Bhopal cyanide debate hampered by information suppression

In the editorial on 'Bhopal: The tragedy of collective amnesia', Balaram[1] implies that our analysis of the available data on cyanide as a causative or contributing factor to the poisoning cases in Bhopal, and the fact that we are US-based, somehow make us bedfellows with Union Carbide. This is far from the truth, and such a litmus test is both counterproductive for those of us who care deeply about the victims of that terrible accident, and flies in the face of the fact that cyanide poisoning has been countered by prominent institutions and individuals in India.

In a series of well-designed experiments conducted by the Council of Scientific and Industrial Research at the National Chemical Laboratory, Pune, no evidence of cyanide generation at the time of the methyl isocyanate (MIC) gas leak that fateful night was found. Unfortunately, these reports were never published or formally released. We have presented a short summary of the results in our critique[2] of Sriramachari's paper.

A Bhopal-based clinic manager, well-known to the media for having advocated sodium thiosulphate therapy[3], has recently declared in a US-based scientific journal that MIC, and not cyanide, is the predominant toxic gas responsible for the short- and long-term health effects among the victims[4]. Other respected Indian scientists, not associated with Union Carbide, have also seriously questioned or dismissed the cyanide-poisoning hypothesis[5].

We would like to reiterate that our critique both welcomed Sriramachari's efforts on behalf of the gas victims, as well as urged that the quality of scientific data be consistent with current evidence-based criteria for cyanide poisoning and also be presented in a manner respectful of the patients he studied.

We call for the release of all unpublished data and studies on the Bhopal disaster (with the exception of personal medical records) held by Union Carbide, its successor Dow Chemical, the Government of India, and any other institution which has researched the known gas, MIC, which killed and disabled tens of thousands of innocent people. For the Bhopal victims, information suppressed is justice denied. We prefer to work together with concerned scientists, physicians and health activists toward this end to address the seeming amnesia to which Balaram has alluded.

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2. Gassert, T. H. and Dhara, V. R., *Curr. Sci.*, **89**(6), 923–925.
3. Hanna, B., Morehouse, W. and Sarangi, S. (eds), *The Bhopal Reader: Remembering Twenty Years of the World's Worst Industrial Disaster*, The Apex Press, New York, 2005.
4. Sarangi, S. *et al.*, *Am. J. Ind. Med.*, 2010, **53**, 836–841.
5. Varma, D. R., In *Hazard Assessment of Chemicals* (ed. Saxena, J.), Hemisphere Publishing, 1987, vol. 5.

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Top 20 national rankings in molecular biology and genetics: a scientometric analysis using the *iCX* map representation

Recently, the National Rankings in Molecular Biology and Genetics became available in ScienceWatch (http://sciencewatch.com/dr/cou/2010/10sepMOL/) from Thomson Reuters. The 'top 20' list was drawn upon the basis of citations. The data were extracted from the *Essential Science Indicators*[SM] database, also from Thomson Reuters, covering the period 1 January 2000–30 April 2010, surveying only journal articles (original research reports and review articles) indexed by Thomson Reuters.

Table 1 is based on the 'top 20' list put out by Thomson Reuters. The values are now demographically weighted using populations for 2010 taken from the Internet Answer Engine, True Knowledge (http://www.trueknowledge.com). In raw numbers, predictably, USA is on top. Notable absentees are Brazil, Russia and India, which in spite of their size and efforts, cannot match the impact of even small countries and regions like Scotland, Denmark and Finland! Only China, from the BRIC countries, appears on the list. But when rationalized for population, Scotland appears at the top, followed by Switzerland and Denmark.

Note that in Table 1, the number of papers P and citations C received are for the time window 1 January 2000–30 April 2010. The impact i is then computed as C/P. Although P and C are quantity measures (output and outcome respectively), i is inherently a quality measure. This can be represented on what this author calls an iCX map[1], where the product iC (also i^2P) is an energy-like term (called exergy X) and is a scalar measure of the scientific activity during the window concerned that takes into account both quality and quantity. We see from Table 1 and Figure 1 that research in USA during this period eclipses the rest of the field. In exergy terms, USA is now nearly five times as active as England, six times as active as Germany, and about ten times more active than France or Japan. A better picture of scientific activity is obtained if the citations and exergies are weighted on a per capita basis, where $C' = C$/Million of population and $X' = X$/Million of population.

