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Review

Bridging the gap in patent assessment: The Index of Internal Effort framework for pharma innovations

[Salvando las distancias en la evaluación de patentes: El marco del Índice de Esfuerzo Interno para las innovaciones farmacéuticas]

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Abstract

Context: The process of assessing patents is complex, and there is a gap in the literature on patent assessment at the time of filing.

Aims: To assess patent complexity and the human effort involved in research, we test the effectiveness of the Index of Internal Effort (IIE) framework using pharmaceutical patents developed within the Brazilian public sector as a proof of concept.

Methods: Internal data were collected from innovation projects that included the filing of patents as a project outcome. The Spearman correlation test was applied to determine which internal patent variables could be used as metrics in IIE. Then, IIE was used to measure the complexity of the patents and the individual effort of inventors. Results were then compared with other metrics identified in the literature.

Results: The IIE showed a positive and significant correlation with resources invested at the design stage, as well as commercial and social outcomes of the patents.

Conclusions: The results indicate that the generic IIE framework is a new form of metrification that can be applied to pharmaceutical patents that have not been previously discussed in the literature.

Keywords: data science; Fiocruz; intellectual effort; patent; pharmacology; public service.

Resumen

Contexto: El proceso de evaluación de patentes es complejo, y existe un vacío en la literatura sobre la evaluación de patentes en el momento de su presentación.

Objetivos: Evaluar la complejidad de las patentes y el esfuerzo humano implicado en la investigación, la eficacia del marco del Índice de Esfuerzo Interno (IIE), utilizando patentes farmacéuticas desarrolladas dentro del sector público brasileño como prueba de concepto.

Métodos: Se recogieron datos internos de proyectos de innovación que incluían la presentación de patentes como resultado del proyecto. Se aplicó la prueba de correlación de Spearman para determinar qué variables internas de las patentes podían utilizarse como métricas en la IIE. A continuación, se utilizó la IIE para medir la complejidad de las patentes y el esfuerzo individual de los inventores. A continuación, se compararon los resultados con otras métricas identificadas en la bibliografía.

Resultados: La IIE mostró una correlación positiva y significativa con los recursos invertidos en la fase de diseño, así como con los resultados comerciales y sociales de las patentes.

Conclusiones: Los resultados indican que el marco genérico IIE es una nueva forma de metrificación que se puede aplicar a las patentes farmacéuticas que no se han discutido previamente en la literatura.

Palabras Clave: ciencia de datos; esfuerzo intelectual; farmacología; Fiocruz; patente; servicio público.

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INTRODUCTION

Compared to the assessment of tangible assets, the valuing of a patent as an intangible asset (IA) is a challenging and multidisciplinary process (Kalip et al., 2022). This assessment becomes even more complex when it is based on scores or rules defined by the group being assessed and is, therefore, institutionalized. These scores may be subject to inconsistencies, corporatism, or resistance.

Often, patents developed in the public sector are filed only to fulfill the requirements of an inventors' academic performance evaluation (Liu et al., 2014). Once the patent evaluation is complete, it may be abandoned, or its maintenance may become burdensome for the institution, with no prospect of transfer to the private sector. These conditions result in disparities in value and quality between patents developed by public and private institutions. In an analysis of molecular biology patents, Meneghini and Gamba (2011) found that there is a long-standing trend in Brazil of poor results in technological innovation when compared to other forms of scientific production.

Cativelli (2020) highlights that simply counting the number of patents filed and/or granted does not indicate whether inventions have contributed to the advancement of science or social welfare. To improve this situation, it is necessary to adopt an effective set of metrics that minimizes errors, ambiguities, and distortions during public sector patent evaluation. As noted by Suzuki (2011), there is a significant amount of research that highlights the mismatch between innovation and the number of patents, as not all patents represent innovation or added value, nor is there a guarantee that the innovation will actually be introduced into the market. As a possible solution, Suzuki (2011) suggests identifying the characteristics that are common to high-value patents.

Using the pharmaceutical industry as an example, Chen and Chang (2010) argued that this sector faces the challenge of high research and development costs for new drugs but low manufacturing costs. Consequently, few pharmaceutical companies are willing to invest in research and development without ensuring the protection of their investment in the form of patents. However, in times of crisis, such as in the case of the COVID-19 pandemic that began in 2019, patent protection may represent an obstacle to large-scale adoption of medicines, as discussed by Serger et al. (2020).

In a systematic literature review, Kalip et al. (2022) found that the measurement of patents has multiple dimensions and indicators, with the Technological Readiness Level (TRL) being an item of particular interest. A higher TRL indicates: i) lower risk in the use of technology, as the technology is more advanced; ii) greater length of time in development; and iii) more resources invested in testing, proof of concept (PoC), and prototyping. However, in patent offices, it is not mandatory to indicate TRL.

Among several possible metrics, Squicciarini et al. (2013) propose assessing the quality of a patent by selecting between three equations that simultaneously use up to six variables. These variables should be collected from within the patent (internal) as well as patent offices (external). However, some variables, such as grant lag, show considerable variation across different patent offices, making standardization in measurement unfeasible. In addition, Higham et al. (2021) indicate that caution is needed, as the quality of a patent is an imprecise and unobjective indicator.

Another indicator cited in the literature that requires caution, is the number of citations received by each patent (Song et al., 2023). This indicator varies significantly between databases and patent offices, which generates uncertainties in its use as part of an internationally standardized metric.

Another common topic in the patent literature is the search for valuation methods (Fischer and Leidinger, 2014; Zeebroeck, 2011). Studies on this topic are diverse, with some approaches attempting to compare the sale value of patents with the market value of the filing firms (Chen and Chang, 2009).

For Van Burg et al. (2021), four main factors are crucial in patent valuation: i) whether the patent was filed in one of the three main international patent offices – USPTO (United States Patent and Trade Office), EPO (European Patent Office), and JPO (Japan Patent Office); ii) the number of citations received (forward citations), which measures the influence of the patent within its field; iii) the originality of the patent, measured by the proportion of unique citations included in the patent; and iv) the number of claims in the patent, which may reflect the complexity in the development of the innovation. Nevertheless, the first factor of their proposed metrics excludes local patent assessments, such as those that occur in the public sector in Brazil.

A gap found in the literature on patent metrics is the absence of an indicator that can be applied at the time of patent filing and can estimate patent value without relying on information from third-party databases or websites. In addition, a global indicator is needed, without restrictions of use, to evaluate inven-

tors' performance that is immediate and proportional to the effort applied in developing the patent.

Building on previous research on patent metrics, this study aims to test a generic framework for measuring the complexity and effort of intellectual work, called the Index of Internal Effort (IIE) (Mensures, 2016), and compare it with patent valuation indicators. For this proof of concept (PoC), patent data from the Brazilian public pharmaceutical research institution Fundação Oswaldo Cruz (Fiocruz) were collected. Two metrics of the IIE were considered: i) the complexity of patents (IIEa), following the complexity typology proposed for Systems Engineering (Sheard and Mostashari, 2010); and ii) the average individual effort of inventors (IIE0), which can be used as an indicator to assess the performance of patent inventors.

