risk of infection. Another article[6] says that mast cells, macrophages and skin cells produce antimicrobial peptides. These are called cathelicidin, which disrupts bacterial cell walls, modifies the host cells inflammation, and provides additional immune defence. At the heart of this all, is our friendly neutrophil:

"These studies clearly illuminate the importance of neutrophil recruitment in cutaneous defense against bacterial infection. … Recent advances in understanding of innate immune defense systems have suggested that these ancient evolutionary immune mechanisms may be important to human disease yet previously underappreciated." (Underlining mine)

The article looked at whether just skin and mast cells were involved, or whether neutrophils were also important. Using mice, they found that mice with few neutrophils developed much worse tissue death (necrosis) and had 3,000 times the amount of bacteria on the skin than mice with active neutrophils. The skincells worked hard and could produce some cathelicidin on their own, but didn't have the killing power of the skin cells plus neutrophils. The article's conclusion said that life-threatening necrotizing skin and soft-tissue infections can develop in patients with depressed neutrophils, but that numerous examples exist of patients with increased frequency of skin infections who have no *"demonstrable defect* [7] *in leukocyte recruitment or function."*

Many countries have recently been bombarded with stories[8] about chickenpox resulting in death or serious bacterial infection.

The *New Zealand Herald* article cited above talked about a 14-year-old student, Luchan Li, who *"died of heart failure as a result of a blood infection, also known as septic shock. The illness was possibly connected to a case of chickenpox Luchan had two weeks earlier, but no one knows for certain."*

Is it a coincidence that this article was published before the proposed introduction of the chickenpox vaccine in this country?

At the same time, the *Daily Mail* in England ran a very emotive article about a little girl called Isobel: "*Within days, the virus had taken hold of her body, leading to toxic shock syndrome – a rare type of blood poisoning caused by bacteria – and necrotising fasciitis, a bacterial infection that rapidly eats away at the flesh*."

The article went on to say that it is "thought" that dozens of other chickenpox children have the same complications.

Isobel's mother said that "*if she'd had a big dose of antibiotics at the start, none of this would have happened*." Just maybe Isobel didn't have enough vitamin C to operate her leucocyte system to get rid of the bacteria. And did Isobel's mother use the English version of acetaminophen? The second child in the article, Christopher, who died from chickenpox, was given that drug.

Before antibiotics were used in medical practice, when rickets was still rife and scurvy relatively common, chickenpox was known to have a much higher rate of Group A streptococcal (GAS) infection complications than that seen today.

Group A streptococcus also causes scarlet fever, and rheumatic fever, which in most developed countries, started declining in 1850[9], well before antibiotics were marketed. As a marker of group A streptococcus severity, scarlet fever has exhibited at least four cycles of varying severity followed by remission, believed to have been due largely to virulence variation. A very good article[10] on the web states, "*...reports of fatal infection with invasive strep A bacteria have been increasingly recognized in the United States since 1987. Researchers do not know why the new strain of strep A is on the increase or why it targets certain otherwise healthy people*." Older textbooks and papers all mention the need to be careful when GAS infections follow chickenpox. For thirty years after the introduction of penicillin, there were no reports of serious GAS complications after chickenpox. But those years follow hard on the heels of the "conquest" of rickets, which up to the 1930s had affected nearly 50% of wealthy parents' children in London. There are still some alive who remember the blackstrap molasses and cod liver oil morning routines of the times. Both "malnutrition" and "bad" nutrition can result in infections becoming far more serious.

After the Depression era in the 1930's, food was a lot more basic than it is today, with minimal additives, and very little "junk" food to be found. Nutrition was far better in a general sense than it is now. Because of the huge increase of empty calories in family diets today, many children may now be at greater risk ofsecondary bacterial infections after chickenpox.

Properly fed, healthy children, whose parents know what to do, and what not to do, will rarely get any complications to chickenpox. As was the case for our children, well-managed chickenpox should not even lead to any scarring. So let's ask some questions here, with chickenpox in mind. *What is the function offever?*

Here's a really simple statement[11] from twenty years ago: "*... elevated body temperature enhances the infl ammatory response and function of the immune system at the same time that it reduces the replication of microbes and tumor cells*."

Not so simple is this sentence. *"Fever also appears to be a prominent component of cytokine therapy and attends the use of several biologic response modifiers."*

Fever switches on the chemical messengers and processes which call on the body immune system to respond and "modify" or deal with the infection.

If fever is a key to an immune-system process, without a fever, how effective is the body going to be in fi ghting viruses, or bacteria? With viruses like chickenpox, which are known to have an

affinity with *group A streptococcus*, which can infect the pox rash and so have access to the body, what do we want the immune system to do? It's pretty obvious isn't it?

We *want* to allow the body temperature to rise to the level it needs so that all the on-switches can be thrown.

We *want* the body to send out all those little chemical messengers which get the antiviral side of things going.

We *want* the messengers to call the neutrophils to join the skin cells in producing cathelicidin, and to work with the whole array of anti-viral and antibacterial components[12] in "sweat" to stop *group A streptococcus* in its tracks.