Table 1. Performance ranked by exergy/million of population criterion

Rank	Field	Papers (*P*)	Citations (*C*)	Citations per paper	Exergy (*X*)	Population	*C*/Million population	*X*/Million population	Normalized
1	Scotland	4,531	151,478	33.43	5,064,132.53	5,168,500	29,307.92	979,807	1,247.8
2	Switzerland	6,492	218,290	33.62	7,339,883.56	7,834,000	27,864.44	936,927	1,193.2
3	Denmark	3,054	97,859	32.04	3,135,685.62	5,519,441	17,729.88	568,117	723.5
4	Israel	3,698	119,821	32.40	3,882,388.33	7,688,667	15,584.11	504,949	643.0
5	England	23,572	780,178	33.10	25,822,064.81	51,446,000	15,164.99	501,926	639.2
6	Sweden	5,467	150,419	27.51	4,138,627.32	9,259,000	16,245.71	446,984	569.2
7	USA	117,426	3,832,395	32.64	125,076,656.24	305,689,000	12,536.91	409,163	521.1
8	Finland	2,673	72,403	27.09	1,961,165.14	5,367,219	13,489.85	365,397	465.3
9	Austria	2,686	88,512	32.95	2,916,743.91	8,190,000	10,807.33	356,135	453.5
10	Netherlands	7,513	207,811	27.66	5,748,091.54	16,558,674	12,549.98	347,135	442.1
11	Canada	13,942	360,560	25.86	9,324,595.73	33,100,000	10,893.05	281,710	358.8
12	Germany	25,697	723,916	28.17	20,393,601.40	82,400,000	8,785.39	247,495	315.2
13	Belgium	3,643	91,162	25.02	2,281,227.08	11,118,493	8,199.13	205,174	261.3
14	Australia	7,007	172,960	24.68	4,269,325.19	21,885,016	7,903.12	195,080	248.4
15	France	17,819	475,314	26.67	12,678,792.22	65,073,482	7,304.27	194,838	248.1
16	Japan	24,469	552,938	22.60	12,495,011.31	127,430,000	4,339.15	98,054	124.9
17	Italy	11,812	247,537	20.96	5,187,484.45	60,157,214	4,114.83	86,232	109.8
18	Spain	7,821	158,597	20.28	3,216,085.97	45,840,557	3,459.75	70,158	89.3
19	South Korea	4,658	59,133	12.69	750,689.50	48,861,257	1,210.22	15,364	19.6
20	Peoples Republic of China	9,968	102,962	10.33	1,063,520.61	1,354,370,754	76.02	785	1.0

Source: *Essential Science Indicators* from Thomson Reuters.

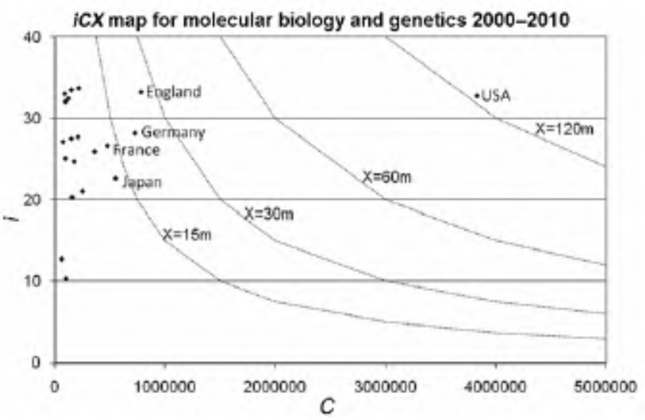

Figure 1. The *iCX* map without taking into account sizes of the countries.

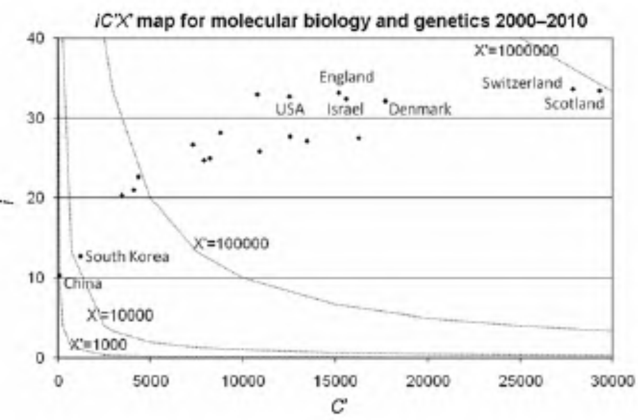

Figure 2. The *iC′X′* map taking into account sizes of the countries.

The corresponding *iC′X′* map is shown in Figure 2. Orders of magnitude differences are seen, when countries and regions like Scotland and Switzerland are compared with the only BRIC country that has made it to the list. The BRIC countries have a long way to go to catch up with the world leaders in the area of molecular biology and genetics.

1. Prathap, G., *Curr. Sci.*, 2010, **98**, 995–996.

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