The IIE was developed to quantify explicit intellectual activities, aiming to improve the efficiency and effectiveness of services provided to society (Mensures, 2016). However, there may be some non-linearity or limitation in its use, which requires further analysis. It is also necessary to compare results with specific metrics and indicators from each field of research, such as the case used herein of patents developed within the Brazilian public sector.

MATERIAL AND METHODS

This study uses a quantitative and applied approach to patent analysis. The research body (dataset) was composed of data from Fiocruz projects that resulted in patent filings, requested through the Brazilian citizen access to an information service portal called Fala.BR (Brasil, 2022). After receiving a spreadsheet containing the patent codes and project details, we proceeded to search for patents in the databases of the offices indicated by Fiocruz. After reading the patents, relevant internal data were manually collected for correlation analysis, and patent complexity and effort were subsequently measured using the IIE framework. Based on Complexity Typology (CT) developed by Sheard and Mostashari (2010), the most significant variables were compiled and employed as hypotheses in the tests. These variables were numbered as Vx, with 'x' representing sequential identification numbers in Tables 1, 2 and 3.

After collecting and tabulating the internal patent data about the projects developed by Fiocruz, the variables were tested for normality using the Shapiro-Wilk test (Royston, 1982) to determine whether the correlation tests were parametric or non-parametric. After confirmation of the most appropriate correlation test, an "all against all" correlation matrix was adopted, following the approach proposed by Su and Lin (2018).

Using a structured table with data from the innovation projects (i), internal data contained in the patents (ii), and indicators found in the literature (iii), a correlation test was conducted to determine which variables contained in the patents (ii) correlate with project data (i) or with significant indicators mentioned in the literature (iii). Then, the IIE was calculated based on Equations [1] and [2], and the correlation between the results of these equations and important variables from groups (i) and (iii) was assessed.

The steps for metrification with IIE (Mensures, 2016) are as follows:

i) identification of the variables involved in the intellectual activity under analysis: internal and external variables of the patents;

ii) organization of the possible variables to be used in the IIE based on the Complexity Typology (CT) method (Sheard and Mostashari, 2010). A correlation test indicates which variables are the most important in metrification;

iii) calculation of the IIE, which should include a minimum of four variables (or groups of variables) to reduce measurement errors arising from the breadth of a single variable or possible subjective bias. To strengthen the measurement process, there should be at least one quantitative variable, as well as a variable representing a qualitative characteristic, where possible;

iv) variables are separated into output or outcome groups (An) and input groups (Bm), each of which must contain at least one variable;

v) IIEa equation (Equation [1]) is applied to the groups of variables selected to estimate patent complexity. The square root is used as a correction factor for amplitude errors, considering that all variables are, in principle, unidimensional. For two-dimensional variables, the cube root is used. This approach yields a dimensionless number similar to the system complexity patent measurement developed by Repperger et al. (2012);

vi) if the correlation test between the estimate of complexity (IIEa) and the patent variables do not show a significant correlation, the process begins again at step 1. Herein, this condition was not observed;

vii) after a significant correlation with IIEa is identified, the primitive function (IIE0 in Equation [2]) is applied to measure the average individual effort of inventors. This requires the inclusion of the number

of inventors in the denominator (B_1) along with other relevant variables that can be used to assess individual effort.

The variables selected for patent measurement (A_n, B_m) were identified after the statistical correlation test, as presented in the Data Organization section.

$$IIEa = 1 + \sqrt[2]{A_1} + \sqrt[2]{A_2} + \sqrt[2]{A_3} + \sqrt[2]{A_4} + \ldots + \sqrt[2]{A_n} \quad [1]$$

$$IIE0 = \frac{1 + \sqrt[2]{A_1} + \sqrt[2]{A_2} + \sqrt[2]{A_3} + \sqrt[2]{A_4} + \ldots + \sqrt[2]{A_n}}{1 + \sqrt[2]{B_1} + \sqrt[2]{B_2} + \ldots + \sqrt[2]{B_m}} \quad [2]$$

RESULTS

The original spreadsheet provided by the Fala.BR system (Brasil, 2022), containing data from Fiocruz, was composed of 134 patents filed between the years 2018 and 2022. These patents were subdivided into four categories: granted patents, patent applications in progress, patents filed and in a period of confidentiality, and records with incomplete data. Additionally, some patents were not located in the indicated offices.

The data provided included information on where the patents were filed, project cost, development time, and TRL. In the end, a set of 35 patents (Table S1) with complete data was chosen as the dataset used in the PoC. The exclusion criterion adopted was a lack of complete information to be used in the correlation tests. Fig. 1 shows the steps taken to create the Fiocruz patents dataset based on the workflow recommended by Page et al. (2021) for systematic literature reviews.

Data organization

Considering the project data made available by Fiocruz through the Fala.BR platform (i), quantitative data that can be collected in patent documents (ii), and the limited data found within the databases of patent or third party offices (iii), this section describes the variables identified to constitute the correlation test and subsequent use in the IIE measurement. The collection of internal patent data (ii) was guided by the literature presented below, and the order (Ox) of the variables was based on the Complexity Typology (CT) (Sheard and Mostashari, 2010). Project or third party data was not organized according to the CT, as it is not included within the patents and was not used in IIE metrification.

The first variable is the project cost (V1), which is crucial to evaluate investment in project development. The original data is in Brazilian Portuguese, and the currency used in the submitted document is the Real (BRL - R$).

The duration of the project in months (V2) is a variable of interest that is subject to correlation analysis with other variables. By calculating the relationship between V1 and V2, an intermediate variable can be obtained: average monthly expenditure (V3).

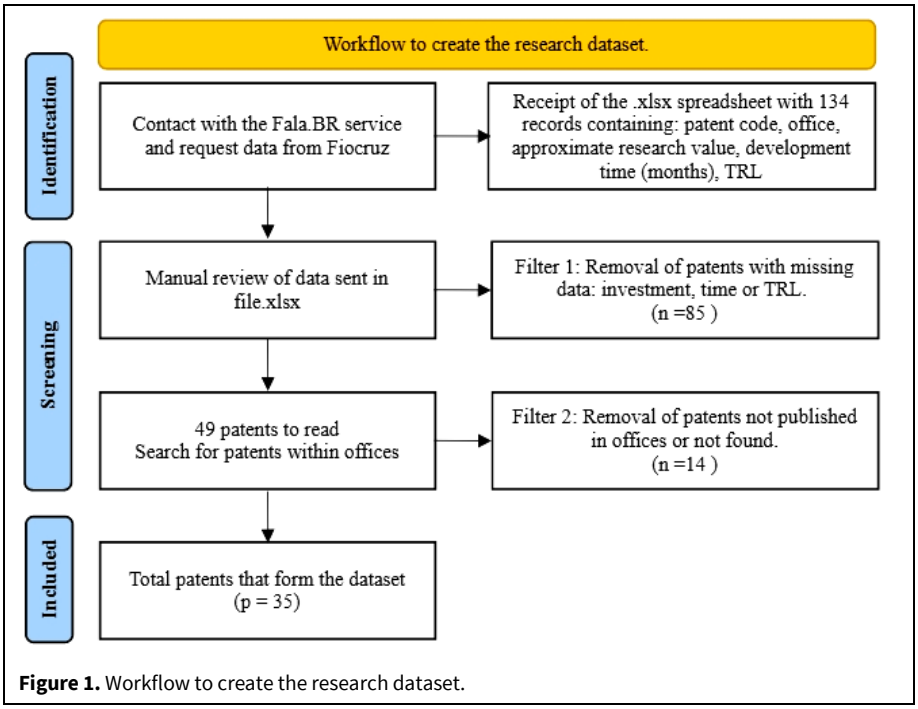

Figure 1. Workflow to create the research dataset.

