Can the extract of *Annona squamosa* cure Type 1 diabetes mellitus?

This is with reference to the article Hypoglycaemic and antidiabetic effect of aqueous extract of leaves of *Annona squamosa* (L.) in experimental animal[1]. Any experimental study on animals should eventually pave the way for its use in humans. In this context the article raises the following doubts.

Alloxan and Streptozotocin induce massive B-cell necrosis, resulting in the lack of production of insulin. This, in turn, causes severe insulin deficiency leading to severe diabetes, almost akin to Type 1 diabetes in humans[2]. Hence the experimentally produced diabetes mellitus (DM) in the study should be nearer to Type 1 and not Type 2 as mentioned in the article.

If oral drugs have to have any action, some B cells have to be present. Are there any methods to know whether any B cells did survive after these drugs were administered?

In Groups C and D of table 1, in the 'No extract' class, referring to the control animals which are also diabetic as they ought to be, why are the blood glucose levels at 3 h given as 92 and 105, which is almost normal?

On the effect of the extract on diabetic rats and rabbits at 350 mg/kg body wt, a fall of 24% in FBG and 37 and 40% in blood glucose at the end of 1 and 2 h of GTT have been shown. This, indeed, is significant. But how did FBG come down? Was the drug given the previous night also?

In the mechanism of action, it is postulated that this water extract might be useful in Type 2 as well as Type 1 diabetes, irrespective of whether the pancreas is partly functional or almost totally destroyed. This cannot happen as no insulin can come out of totally destroyed B cells and no drug can produce insulin in the absence of B cells. If this theory were to be true, there would be no diabetes as B cells could be regenerated.

The effect of the extract on other modes of glucose balancing by the liver or by peripheral utilization of glucose by the muscles cannot bring down the sugar by as much as 40%. Hence, if at all the extract has any effect, it can only be in Type 2 DM where some functioning B cells are still present and not in Type 1 DM as claimed.

1. Gupta, R. K. *et al.*, *Curr. Sci.*, 2005, **88**, 1244–1254.
2. Lally, F. and Bone, A. J., *Text Book of Diabetes-1*, John Pickup & Gareth Williams, Blackwell Publishing, 2003, 19.1, 3rd edn.

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School textbooks on science: are they getting adequate attention?

The recent decision by the International Astronomical Union of changing the status of Pluto from planet to 'dwarf planet' and in the process reducing the number of solar planets from nine to eight, has not only grabbed media headlines but has also turned it into a matter of discussion in different circles. Moreover, the designation 'dwarf planet' introduced for the first time has not only been used to identify Pluto but its satellite Charon, along with two more members of the solar system, i.e. Ceres and Eris.

But how does this information reach students? The National Council of Educational Research and Training (NCERT), that publishes textbooks for schools in India, has declared that this latest information will find place in books this year. Hopefully, schools under the Central Board of Secondary Education (CBSE) that use these books, will have the corrected information for their students. But what about the students in schools affiliated to different State Boards where the medium of instruction by and large is one of the regional languages? Will the books they prescribe have the corrected information incorporated? One has reasons to doubt this, since all books are really not the adopted versions of the NCERT books. And this brings in a few important questions related to school science textbooks, particularly in regional languages.

There are a large number of schools in different parts of India, where education is imparted in regional languages. If one takes a cursory look at the books on science for high school (grades VIII to X) written according to the syllabi of different State Boards, one will invariably find a significant number of errors that have crept into these books. Moreover, a large number of widely taught principles, laws and definitions are presented in a way that is really not consistent, and the wordings vary from book to book causing confusion among the students. For example, the very statements of Newton's laws of motion or that of Ohm's law differ from book to book. The definitions of a number of physical quantities like the boiling point or melting point of a substance or water equivalent or thermal capacity are also given in different wordings in different books. These can easily be done away with the formulation of laws and definitions in some standard wordings[1] in different regional languages using the help of experts, and publishers may be directed to use these wordings only. The authors can easily show their prowess and originality through explanation of the subjects and other materials contained in the book.

It is not that all NCERT science books are free from errors, but as a government agency the NCERT takes certain visible steps to produce good quality books for students and updates and revises them. However, the same thing cannot be said about other English language science books from private publishers. The concern is more for regional language books, since a larger number of students use them and also they do not have alternate resources within their reach to check the facts stated in their books. Since many of these students pursue higher studies in science and technology, in a way, the science books in regional languages shoulder a heavier responsibility.

