# Cardiac arrest due to severe hyperkalaemia in patient taking nabumetone and low salt diet

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**Beware of hyperkalaemia in people with renal impairment taking "low salt" diets**

We describe the case of a woman with underlying renal insufficiency who developed hyperkalaemia while taking a non-steroidal anti-inflammatory drug and, probably more importantly, a low salt preparation that was also high in potassium.

## Case report

This 70 year old woman had suffered from seropositive, erosive rheumatoid arthritis for about 17 years, mainly managed with non-steroidal anti-inflammatory drugs and simple analgesics. She developed hypertension about three years before presentation but had not been taking any regular antihypertensive treatment. Six years previously she had been investigated for haematuria but no lesions were found in the urinary tract. Recently she had been reassessed after a flare-up of her arthritis, and her naproxen was changed to nabumetone 500 mg twice daily. She had been taking it for one month when she was admitted for further assessment of her rheumatoid disease. Mild renal insufficiency was found, with a serum creatinine concentration of 148 μmol/l and a potassium concentration of 5·7 mmol/l. Dipstick urine analysis showed protein and blood, and urine culture showed coliform organisms sensitive to trimethoprim. She was kept on nabumetone and no new drugs were introduced, except for trimethoprim at the time of her discharge.

A week later she suffered a cardiac arrest at her general practitioner's surgery. Immediate resuscitation was started and continued in the ambulance to the casualty department. Electrocardiography showed ventricular tachycardia, and she eventually reverted to sinus tachycardia. At the time of her resuscitation she was found to have a serum potassium concentration of 9·7 mmol/l with impaired renal function as shown by the following results: sodium 138 mmol/l, urea 18·0 mmol/l, creatinine 280 μmol/l, and bicarbonate 9 mmol/l. One hour after resuscitation she was awake and talking but the serum potassium concentration was still raised at 8·3 mmol/l. She was treated with further intravenous insulin and dextrose, calcium chloride, sodium bicarbonate, and 250 mg of frusemide. Urine output increased to 200 ml/h and serum potassium concentration fell progressively. Her subsequent progress was satisfactory and the serum potassium concentration returned to near normal values (K=5·4 mmol/l). Some renal impairment remained (serum creatinine 148 μmol/l).

After her acute episode was over further questioning revealed that her general practitioner had advised her to start a low salt diet for her hypertension and as a result she had been using a low sodium formulation (Lo Salt) for cooking, and also taking extra orange juice as a vitamin C supplement. As she had felt progressively less well and anorexic in the week before her cardiac arrest she found she was able to eat only bananas.

*Patient's daily dietary intake of potassium before cardiac arrest*

| | mmol/day |
|---|---|
| Total potassium from food* (excluding fruits and orange drinks) | 56·6 |
| Total potassium from fruit and orange drinks | 32·1 |
| Potassium from adding Lo-Salt in cooking and on table (7-14 g/day) | 12·3-24·6 |
| Total potassium intake | 101-113·3 |

*Breakfast: porridge with banana and milk, toast and marmalade, orange squash.
Lunch: vegetable soup, bread, cheese, apples and pears.
Dinner: chicken, potatoes, vegetables, apple pie.

## Discussion

We do not consider that nabumetone (administered and excreted in an inactive form but converted in the liver to the active metabolite) was the main cause of our patient's dangerous level of hyperkalaemia, but it may have played a part.[1] Indeed, this patient probably had intrinsic renal problems, as evidenced by her history of haematuria and biochemical renal insufficiency which may well have been associated with her hypertension or rheumatoid disease. Patients with rheumatoid arthritis have an increased prevalence of renal disorders,[2] often caused or aggravated by their drugs.[3-7] Personal communication with the manufacturers revealed that there was a single report made to the Committee on Safety of Medicines of hyperkalaemia associated with nabumetone in the United Kingdom.

The important point here is that this patient's hyperkalaemia and renal insufficiency were further aggravated by her low sodium diet which contained abundant potassium (estimated to exceed 100 mmol/day (see table)), and her increased risk for hyperkalaemia because of renal impairment further compounded by the intercurrent urinary tract infection. In this patient serious problems arose from a combination of her mild renal insufficiency associated with hypertension, the urinary tract infection, her drug treatment and unwitting intake of a high quantity of potassium salts in her diet, as well as the low salt (but high potassium) preparation.