The number of offices in which patents have been filed (V4) is noted by some authors (Chiu and Chen, 2007; Squicciarini et al., 2013; Wang et al., 2011) as an indicator of "family size" and is used to assess patent value or quality.

The Technology Readiness Level (TRL) (V5) indicates the current stage of development of the innovation (NASA, 2018), providing an inference about the resources invested in testing, proof of concept, and prototyping. This information was obtained through a request to Fiocruz. Because it is not mandatory to present this information at the time of patent registration, it is not easily found in the literature.

The number of applicant companies or institutions holding a patent (V6, assignees) is a variable that can, as a hypothesis, describe the robustness of the invention, since it indicates collaboration between institutions. Thus, this variable was classified as an item of order 3 (O3) using the CT.

The number of inventors (V7) within the context of work effort may indicate that the more "hands at work", the faster or more complex the patent development may have been. This variable is referenced in previous research (Gambardella et al., 2008; Su and Lin, 2018; Suzuki, 2011; Yao and Ni, 2023), and was classified as 3 (O3) using the CT.

Although uncommon in patent metrics, Yao and Ni (2023) studied the impact of the number of pages in patents (V8) and argued that this variable is related to the technological complexity of the patent. Due to its simplicity, according to the CT, this item was feasible and was classified as order 1 (O1).

The number of internal citations (V9) was mentioned in studies by Chen and Chang (2009), Squicciarini et al. (2013), Suzuki (2011), Trappey et al. (2012), and Wang et al. (2011). Citations from publications outside the patents, such as scientific journals, congresses, books or similar, were not considered in this study. This variable was classified as order 6 (O6) using the CT due to its social context.

The number of claims (V10) is one of the most relevant aspects of patents as it objectively indicates what is protected by the patent (Reitzig, 2004). Moreover, a higher number of claims may be associated with a greater impact on the patent. This variable was mentioned in several studies (Gambardella et al., 2008; Squicciarini et al., 2013; Su and Lin, 2018; Trappey et al., 2012; Van Burg et al., 2021; Wang et al., 2011; Yao and Ni, 2023). In the CT, V10 was classified with a value of 5 (O5) due to its variability over time and the impossibility of predicting its evolution.

The number of fields covered by the patent (V11) is the sum of the areas referenced in the International Patent Classification (IPC). This variable describes the breadth of applications of the innovation or utility model. V11 is mentioned in the studies by Gambardella et al. (2008), Song et al. (2023), Squicciarini et al. (2013), Su and Lin (2018), and Trappey et al. (2012). Using the CT, this variable was classified as order 3 (O3) due to its connections, limitations, and rules of use.

This study proposes a test variable to measure the effort in developing a patent called dimensional complexity (DC - V12). Its value is calculated as the module of the natural logarithm (ln(x)) of the minimum or maximum dimension of a physical variable controlled by the innovation registered in the patent, expressed mathematically as $V12 = |\ln(x)|$. This variable serves to infer the complexity of projects with nanotechnologies, such as vaccines and biotechnology. In metrology, this variable can be interpreted as an approximation of the "dimensional tolerance" in the production or manipulation of a part, where a lower value indicates a more difficult process necessary to avoid errors (Fischer, 2011). Using the CT, this variable has an order of 2 (O2).

The number of citations received by a patent (V13) is considered one of the most important indicators in the literature (Cativelli, 2020; Gambardella et al., 2008; Kalip et al., 2022; Song et al., 2023; Squicciarini et al., 2013; Suzuki, 2011; Trappey et al., 2012; Wang et al., 2011). However, citation counts vary significantly between databases, which creates a problem. In this study, the highest citation value found between the Lens.org and Google Patents databases was used. As V13 is an external variable, no order was defined based on the CT.

The estimation of the value of a patent (V14), used as a hypothesis in this study, is based on the empirical work of Fischer and Leidinger (2014). The authors used auction data from Ocean Tomo to identify variables that help predict the sale value of a patent. In short, the value of the patent is composed of the following: i) each citation received by the patent within the first five years increases its value by 14,224 monetary units; ii) each filing of the patent in a new patent office increases its value by 750 monetary units; and iii) each claim of the patent increases its value by 1,744 monetary units. As this study uses a correlation test, it was not necessary to consider the monetary unit.

To measure complexity (IIEa) or effort in patent development (IIE0), internal variables directly accessible in patent documents (Ox) were considered, provided that they correlate with project data or patent sales value. These variables must be ordered and organized according to the CT used in Systems Engi-

neering, as proposed by Sheard and Mostashari (2010).

Table 3 presents an organizational summary of the variables used in this study, according to the literature review by Arias Gonzáles (2022).

Correlation test results

With the application of the Shapiro-Wilk normality test, only variables V2, V10, and V12 showed a normal distribution ($p>0.05$). Therefore, the most appropriate correlation test was Spearman's (non-parametric test). For the sample of 35 patents, the following minimum acceptable (significant) correlation values (ρ) were adopted: $-0.283 < \rho > +0.283$ for alpha of 0.05 (Confidence Level = 95%). For cases of strong correlation (Confidence Level = 99%), the values adopted were $-0.394 < \rho > +0.394$ for the alpha of 0.01. The result of this test is presented in Table 1 and is similar to the test of patent variables presented by Zeebroeck (2011).

Based on the hypothesis that the reference variables for patent metrics are those that correlate with development or social/commercial impact (V1, V2, V3, V13, and V14), the internal patent variables showed a significant and positive correlation with the following:

i) project data (V1, V2, and V3) correlated with V6, V7, V8, and V10;

ii) commercial or social results, as shown by V13 and V14, were correlated with V11, V12, V7, V8, and V10. Although V4 showed a correlation with V13, V4 is not found in the patent documents, making it inapplicable as a calculation variable in a general assessment performed using IIE at the time of patent filing.

Given that IIE indicates a prioritization of variables, when possible, and division between numerator and denominator, the variables for the test with IIE were organized as follows: in the numerator (An) V10, V12, V11, V6, V8, following the CT; in the denominator (Bm), only V7.

Table 1. Correlation matrix of dataset variables.

Variable	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14
V1	1	0.219	0.897**	0.238	0.273	0.403**	0.551**	0.250	0.068	0.509**	-0.247	0.122	-0.152	0.430**
V2		1	-0.094	0.239	0.236	0.403**	0.047	-0.066	-0.047	0.106	0.010	-0.292_*	0.091	0.176
V3			1	0.177	0.251	0.403**	0.566**	0.311	0.143	0.544**	-0.373_*	0.122	-0.279	0.387*
V4				1	0.650**	0.434**	0.070	-0.104	0.299*	-0.049	0.057	-0.261	0.317	0.174
V5					1	0.191	0.142	-0.283_*	0.422**	0.145	-0.109	-0.177	0.063	0.223
V6						1	0.321*	0.262	0.012	0.306*	-0.387_*	-0.232	-0.088	0.256
V7							1	0.116	0.057	0.549**	-0.227	-0.275	-0.499_**	0.313*
V8								1	0.000	0.334*	-0.183	0.217	0.015	0.312*
V9									1	0.085	0.131	-0.073	0.245	0.199
V10										1	-0.139	-0.238	-0.181	0.869**
V11											1	0.057	0.484**	0.091
V12												1	0.336*	-0.118
V13													1	0.302*
V14														1

*Indicates significant correlation at 95% confidence level and ** at 99%.