As a 1991 article[13] says: "*... temperature elevation ... enhances the processes involved in initial antigen recognition and support for immunological specifi c response to challenge.*"

We want the body to recognize the virus, ring the bell and sound the red alert (fever) to fight, don't we? Why, then, turn the fever off with acetaminophen products? Doesn't that defy logic?

Another article[14] of that era said: "*There is considerable in-vitro evidence that a variety of human immunological defences function better at febrile temperatures than at normal ones ... Studies have clearly shown that fever helps laboratory animals to survive an infection whereas antipyresis*[15]*increases mortality*."

A 1998 article[16] said: "*The elevation of body temperature by a few degrees may improve the efficiency of macrophages in killing invading bacteria, whereas it impairs the replication of many microorganisms, giving the immune system an adaptive advantage. There is a simultaneous switch from the burning of glucose, an excellent substrate for bacterial growth, to metabolism based on proteolysis and lipolysis. The host organism is anorectic (doesn't want to eat) minimizing the availability of glucose, and somnolent, reducing the demand by muscles for energy substrate. During the febrile response, the liver produced proteins known as acute phase reactants ... the net effect ... is to give the host organism an adaptive advantage over the invader*." (Underlining mine.)

I could bombard you with article after article showing not only that fever in infections is beneficial, but also that when you use paracetamol products, you *increase* the likelihood of dying and you increase the likelihood of complications.

Pubmed is littered with articles from around the world saying this. The World Health Organization surprised me by having two articles on its website decrying the use of paracetamol for bringing down fevers.

Treating fevers is dicing with more severe infection, and a greater likelihood of death, because fever is a key immune response to get the immune system working properly.

You mess with fever, and you mess with lots of things. It stands to reason. Do you need to know what the medical profession does not *yet know about fever in its totality*, to see that?

Back to chickenpox. Tucked away in a small corner of the *New Zealand Herald* in 2001 was a warning:[1]7 "*GPs warned over chickenpox drug*." Doctors were warned about treating chickenpox with ibuprofen to reduce fever because of a higher rate of necrotizing fasciitis[18]. There was no mention of paracetamol in the warning, yet, since both perform the same function, there is reason to argue that paracetamol might do the same as ibuprofen. In USA, the link between the use of non-steroidal anti-infl ammatories and chickenpox reached the ears of doctors,[19,20] but not, it seems, the public.

There was a flurry of articles suggesting it was dangerous to use anti-febrile drugs with chickenpox; there was also an article by a group of doctors, who in defiance of all logic and known immunological impacts of drugs used to reduce fever, decided that there was no association. They[21] decreed that when parents used drugs to "treat high fever and severe illness", drug use was merely the identifying factor of who was at high risk for secondary bacterial infection! That interesting little word "coincidental" again.

Doctors[22] will say that the resurgence of streptococcal infections "highlights the wisdom of recommending widespread use of the varicella vaccine to prevent this kind of infection". Why worry about GAS, when a vaccine will prevent both chickenpox and GAS. On the surface, this looks logical.

I see the increase in these infections as evidence of a total lack of common sense about how to prevent complications. I see the association between nonsteroidal anti-febrile drugs and GAS as a predictable outcome of the loss of home nursing skills and handed-down generational wisdom. I see the increase insecondary bacterial infections as something which can stem from parental lack of understanding that messing around with fever, and using symptom-suppressing/immune-suppressing drugs can restrict the ability of the immune system to fi ght the virus. It also reduces the ability of the leucocyte system of neutrophils,macrophages and phagocytes to fight bacterial toxins from secondary bacterial infections.

As pointed out in Chapter 70, if you don't have enough vitamin C in your system, then the neutrophils won't be recognized by the macrophages, and you might be in big

trouble, because if that happens, the result could be toxic shock/sepsis taking hold very quickly. Even if you have enough vitamin C, if the amountof GAS toxin is such that the glucose transporters (which are part of the vitamin C shuttle service which takes ascorbate from A to B) are blocked, that can result in a GAS infection which threatens to run out of control. The quickest way to restore the immune function in a case of sepsis is by giving vitamin C intravenously. The body can fight sepsis by itself, but it's a bit more of a lottery as to whether it will succeed if it doesn't have the tools to do the job.

"Health" is not a one-pronged fork. Lots of things have to be working well, for the body to do what it is programmed to do.

Get smart with your computer, and the whole thing can crash. That analogy applies to the processes of fighting infections. So the next time you read a historical novel where the family is relieved to see the break out of a fevered sweat, you will have an idea why. The anecdote of the old wives wins out yet again. Everyone knew that to beat the sickness lottery, a big sweat was usually a plus. Now we know why. A big sweat is part of the beneficial natural defense your skin immune system uses to fight any bacterial flora on/in the skin, such as group A *streptococcus.*

A big sweat shows that the immune system is working properly. A fever and a sweat in any infection, if you do not have heart or lung disease,[23] is the right thing[24] to allow to happen.

In the "olden days", they didn't clean a patient during an infectious sweat, and after the sweat broke, they let them sleep. My grandma would change the sheets, but she knew that there would be no shower until after the patient had recovered.

She just "knew" that was the right way to treat infections.