As such, most of the State Boards, at least theoretically, follow the same procedure of reviewing books before permitting the publishers to bring out the book with a textbook number that bears the sign of approval by the concerned Board. But the system of vetting the books before giving the green signal to a publisher issuing a textbook number is ill-equipped. Allowing the reviewers a short time to do their work and yielding to the pressure from the publishers' lobby, are just a few points worth mentioning in this connection.

The experiments that are often described in school textbooks are indeed difficult to perform by a student unaided by any standard laboratory. But in most of the cases, alternate experiments do exist that can be performed with everyday objects or with limited resources, to stress the role of the same physical phenomenon. If experiments are suggested keeping these in mind, the learning process is likely to improve, where the teacher can act as a facilitator.

Incidentally, not only the science books but a significant number of mathematics text books are also laden with wrong presentation of concepts. Can the teachers' community do anything about this? Can the scientific community help in this regard? A consorted effort is indeed the need of the day.

1. Kaye, G. W. C. and Laby, T. H., *Tables of Physical and Chemical Constants*, Longman, London, 1986.

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Relativistic resolutions of the twin paradox

In a recent article in this journal, Unnikrishnan[1] has claimed that Einstein's resolution of the twin paradox and several related resolutions are untenable. There are some points of his analysis that should be commented.

Unnikrishnan criticises Einstein for using the general theory of relativity in his resolution of the twin paradox, and for taking into account the period of acceleration of the travelling twin when he is about to return to his brother, because there exist versions of the paradox with three persons moving inertially, that have been resolved using the special theory of relativity, only.

Considering the situation with an inertial twin A and a travelling twin B, Unnikrishnan writes: 'If B's calculation invokes a differential time dilation due to a homogeneous gravitational field, then it is illogical and inconsistent to ignore it in A's calculation'.

Unnikrishnan further considers a situation with inertial clocks A, C, D at different positions and claims: 'Since all the reference clocks A, C and D are at relative rest and synchronized, the physical time dilation of B should be identical relative to each of these clocks'.

Unnikrishnan asserts that the rapid ageing of A as observed by B when B experiences a gravitational field due to his accelerated motion, 'would be violating the restrictions of absence of "spooky" instantaneous action at a distance in classical relativity'.

Unnikrishnan also considers a version of the twin paradox without any acceleration. A and B have stop watches. A emits a light signal to B that arrives just before B starts to decelerate to return. A and B stop the watches and the readings of the watches are compared when B arrives back at A. According to A, B's clock should show the least time, but according to B, A's clock should show the least time. Since both cannot be correct, Unnikrishnan concludes: 'This thought experiment shows that all standard resolutions of the twin paradox invoking acceleration or an equivalent pseudo-gravitational field as a physical effect responsible for assymmetric time dilation are flawed, and Einstein's resolution is no exception'.

Next I will point out why these claims are not correct, and then I will present a simple version of Einstein's resolution of the twin paradox.

There are different versions of the twin paradox. As a self-consistent theory, the theory of relativity must be able to resolve all of them in a consistent way, i.e. without any contradictions. I will here consider the version analysed by Einstein with only two twins, one inertial A and the other B travelling and accelerating at the point of return. The formulation of the paradox invokes the general principle of relativity and thereby the general theory of relativity, by saying that both twins may consider themselves as at rest during all of the time they are away from each other, including the period when B accelerates. The paradox then arises using only the special theory of relativity to calculate the ageing each twin predicts for the other. Then A predicts that B is younger than himself when they meet again, and B predicts that A is younger. Since the general theory of relativity has been applied in the formulation of the paradox, it is to be expected that general relativistic effects must be taken into account in the analysis of the paradox.

For simplicity I will consider a situation where B travels with constant velocity to a point P and then immediately returns with constant velocity. This involves the limit in which the acceleration that makes B return, is infinitely great for an infinitely small interval of time[2]. The corresponding situation with finite acceleration has been analysed by Eriksen and Grøn[3]. It will be shown later that even if A's calculation shows that the ageing of B while A experiences a gravitational field due to his acceleration, is finite, the corresponding ageing of A vanishes in the limit with infinitely great acceleration.

Unnikrishnan considers synchronized inertial clocks at rest relative to each other. Then he notes that in the accelerated rest frame of B there is a homogeneous gravitational field and that according to the standard relativistic analysis, the clocks age by a position-dependent rate in this field. He concludes that this is not possible as cited earlier in the communication. It seems that his conclusion is due to an assumption that the state of synchronization of the clocks is invariant against a change of reference frame. This is, however, not the case, which makes his conclusion untenable.

Unnikrishnan also considers two clocks A and B at different positions. The rate of ageing of A as measured by B depends upon the state of motion of B. Changing the state of motion immediately implies a change of the rate of ageing of A, Unnikrishnan says that this implies an