Table 2. Correlation matrix of the variables for IIE proof of concept.

Variable	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	IIEa	IIE0
V1	1	0.219	0.897**	0.238	0.273	0.403**	0.551**	0.250	0.068	0.509**	-0.247	0.122	-0.152	0.430**	0.384	-0.223
V2		1	-0.094	0.239	0.236	0.403**	0.047	-0.066	-0.047	0.106	0.010	-0.292_*	0.091	0.176	-0.068	-0.173
V3			1	0.177	0.251	0.403**	0.566**	0.311*	0.143	0.544**	-0.373_*	0.122	-0.279	0.387*	0.440**	-0.146
V4				1	0.650**	0.434**	0.070	-0.104	0.299*	-0.049	0.057	-0.261	0.317*	0.174	-0.158	-0.220
V5					1	0.191	0.142	-0.283_*	0.422	0.145	-0.109	-0.177	0.063	0.223	-0.203	-0.318_*
V6						1	0.321*	0.262	0.012	0.306*	-0.387_*	-0.232	-0.088	0.256	0.256	-0.061
V7							1	0.116	0.057	0.549**	-0.227	-0.275	-0.499_**	0.313*	0.155	-0.671_**
V8								1	0.000	0.334*	-0.183	0.217	0.015	0.312*	0.877**	0.492**
V9									1	0.085	0.131	-0.073	0.245	0.199	0.063	-0.087
V10										1	-0.139	-0.238	-0.181	0.869**	0.524**	-0.089
V11											1	0.057	0.484**	0.091	-0.056	0.174
V12												1	0.336*	-0.118	0.404**	0.510**
V13													1	0.302*	0.115	0.385*
V14														1	0.535**	0.049
IIEa															1	0.557**
IIE0																1

*Indicates significant correlation at 95% confidence level and ** at 99%.

IIE measurement results

IIE was calculated based on Equations [1] and [2] and the variables described in the section "Correlation test results". The results are presented in Table 3 and are also available at the link provided by the authors (Dataset link: https://docs.google.com/spreadsheets/d/14BWLgg9tlaDy0T8deLvMzUzY7roORwHj/edit?usp=sharing&ouid=108894340029492345033&rtpof=true&sd=true)

DISCUSSION

In this study, Fiocruz patents were used as a database to conduct a proof of concept (PoC) of the applicability of IIE, allowing the comparison of results obtained from project data with commercial or social results of the filed patents.

The exclusive use of internal variables that conform to the CT of Systems Engineering (Sheard and Mostashari, 2010) enabled the calculation of IIE, producing significant results. IIEa showed a significant correlation with total cost (V1), monthly cost (V3), and approximate auction value (V14), which is an important result in inferring commercial value. In addition to these variables, IIEa presented a significant correlation with standard indicators, such as the number of claims (V10), as well as the new variable proposed in this study, dimensional complexity (V12) (Table 2). IIEa also showed a significant correlation with the number of pages (V8).

Table 3. Operationalization of variables - All the variables are quantitative.

N°	Indicator variable	Conceptual definition	Operational definition	Dimensions	Type	Measurement scale
V1	Cost ($)	Important to evaluate investment in project development	Original data from Fiocruz	Investment	Independent	Ratio
V2	Development time (months)	Development time increases research costs	Original data from Fiocruz	Investment	Independent	Ratio
V3	Cost per month	Average monthly expenditure	Calculated from V1 and V2	Investment	Independent	Ratio
V4	Family size	The number of offices in which patents have been filed; used to assess patent value or quality	Original data from Fiocruz	Territorial scope	Independent	Ratio
V5	Technology Readiness Level – TRL	Indicates the current stage of development of the innovation, providing an inference about the resources invested	Original data from Fiocruz	Current level of development	Independent	Internal
V6	N° assignees	Number of institutions holding a patent; hypothesis indicates the robustness of the invention	Patent internal data	External collaboration	Independent	Ratio
V7	N° authors	Number of inventors is an important variable within the context of effectiveness and effort	Data collected from within the patent	Internal collaboration	Independent	Ratio
V8	N° pages	Contains information that is difficult to measure, such as graphs, tables, equations, among others	Data collected from within the patent	Quantity	Independent	Ratio
V9	N° backward citations	Describes the patent's effort to report the state of the art	Data collected from within the patent	Literature review	Independent	Ratio
V10	N° claims	A higher number of claims may be associated with greater impact of the patent	Data collected from within the patent	Scope of applications	Independent	Ratio
V11	N° areas (IPC)	Describes the spectrum (diversity) of patent application areas	Data collected from within the patent	Diversity of applications	Independent	Ratio
V12	Dimension complexity	A hypothetical variable that helps to measure the complexity of projects involving nanotechnology	Data collected from within the patent	Difficulty of handling	Independent	Ratio
V13	N° max. citations (forward)	Considered one of the most important indicators of patents in the literature	Collected from Lens and Google Patents	Importance to the area	Independent	Ratio
V14	Price (Fischer and, Leidinger, 2014)	Estimate of the value of a patent	Calculated value	Estimated value ($)	Dependent	Ratio
IIEa	Complexity (IIEa)	Complexity indicator of a patent, according to the IIE framework	Calculated value	Complexity of work	Dependent	Ratio
IIE0	Average effort (IIE0)	Average effort of each inventor during the development of a patent, according to the IIE framework	Calculated value	Work effort	Dependent	Ratio

Although the denominator in IIE0 decreased the final value (V7), we found a significant correlation between IIE0 and the number of patent citations (V13), which is recognized in the literature as an important indicator (Song et al., 2023).

Unexpectedly, an inversely proportional significant relationship was found between the variables: V5 with V8; V11 with V3 and V6; V12 with V2; and V13 with V7. These statistical results may be contradictory, raising the possibility of limitations in the dataset or pointing to non-linearity in the data. However, the results are consistent with what Gambardella et al. (2008) previously reported when they identified the presence of many highly cited patents with low economic value, as well as patents with no citations but high economic value. This behavior suggests the need for caution when using valuation variables, especially those with unique and distinct behavior.

The variable dimensional complexity (V12) proposed in this study showed a correlation with the number of citations received (V13). Although it was expected that V12 would show a correlation with other variables, it is important to consider that the data in this study only includes patents from a single field (pharmaceutical). Hypothetically, a different result may be observed when applying V12 to a more diverse dataset, which could better elucidate the differences between patent applications across a range of academic fields.

