LABELLED COMPOUNDS : THE USER AND THE SUPPLIER.

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SUMMARY

The uses of radioactive research chemicals are too diversified to permit of detailed standardisation and specification. The best safeguards for the user are a full description by the supplier, a careful study of the supplier's evidence by the user, and good communication between both.

Materials for scientific research are different from consumer goods in the relationship between supplier and user, and I would like, if you will allow me, to illustrate this by a homely example.

The ordinary man, going to the tailor for a suit of clothes, may fairly demand what he would like, knows what he wants, and is, generally speaking, able to judge its quality for himself. If he chooses to wear a formal evening jacket with a cloth cap and bermuda shorts, that is his affair, and the tailor has no right to question his choice. They do not both belong to a professional fraternity dedicated as a moral duty to a particular convention of gentlemen's costume.

The tailor's customer is unlikely to be able to detect certain kinds of fraud; substitution of rayon for silk, for example; and to that extent he needs some legal protection. This is usually in general terms of "honest merchandising", and under civil law. Food and drug legislation illustrates strikingly the difficulty and complexity of going from the

general to the particular, in "consumer protection" of this kind.

One other comment: The tailor knows what the customer is going to use his suit for. He is unlikely to use it for lagging a boiler-flue, or to cut it up for filter cloths, complaining later that it isn't satisfactory for these purposes. That may sound ludicrous, but is not an unfair comparison with some of the uses of labelled compounds.

The supplier of a research reagent - let us say an isotopic tracer compound - and the user, both subscribe to the fraternity and ideals of science. Both are pledged to scientific integrity and scientific progress. I hope no-one will dissent from this. I believe that view is generally accepted and generally honoured. One may apply to the scientist what Ruskin wrote truly of the true artist; he may be covetous, selfish, vain, but in the last resort it is art, or science, that comes first.

The cynic may retort that the scientific customer, being in the strict sense of the word a critical person, keeps the supplier on his toes, and there is certainly something in that: no harm. The scientific customer should at least be able to look after himself. He should be well equipped to evaluate what he buys. But some of them are - in the strict sense of the word - less critical than others.

The supplier of a labelled compound, unlike the tailor, does not always know what his customer is going to do with his purchase. It may be applied to the most unexpected kind of problem, which makes life very interesting but is the despair of anyone trying to write a definitive product specification.

Now let us consider the implications. Firstly, the supplier of a labelled compound may fairly be expected to disclose what he knows about its quality, in sufficient detail for the instructed user to form an opinion how far it may be suitable for the intended use - the intended experiment. That is the only useful meaning I know of "purity" of a chemical

and the instructed user is the only person who knows all the relevant circumstances. The supplier cannot be expected to warrant suitability for any particular use, unless that use is properly defined.

I repeat, the instructed user. He is dealing with an experimental material. He is not a medical man, pressed for time, buying a drug for a specific purpose, with a pharmacopoeial specification, specified dosage, contraindications, and so on. He is not, or should not be, a technician only.

He must compare the evidence given by the supplier with what he believes he needs, and he must do this critically and dispassionately. The supplier may state "98% radiochemical purity in chromatographic system X at a given date". If so, he means that, no more and no less, no less and no more. The instructed user will know that the 98% is, at best, ±1% and likely to be rather less precise. What might suprise you is how many users fail to recognize that there is 2% ± something still to account for. The instructed user will know also that, if the date was some time back, the purity may have gone down.

For a drug, with a specific use, all this would be specified. But that is not so easy for many hundreds of labelled compounds with their diversity of uses, most of them having a relatively small sales income. We must be circumspect in fixing official specifications. That, I know, will sound heretical to some of you. But there is a real risk that a specification will be not exacting enough for some uses, too exacting for others, and quite irrelevant for yet others: and it may obscure the need for the instructed user to be critical on his own account.

Scientific integrity demands, then, that the supplier shall state honestly what he knows, and that the user shall think carefully what he is about; and even so, in my experience, both will do well to remember the quaintly expressed but forceful plea of Oliver Cromwell - "I beseech you,

in the bowels of Christ, think you may be mistaken".. For the most careful of people are sometimes mistaken, and the truth is not always easy to come by.

Even at the simplest level, failure to read a label on a vial is far more common than you would think, and I could quote many examples from my own experience, although it would be ill-natured to set them down in cold print in a learned journal.

Reading the publications of the nineteenth-century scientists, one recalls the care they would take to caliorate equipment, standardize materials, establish "blank" values, and note circumstances, to a degree which may even seem pedantic today. In our century, science has become more of a trade and less of a vocation, we have much better material and equipment, and I suspect we are sometimes less critical than we should be, and perhaps less well-informed. When customers ask, as they do, for ammonia or urea labelled with tritium, to study nitrogen metabolism in plants, I have misgivings. When Wang and Willis wrote, "the opportunities for misinterpretation are probably much greater in tracer experiments than in the traditional approaches" I doubt if they had that kind of error in mind.

Now, how are the producer and user implicated in scientific progress? Supply of cheap satisfactory materials clearly helps, and lack of supply and high prices hinder progress.

Let me again hark back to the middle of the last century, when Merck and Kahlbaum were developing the supply of chemicals as laboratory reagents. Merck were pioneers of quality control of chemicals in 1860. Heinrich Emanuel Merck wrote: "I shall always guarantee the purity of my preparations and accept the responsibility for all disadvantages which may result from impure preparations".

Now by present-day standards, no doubt, many of Heinrich Merck's products would be considered very impure, i.e. not suitable for present-

day uses. But those early suppliers did the best they could, in the then state of knowledge, for the money they charged; and they contributed substantially to the development of classical organic chemistry, which made modern biochemistry possible. If that commercial supply had waited for better analytical methods, progress would have been much slower.

So with the supply of labelled compounds. If, at the time the business developed nearly a quarter of a century ago, we had not all been content to do the best we could at the time, biochemistry would be less advanced than it is. The same must be true today. Experimental science, no less than politics, is an art of the possible, and waiting for a better material in the future may mean there will be no future to await.

I offer you three main conclusions.

Firstly, that the supply of research reagents is inherently a supply of experimental materials and cannot therefore be standardized as completely as many other commodities may be standardized.

Secondly, that any official standards or specifications need to take full account of this experimental character.

The last, and perhaps the most important, is the need for good communication between the user and producer. This is good for all the three interests concerned. The user gains by saving time and trouble and expense. The producer benefits, because he is in a long-term business and a satisfied enquirer is better for him than a dissatisfied customer. Science benefits, both in integrity of work and in rate of progress.