TLC,[25] drinks, maybe cool cloths to the wrists and face, and a gentle breeze from a slow fan is all that is needed.

Yet it's amazing how often you find out that some well-meaning parent sees a sweat and does exactly the wrong thing by "cleaning" the child up with some new and improved antibacterial soap, all in the name of making the person more comfortable!

Notes

1 Associated Press. 2001. "Sweat has the power to fi ght off disease." *The New Zealand Herald,* November 9, p. A13.

2 Josefson, D. 2001. "Bacteria killer found in sweat" ***BMJ,*** 323: 1206, November 24. http://bmj.bmjjournals.com/cgi/content/full/323/7232/1206/c

3 Schittek, B. 2001., "Dermcidin: a novel human antibiotic peptide secreted by sweat glands." *Nat Immunol,* 2(12): 1133–7, December. PMID: 11694882.

4 **Neutrophil**; See Chapter 70 (on Vitamin C and sepsis).

5 Borregaard, N. et al. 2005. "Neutrophils and keratinocytes in innate immunity – cooperative actions to provide antimicrobial defense at the right time and place." *J Leukoc Biol*, 77(4): 439–43, April. Epub 2004, December 6. Review. PMID: 15582983.

6 Braff, M.H. et al. 2005. "Keratinocyte production of cathelicidin provides direct activity against bacterial skin pathogens." *Infect Immun*, 74(10): 6771–81, October. PMID: 16177355.

7 Demonstrable defect = Did the researchers check to see if the patient had enough vitamin C for the leucocyte system to work? Not as far as I can see.

8 Vass, B. 2007. "Mystery bug claims teen's life" *The New Zealand Herald,* November 20. http://www.nzherald.co.nz/category/story.cfm?c_id=204&objectid=10477164 Accessed 21 November 2007.

9 McKeown, T and Lowe C.R. 1974. "An Introduction to Social Medicine." ISBN 0 632 09310 2. Pgs 12–13.

10 Directors of Health Promotion and Education. "Group A Streptococcus." Accessed on 26 January 2008. http://www.dhpe.org/infect/strepa.html This article is a very good ABC on the various very different infections with a single bacterial group can cause.

11 Dinarello, C.A. et al. 1988. "New concepts on the pathogenesis of fever." Rev Infect Dis, 10(1):168–89, January–February. Review. PMID: 2451266.

12 Dorschner, R.A. et al. 2001. "Cutaneous injury induces the release of cathelicidin anti-microbial peptides active against group A streptococcus." *J Invest Dermatol*, 117(1):91–7. PMID: 11442754. http://www.nature.com/jid/journal/v117/n1/pdf/5601121a.pdf (Pox from chickenpox qualifi es as cutaneous injury.)

13 Roberts. N.J. Jr. 1991. "Impact of temperature elevation on immunologic defenses." *Rev Infect Dis,* 13(3): 462–72, May–June. Review. PMID: 1866550.

14 Kramer, M.S. et al. 1991 "Risks and benefi ts of paracetamol antipyresis in young children with fever of presumed viral origin." *Lancet,* 337(8741): 591–4, March 9. PMID: 1671951.

15 *Antipyresis* = reducing fever; bringing a temperature back down to normal. Anti and "pyresis" =bonfi re.

16 Saper, C.B. 1998. "Neurobiological basis of fever." *Ann NY Acad Sci,* 856: 90–4, September 29. Review. PMID: 9917869.

17 (No author named.). 2001. "GPs warned over chickenpox drug." *New Zealand Herald*, February 1, p. A5.

18 *Necrotising fasciitis* = many bacteria can cause fl esh-eating disease, but Group A *Streptococcus* is the most common of these.

19 Gonzalez, B.E. et al. 2005. "Severe Staphylococcal sepsis in adolescents in the era of community-acquired methicillin-resistant *Staphylococcus aureus*." *Pediatrics*, 115(3): 642–8, March. PMID: 15741366.

20 Barton, L.L. 2005. "Nonsteroidal anti-infl ammatory drugs and invasive staphylococcal infections: the cart or the horse?" *Pediatrics*, 115(6): 1790 and author reply p. 1791; June. No abstract available. PMID: 15930253.

21 Lesko, S.M. et al. 2001. "Invasive group A streptococcal infection and nonsteroidal antiinfl ammatory drug use among children with primary varicella." *Pediatrics*, 107(5): 1108–15, May. PMID: 11331694.

22 Stevenson, M. 1997. "Gas infections and varicella have a long standing relationship". *Infectious Diseases in Children,* August. http://www.idinchildren.com/199708/frameset.asp?article=gasinfct.asp

23 Shann, F. 1995. "Paracetamol: use in children." *Australian Prescriber, 18*: 233–4. http://www.australianprescriber.com/magazine/18/2/33/5/. Accessed 6 December 2007.

24 Eichenwalk, H.F. 2003. "Fever and antipyresis." *Bulletin of the World Health Organization, 81*(5). http://www.scielosp.org/scielo.php?script=sci_arttext&pid=S0042-96862003000500012 . Accessed 6 December 2007.

25 *TLC* = Tender loving care.