For Trappey et al. (2012) the number of fields in which the patent can be applied (V11) is one of the most important variables in the valuation of these explicit intellectual activities, as it represents the spectrum of possible applications. However, in this study, V11 presented a significant and positive correlation only with V13. In addition, V11 presented an inversely proportional correlation with V3 and V6, which

raises doubts about its use, since V3 and V6 are important variables in patent metrics.

In Bessen's (2008) study on the market value of patents, the author suggested that citations received by patents (V13) may, in some cases, act as noise in the process of measuring patent quality. Therefore, its use should be linked to other variables to minimize this possible issue. We can see this noise in the Fiocruz dataset, as cases of patents cited on the Google Patents platform that did not have citations registered on the Lens.org platform were identified. This noise implies that the variable can only be used in two scenarios: i) when the study is based on the same data source and in the same field; or ii) when the metrification method is robust and uses multiple variables, which helps to mitigate possible errors arising from this noise.

IIE measures intellectual activities in a way that is similar to robust control, which is used in the field of systems control. In this area, the control system is "robust" because it functions properly while tolerating small changes, non-linearities, and incomplete knowledge about the mathematical model of the system (Dorf and Bishop, 2011). This functionality is reinforced by the Pareto Principle, which states that 20% of the causes generate 80% of the consequences.

All values used in the IIE calculations were found within the patents. This means that values coming from a specific patent office that could distort a global metrification are not used. Thus, unlike the variable grant lag (GLT) proposed by Squicciarini et al. (2013), the IIE framework can be used when comparing patents from different fields, institutions, or countries without distorting the results.

Considering Equations [1] and [2], the IIE framework is adaptable. As a consequence, there is a need to standardize the framework for the area in which it will be used, i.e., such as by patent offices. An example of this adaptability is long-term measurement. Unlike the study presented in Table 2, by adding variables to the numerator that change over time, for example, the number of citations received and the number of offices where the patent was filed, IIE can be used to assess the social impact of the innovation contained in the patent. Similarly, by adding the age of the patent (as a hypothesis) to the denominator of the IIE, this will automatically reduce the value of the patent each year, which is consistent with what Fischer and Leidinger (2014) observed for the decline of patent auction value.

An important observation to be mentioned is the cost of the project (V1), as indicated by Fiocruz. When calculating the average monthly expenditure (V3) and analyzing the number of patent inventors (V7), the values are so low that it is clear they do not consider the salary of the researchers involved, indicating that the real invested values are well above those provided by Fiocruz. Thus, considering that Fiocruz is a public research institution, the V1 value in the dataset only includes inputs used in the research and does not reflect the actual value spend on the research that resulted in the patent filing.

The low number of citations in the database of patents used as PoC for IIE prohibited us from comparing the results with metrics proposed in the literature that include this variable as a fundamental item, for example, Cativelli (2020), Song et al. (2023), and Zeebroeck (2011), among others. Thus, in future analyses there is a need to test the IIE with a database that contains patents only in English, as it is an internationally recognized language for trade, which could help to verify the selection of other variables to be used in IIE.

Table 4 presents the results of IIE0 at its lower and upper extremes. In absolute terms, the difference between the extremes of the final scores is not significant. However, when we compare the percentage (%), the discrepancy between patents with higher scores and those with lower scores becomes evident. Comparing samples 4 and 9 reveals a substantial difference in the work effort. Patent number 9 consists of 151 pages, written by two inventors, with 19 claims and applicable to 19 different areas (V11). Meanwhile, patent number 4 has only 18 pages, written by five inventors, with 10 claims, applicable to only three

Table 4. Comparison between the extreme values of the IIE indicator.

N°	Patent code	V1	V4	V7	V8	V9	V10	V11	V12	V13	V14	IIEa	IIE0	%IIE0
4	US 10538515	100,000.00	2	5	18	10	10	3	3.2	0	18,940.00	12.93	3.99	36.6
9	US 11230574	184,000.00	2	2	151	4	19	7	11.0	3	77,308	24.62	10.20	93.5
10	EP 3498850	184,000.00	2	2	230	3	13	5	11.0	3	66,844	26.33	10.91	100
11	BR1120190135316	166,000.00	1	4	143	0	15	5	10.4	0	26,910	23.29	7.76	71.2
15	BR1020200099116	91,201.15	1	11	49	2	12	4	8.8	0	21,678	17.43	4.04	37.0
26	CN 113784975	480,000.00	4	7	27	1	17	6	3.9	0	32,648	15.75	4.32	39.6

different areas (V11). Although patent number 4 has a lower production cost (V1), it hypothetically holds less market value since it lacks citations from other patents, whereas patent number 9 has received three citations from recent patents. This is a clear example of how patents within the workplace, such as in Brazilian public research institutions, cannot be evaluated based on the assumption that "all are equal."

Pinheiro-Machado and Oliveira (2001) suggested that Petrobras is among the Brazilian public companies with the highest number of filed patents. As such, a potential future endeavor could involve assessing the patents held by this state-owned industry entity and comparing them with the pharmaceutical data presented herein. In so doing, we aim to uncover new metrics that can be applied in the field of patents.

CONCLUSION

The structure of the Index of Internal Effort (IIE), combined with a dataset of pharmaceutical patents developed in the Brazilian public sector, demonstrates the feasibility of robust patent metrics that can be applied at the time of filing, a contribution hitherto unexplored in the literature. Another important feature of this framework is the ability of the IIE0 to serve as an indicator of inventor productivity, which is an essential metric to gauge the efficiency and effectiveness of the public sector.

Based on the results of correlation analysis, no significant limitations were identified for the use of the IIE in patent metrics. This suggests that its implementation in government offices could be quick and straightforward. However, given the novelty of this technique, it is essential to test it in other fields of research to identify possible limitations in its use.

A crucial implication of this study is that patent evaluation should transcend traditional metrics and consider the social and economic context in which patents are conceived and used. By incorporating factors such as Fiocruz's mission and the social relevance of its patents, the structure of the IIE can promote a broader and more socially responsible approach to patent evaluation. Such an approach aims to promote the development and use of patents for the benefit of society as a whole, rather than only serving the interests of a select group of private entities.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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REFERENCES

Arias Gonzáles JL (2022) Guía para elaborar la operacionalización de variables. Espacio I+D Innov Desarro 10: 28. https://doi.org/10.31644/IMASD.28.2021.a02

Bessen J (2008) The value of U.S. patents by owner and patent characteristics. Res Policy 37(5): 932–945. https://doi.org/10.1016/j.respol.2008.02.005

Brasil (2022) Fala.BR. Retrieved from: https://falabr.cgu.gov.br/publico/Manifestacao/SelecionarTipoManifestacao.aspx?ReturnUrl=%2f

Cativelli AS (2020) Metric indicators of patent value: construction of a Value Index using Brazilian green patents. [Original in Portuguese: Indicadores métricos de valor de patentes: construção de um Índice de Valor utilizando as patentes verdes brasileiras]. Programa de Pós-Graduação em Ciência da Informação da Universidade Federal de Santa Catarina (UFSC). [Ph. D Thesis]. 284 p. Retrieved from: https://repositorio.ufsc.br/bitstream/handle/123456789/219292/PCIN0244-T.pdf?sequence=-1&isAllowed=y

Chen YS, Chang KC (2009) Using neural network to analyze the influence of the patent performance upon the market value of the US pharmaceutical companies. Scientometrics 80: 637–655. https://doi.org/10.1007/s11192-009-2095-2

Chen YS, Chang KC (2010) The relationship between a firm's patent quality and its market value - The case of US pharmaceutical industry. Technol Forecast Soc Change 77(1): 20–33. https://doi.org/10.1016/j.techfore.2009.06.003

Chiu YJ, Chen YW (2007) Using AHP in patent valuation. Math Comput Model 46(7-8): 1054–1062. https://doi.org/10.1016/j.mcm.2007.03.009

Dorf RC, Bishop RH (2011) Modern control systems. 12th ed. Prentice Hall, pp. 1104.