Our case raises the issue of potassium supplementation deliberately for health gain (often by individuals without medical consultation or advice), or, inadvertently, because people are not aware of the potassium content of health products or salt substitutes and the consequent dangers associated with unrestricted consumption.[8] Potassium supplementation is particularly risky in susceptible patients with underlying diseases of the heart or kidneys; those on certain drugs, such as potassium sparing diuretics, angiotensin converting enzyme inhibitors, and non-steroidal anti-inflammatory drugs; and also the elderly.

A number of "low" salt products available with brand names such as "Lo Salt," contain varying proportions of potassium salts in addition to sodium chloride. "Lo Salt," for example, contains 66% of potassium chloride. Low salt preparations are often recommended for patients with oedema and may have a place in the management of hypertension. Doctors who recommend low salt diets need to be aware that

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many of these patients may also be taking high amounts of potassium. The problem is compounded by the fact that potassium overloading may go unnoticed for a long time as hyperkalaemia has few or only vague clinical warning symptoms, and serum potassium concentrations may rise to dangerous concentrations before presentation, as happened in this patient. This event in our patient was almost fatal, and it could readily recur unless a regular check is kept on prescribed drugs, as well as over the counter medicines and products from health shops.

Doctors should thus be careful about their advice on low salt diets, especially for those high risk subjects with underlying cardiac, hepatic, or renal insufficiency, those taking non-steroidal anti-inflammatory drugs, and elderly people. Manufacturers should also clearly state the risks of their preparations in susceptible subjects: the warning should appear prominently on the label.

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# *Guide to the Internet*

## Electronic mail

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*This is the second in a short series introducing medical practitioners to the Internet*

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**Electronic mail (email) has many advantages over other forms of communication: it is easy to use, free of charge, fast, and delivers information in a digital format. As a text only medium, email is usually less formal in style than conventional correspondence and may contain acronyms and other features, such as smileys, that are peculiar to the Internet. Email client programs that run on your own microcomputer render email powerful and easy to use. With suitable encoding methods, email can be used to send any kind of computer file, including pictures, sounds, programs, and movies. Numerous biomedical electronic mailing lists and other Internet services are accessible by email.**

Electronic mail, or email, is the transmission of text based messages between networked computers. Email was one of the earliest and most basic resources on the Internet and in many ways it still acts as the lowest common denominator for computer communications. Many computers that cannot access other Internet services can still exchange email with machines on the Internet.

### Why use email?

Several studies have stressed the beneficial effects of communication by email in medical, nursing, and other settings.[1-5] Indeed, email has many advantages over other methods of communication:

- It is faster than conventional mail (or "snailmail"), usually reaching its destination in minutes, even when sent from the United Kingdom to North America or Australia
- It requires less physical effort than sending a letter by snailmail, as there is no need to buy stamps or envelopes or for a trip to the postbox
- Once the hardware, software, and Internet connection are in place, email on the Internet is free, even if messages are sent to the other side of the world
- Unlike communication by telephone, email does not require the attention of both parties at the same time—so doctors and patients may find it more suitable than the telephone for communication about simple and non-urgent problems[6 7]
- With email it is easy to send the same piece of information to several people simultaneously—for example, you can circulate memos, agendas, and minutes, or disseminate educational material[8]
- Junk email is rare, so reading the day's email is usually far more pleasurable than sifting through a pile of snailmail; furthermore, you can scan the headers of any new batch of email to separate the urgent from the less important
- If you use an encryption system such as Pretty Good Privacy (PGP) you can render your email messages completely uncrackable to outsiders but easily readable by your intended recipient (however, note that such strong encryption is illegal in some countries and that it is illegal to export PGP from the United States)
- Email delivers the information in a computer readable format—this means that if you are collaborating on, say, a scientific paper, you can easily exchange amended drafts of the paper many times with your coauthor without either of you having to type in the other's amendments.

### Essentials of an email message

An email message consists of a header and a body (fig 1). The header is a kind of virtual envelope, containing some or all of the following lines:

- A "From:" line showing who the message is from
- A "Date:" line showing when it was sent
- A "To:" line showing the email address(es) of the intended recipient(s) (each separated by a comma and a space, if more than one)
- A "Subject:" line, which contains a description of the subject matter of the message (leaving the subject line blank is a sure sign of a "newbie"). Most email programs automatically preface the subject line of a follow up or forwarded message with "Re:"
- A "CC:" line showing those who will receive the message in addition to the addressee(s)
- A "Message-ID:" line showing the number