Fischer T, Leidinger J (2014) Testing patent value indicators on directly observed patent value - An empirical analysis of Ocean Tomo patent auctions. Res Policy 43(3): 519–529. http://dx.doi.org/10.1016/j.respol.2013.07.013

Fischer U (2011) Tabellenbuch metall. [Portuguese: Manual de tecnologia metal mecânica]. 2° ed. Blucher.

Gambardella A, Harhoff D, Verspagen B (2008) The value of European patents. Eur Manag Rev 5(2): 69–84. https://doi.org/10.1057/emr.2008.10

Higham K, Rassenfosse G, Jaffe AB (2021) Patent quality: Towards a systematic framework for analysis and measurement. Res Policy 50(4): 104215. https://doi.org/10.1016/j.respol.2021.104215

Kalip NG, Erzurumlu YÖE, Gün NA (2022) Qualitative and quantitative patent valuation methods: A systematic literature review. World Pat Inf 69: 102111. https://doi.org/10.1016/j.wpi.2022.102111

Liu L, Cao C, Song M (2014) China's agricultural patents: How has their value changed amid recent patent boom? Technol Forecast Soc Change 88: 106–121. https://doi.org/10.1016/j.techfore.2014.06.018

Meneghini R, Gamba EC (2011) Assessment of the scientific-technological production in molecular biology in Brazil (1996-2007): The contribution of genomics programs. An Acad Bras Ciênc 83(2): 745–760. https://doi.org/10.1590/S0001-37652011005000004

Mensures (2016) Software developed to measure intellectual activities based on the Index of Internal Effort methodology. [Original in Portuguese: Software desenvolvido para mensurar atividades intelectuais baseado na metodologia do Índice Interno de Esforço]. [Patent]. INPI. BR 51 2016 001521-7. RPI 2405. 2016.

NASA (2018) Technology Readiness Level - TRL. NASA. Retrieved from: https://www.nasa.gov/directorates/heo/scan/engineering/technology/technology_readiness_level

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D (2021) The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 372: n71 https://doi.org/10.1136/bmj.n71

Pinheiro-Machado R, Oliveira PL (2011) The Brazilian investment in science and technology. Braz J Med Biol Res 34(12): 1521–1530. https://doi.org/10.1590/S0100-879X2001001200003

Reitzig M (2004) Improving patent valuations for management purposes—validating new indicators by analyzing application rationales. Res Policy 33(6-7): 939–957. https://doi.org/10.1016/j.respol.2004.02.004

Repperger DW, Roberts RG, Koepke CG (2012) Quantitative measurements of system complexity. Google Patents, ago. 8, 2012. US Patent 8,244,503 B1. https://patents.google.com/patent/US8244503

Royston JP (1982) An Extension of Shapiro and Wilk's W Test for Normality to Large Samples. Appl Statist 31(2): 115. https://doi.org/10.2307/2347973

Serger MR, Evangelista TCS, Dantas RF, Santana MVS, Gonçalves LCS, Souza-Neto LR, Ferreira SB, Silva-Junior FP (2020) COVID-19: molecular targets, drug repurposing and new avenues for drug discovery. Mem Inst Oswaldo Cruz 115. https://doi.org/10.1590/0074-02760200254

Sheard SA, Mostashari A (2010) A complexity typology for systems engineering. INCOSE Int Symp 20(1): 933–945. https://doi.org/10.1002/j.2334-5837.2010.tb01115.x

Song H, Hou J, Zhang Y (2023) The measurements and determinants of patent technological value: Lifetime, strength, breadth, and dispersion from the technology diffusion perspective. J Informetr 17(1): 101370. https://doi.org/10.1016/j.joi.2022.101370

Squicciarini M, Dermis H, Criscuolo C (2013) Measuring Patent Quality: Indicators of Technological and Economic Value, OECD Science, Technology and Industry Working Papers. No. 2013/03, OECD Publishing, Paris. https://doi.org/10.1787/5k4522wkw1r8-en

Su HN, Lin YS (2018) How do patent-based measures inform product commercialization? —The case of the United States pharmaceutical industry. J Eng Technol Manag 50: 24-38. https://doi.org/10.1016/j.jengtecman.2018.08.002

Suzuki J (2011) Structural modeling of the value of patent. Res Policy 40(7): 986–1000. https://doi.org/10.1016/j.respol.2011.05.006

Trappey AJC, Trappey CV, Wu CY, Lin CW (2012) A patent quality analysis for innovative technology and product development. Adv Eng Informatics 26(1): 26–34. https://doi.org/10.1016/j.aei.2011.06.005

Van Burg E, Du J, Kers JG (2021) When do academics patent outside their university? An in-depth case study. Technovation 107: 102287. https://doi.org/10.1016/j.technovation.2021.102287

Wang X, García F, Guijarro F, Moya I (2011) Evaluating patent portfolios by means of multicriteria analysis. Rev Contab 14(1): 9–27. https://doi.org/10.1016/S1138-4891(11)70020-6

Yao L, Ni H (2023) Prediction of patent grant and interpreting the key determinants: an application of interpretable machine learning approach. Scientometrics 128: 4933–4969. https://doi.org/10.1007/s11192-023-04736-z

Zeebroeck NV (2011) The puzzle of patent value indicators. Econ Innov New Technol 20(1): 33–62. https://doi.org/10.1080/10438590903038256

AUTHOR CONTRIBUTION:

Contribution	de Oliveira AA	Santos CB	Pilatti LA
Concepts or ideas	x		
Design	x		
Definition of intellectual content	x		x
Literature search	x		
Experimental studies			
Data acquisition	x		
Data analysis		x	
Statistical analysis		x	
Manuscript preparation	x		
Manuscript editing	x		x
Manuscript review	x	x	x

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Supplementary data

Table S1. Qualitative summary of the 35 patents.

Nº	Patent code/number	Patent Office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
1	US 10688088	USPTO	Pharmaceutical composition, use of mefloquine in fixed dose, and method for treating tuberculosis	Marcus Vinicius Nora de Souza, Raoni Schroeder Borges GONCALVES, Maria Cristina da Silva Lourenco	Fundacao Oswaldo Cruz	This invention concerns the use of mefloquine in relation to Mycobacterium tuberculosis. This invention also concerns the combination of mefloquine with drugs used in first and second choice treatment of tuberculosis, achieving a reduction in the treatment period of tuberculosis (TB) and the treatment of multi - drug resistant tuberculosis (MDR -TB).	A61K
2	CN 108472292B	CNIPA China EspaceNet	PHARMACEUTICAL COMPOSITION, USE OF MEFLOQUINE IN A FIXED DOSE, AND METHOD FOR TREATING TUBERCULOSIS	M·V·N·德索萨; R·S·B·贡萨尔维斯; M·C·达斯瓦·洛伦索	奥斯瓦道·克鲁兹基金会	本发明涉及甲氟喹抗结核分枝杆菌的用途。本发明进一步考虑甲氟喹与用于结核病的首选和次选治疗的药物的组合，实现了结核病(TB)和多药耐药结核病(MDR-TB)的较短的治疗期	A61K
3	BR1120180724947	INPI	COMPOSTO DERIVADO DE ISATINA, USO DO COMPOSTO, E, MÉTODOS PARA TRATAMENTO DE AIDS, PARA O TRATAMENTO DE UMA INFECÇÃO CAUSADA POR HBV E PARA O TRATAMENTO DE UMA COINFECÇÃO CAUSADA POR HIV E HBV.	NUBIA BOECHAT; MÔNICA MACEDO BASTOS; THIAGO MORENO LOPES E SOUZA; DÉBORA INÁCIO LEITE; ALICE MARIA ROLIM BERNARDINO	FUNDAÇÃO OSWALDO CRUZ	A presente invenção se refere a compostos inibidores do HIV consistindo de derivados de isatina de fórmulas I, II e III, conforme representados a seguir (fórmulas I, II e III) onde nas fórmulas I, II e III, R1 é selecionado dentre H, CH3 ou Cl R2 e selecionado dentre um dos seguintes radicais: zidovudina, amprenavir ou uma cadeia fosfonato acíclica, representados a seguir. A presente invenção também consiste do uso e do método de tratamento usando os compostos de fórmulas I, II e III. Os compostos da presente invenção também são usados no tratamento de uma infecção causada pelo HBV ou na coinfecção causada pelo HIV e HBV.	C07D; A61K
4	US 10538515	USPTO	Isatin-derived compounds, use of the compounds for the treatment of AIDS and method of treatment using these compounds	Boechat, Nubia; Bastos, Mônica Macedo; Lopes E Souza, Thiago Moreno; Leite, Débora Inácio; Bernardino, Alice Maria Rolim	Fundacao Oswaldo Cruz	This invention relates to HIV-inhibiting compounds consisting of other Formulae I, II or III isatin derivatives, as shown below (Formulae I, II and III), whereby in Formulae I, II and III, R1 is selected from H, CH3 or Cl; R2 is selected from one of the following radicals: zidovudine, amprenavir or an acyclic phosphonate chain, as shown below. This invention also relates to the use and treatment method using the Formulae I, II and III compounds. According to this invention, these compounds are also used for the treatment of infections caused by HBV or co-infection caused by HIV and HBV.	A61P; C07D; C07F.
5	BR1020180115502	INPI	FORMULAÇÃO FARMACÊUTICA, PROCESSOS DE PRODUÇÃO DE UMA FORMULAÇÃO FARMACÊUTICA, MÉTODOS DE TRATAMENTO, E, USO DE UMA FORMULAÇÃO FARMACÊUTICA	RAQUEL ELISA DA SILVA LÓPEZ; ELIZABETH GOMES SANCHES; RAYANE NATASHE GONÇALVES.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção refere-se, de forma geral, a formulações farmacêuticas que compreendem, como insumo farmacêutico ativo vegetal (IFAV), o extrato aquoso de Crotalaria spectabilis e excipientes farmaceuticamente aceitáveis. A presente invenção ainda provê processos de produção das referidas formulações, métodos de tratamento e uso das mesmas. As formulações da presente invenção são baseadas na atividade de inibidores enzimáticos (proteínas), constituindo uma inovadora alternativa terapêutica no controle das leishmanioses cutâneas e como tratamento coadjuvante da esporotricose	A61K; A61P.
6	BR1020180673394	INPI	MÉTODO PARA DETECTAR ANTICORPOS CONTRA LEISHMANIA EM UMA AMOSTRA BIOLÓGICA CANINA, KIT PARA DETECÇÃO DE INFECÇÃO POR LEISHMANIA EM UMA AMOSTRA BIOLÓGICA, E USO DE LIPOFOSFOGLICANO DE LEISHMANIA	RODRIGO PEDRO PINTO SOARES; RICARDO WAGNER DIAS PORTELA; STELLA MARIA BARROUIN MELO; GABRIELA PORFÍRIO PASSOS; THIAGO ASSIS DORIA BARRAL.	FUNDAÇÃO OSWALDO CRUZ	Leishmaniose visceral é uma das doenças mais negligenciadas no mundo e acomete humanos e outros mamíferos. Os cães constituem o principal elo doméstico da leishmaniose visceral, sendo considerado a principal fonte de infecção para vetores. Há necessidade de diagnosticar corretamente os animais doentes com e sem manifestação clínica (assintomáticos). São providos métodos e kits para detectar leishmaniose visceral canina com alta sensibilidade e especificidade, inclusive em animais aparentemente sadios e sem manifestações clínicas, usando lipofosfoglicanos isolados de L. infantum. O método desenvolvido apresenta sensibilidade de 91,7%, especificidade de 98,5%, acurácia de 99,7%, com capacidade de discriminar adequadamente soros de cães infectados doentes daqueles parasitados e clinicamente saudáveis, e com baixo índice de reatividade cruzada quando foram testadas amostras de cães infectados com outros agentes infecciosos.	G01N; A61K; A61P.

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent Office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
7	BR1020180695983	INPI	FORMULAÇÃO LIPOSSOMAL, COMPOSIÇÃO FARMACÊUTICA, USO DE UMA FORMULAÇÃO LIPOSSOMAL, MÉTODO PARA TRATAMENTO DE CÂNCER, E, PROCESSO PARA PREPARAÇÃO DE UMA FORMULAÇÃO LIPOSSOMAL	MARIA ANTONIETA FERRARA; JONAS PERALES; SURZA LÚCIA GONÇALVES DA ROCHA; LUCIANA FACCHINETTI DE CASTRO GIRÃO; ELBA PINTO DA SILVA BOM; MARIA LUÍSA TEIXEIRA DE AZEVEDO CORVO; MANUELA COLLA CARVALHEIRO; MARIA BÁRBARA DOS ANJOS FIGUEIRA MARTINS.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção refere-se a formulações lipossomais compreendendo enzimas com atividade asparaginase ligadas covalentemente às extremidades de moléculas de polietileno glicol expostas na superfície de lipossomos. As formulações lipossomais aqui descritas são úteis no tratamento de câncer, particularmente leucemias.	A61K; A61P.
8	BR1020180132385	INPI	MÉTODO PARA DETECTAR ANTICORPOS CONTRA SCHISTOSOMA, KIT PARA DETECÇÃO DE INFECÇÃO POR SCHISTOSOMA EM UMA AMOSTRA BIOLÓGICA, E, USO DE UM ANTÍGENO DE SCHISTOSOMA	CRISTINA TOSCANO FONSECA; GARDÊNIA BRAZ FIGUEIREDO DE CARVALHO; JERONIMO CONCEIÇÃO RUIZ; DANIELA DE MELO RESENDE.	FUNDAÇÃO OSWALDO CRUZ	A esquistossomose continua sendo uma das infecções parasitárias mais prevalentes no mundo, e para o controle e monitoramento efetivo dessa doença é essencial que se disponha de métodos diagnósticos cada vez mais acurados. Um antígeno de S. mansoni foi selecionado in silico para utilização no diagnóstico sorológico da esquistossomose e no controle de cura da doença póstratamento. O método diagnóstico desenvolvido foi capaz de diferenciar indivíduos infectados de áreas endêmicas, de indivíduos negativos de área endêmica e doadores saudáveis não residentes de área endêmica. Além disso, também foi capaz de diferenciar soro de indivíduos infectados de área endêmica, de soro de indivíduos infectados 30 e 180 dias após tratamento, o que poderia ser utilizado para controle de cura, com especificidade de 100% e sensibilidade de 96,15%.	G01N; C07K.
9	US 11230574	USPTO	Heterologous expression cassette, DNA construct and vaccine composition to immunize against flavivirus and/or other pathogens	Bonaldo, Myrna Cristina; Lima, Noemia Santana	FUNDACAO OSWALDO CRUZ	A heterologous expression cassette, DNA construct and vaccine composition for immunization against flavivirus and/or other pathogens. DNA constructs, recombinant viruses and vaccine compositions containing the recombinant viruses were obtained. This invention also concerns and provide an improved expression vector of the live-attenuated yellow fever 17D virus. Modifications in the expression cassette of heterologous proteins in the intergenic E/NS1 region of the yellow fever 17D vaccine virus, were made. The two new functional domains inserted in the expression cassette were (1) a coding sequence for the N-glycosylation motif, located between the NS1 N-terminal motif and the heterologous protein and (2) a sequence which promoted the proteolytic cleavage, or not, of the recombinant protein in such a way as to release it from its C-terminal containing the transmembrane domains and, consequently, from its association with the membrane of the endoplasmatic reticulum—ER.	A61K; C07K; C12N;
10	EP 3498850	EPO	HETEROLOGOUS EXPRESSION CASSETTE, DNA CONSTRUCT AND VACCINE COMPOSITION FOR IMMUNIZING AGAINST FLAVIVIRUS AND/OR OTHER PATHOGENS	BONALDO, Myrna, Cristina; LIMA, Noemia, Santana.	FUNDACAO OSWALDO CRUZ	The present invention concerns DNA constructs, recombinant viruses and vaccine compositions containing the recombinant viruses obtained. This invention also concerns an improvement of an expression vector of the live-attenuated yellow fever 17D virus. The present invention provides for the introduction of modifications in the expression cassette of heterologous proteins in the intergenic E/NS1 region of the yellow fever 17D vaccine virus. The two new functional domains inserted in the expression cassette were (1) a coding sequence for the N-glycosylation motif, located between the NS1 N-terminal motif and the heterologous protein and (2) a sequence which promoted the proteolytic cleavage, or not, of the recombinant protein in such a way as to release it from its C-terminal containing the transmembrane domains and, consequently, from its association with the membrane of the endoplasmatic reticulum – ER.	A61K; C12N.
11	BR1120190135316	INPI	: COMBINAÇÃO, COMPOSIÇÃO FARMACÊUTICA, MEDICAMENTO, MÉTODO PARA TRATAR LEISHMANIOSE, E, USO DA COMPOSIÇÃO.	JOÃO RAFAEL VALENTIM SILVA; ROBERTO NICOLETE; ANDREIMAR MARTINS SOARES; LEONARDO DE AZEVEDO CALDERON	FUNDAÇÃO OSWALDO CRUZ	A presente invenção refere-se de forma geral à combinação entre Crotamina e fármacos utilizados na terapia. Mais especificamente, a presente invenção refere-se à combinação de Crotamina, toxina da serpente Crotalus durissus terrificus, a fármacos utilizados na terapia antileishmania clássica. A presente invenção ainda provê uma composição farmacêutica, um medicamento, método para tratar leishmaniose e uso da composição. A referida toxina atua como um nanopeptídeo com interação com o DNA humano, apresentando penetração celular, endereçando os fármacos, especificamente Anfotericina B, Pentamidina, ou Glucantime®, para o interior de macrófagos infectados com a finalidade de melhorar a eficácia farmacológica, bem como reduzir os efeitos colaterais e adversos dos mesmos no tratamento das Leishmanioses, particularmente a Leishmaniose Tegumentar Americana, especificamente, causada pela espécie L. amazonensis, responsável pela doença na forma cutânea difusa.	A61K

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent Office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
12	BR1020190061324	INPI	OLIGONUCLEOTÍDEOS, CONJUNTO DE OLIGONUCLEOTÍDEOS, MÉTODOS PARA IDENTIFICAÇÃO DA INFECÇÃO POR PLASMODIUM E DISCRIMINAÇÃO DE INFECÇÃO POR PLASMODIUM SIMIUM E PARA DETECÇÃO EM LARGA ESCALA E QUANTIFICAÇÃO DA PARASITEMIA POR PLASMODIUM SIMIUM E PLASMODIUM VIVAX, KITS PARA DIAGNÓSTICO DA INFECÇÃO POR PLASMODIUM E DISCRIMINAÇÃO DE INFECÇÃO POR PLASMODIUM SIMIUM, E, SONDAS.	CRISTIANA FERREIRA ALVES BRITO; DENISE ANETE MADUREIRA DE ALVARENGA; CLAUDIO TADEU DANIEL-RIBEIRO; ANIELLE DE PINA COSTA; PATRÍCIA BRASIL; RICARDO LOURENÇO DE OLIVEIRA; RICHARD CULLETON; ZELINDA MARIA BRAGA HIRANO; JULIO CESAR DE SOUZA JUNIOR	FUNDAÇÃO OSWALDO CRUZ	A presente invenção provê um método de Nested-PCR/RFLP e outro de PCR em tempo real que permitem a identificação de infecção por Plasmodium e a diferenciação da infecção por Plasmodium simium da infecção por Plasmodium vivax e outras espécies de Plasmodium. Para isto, foram desenvolvidos iniciadores utilizados para amplificar regiões particulares do genoma mitocondrial do parasito e utilização de enzima de restrição para discriminação da infecção por P.simium ou uso de sondas para detecção em larga escala da infecção de Plasmodium simium e Plasmodium vivax por PCR em tempo real e possível quantificação da parasitemia.	C12Q
13	BR1020190185570	INPI	COMPOSTO DERIVADO DE QUINOLINA, USO DE UM COMPOSTO, COMPOSIÇÃO, E, MÉTODO PARA O TRATAMENTO OU PROFILAXIA DE UMA CONDIÇÃO CAUSADA POR UM PARASITO DO SANGUE	ANTONIANA URSINE KRETTLI; ANNA CAROLINE CAMPOS AGUIAR; MARIO ROBERTO MENEGHETTI; WILIAN AUGUSTO CORTOPASSI COELHO; ANDRÉ SILVA PIMENTEL.	FUNDAÇÃO OSWALDO CRUZ	Apesar dos esforços recentes para erradicar a malária no mundo, esta doença parasitária ainda é considerada um grande problema de saúde pública, com um total de 219 milhões de casos de malária e 435.000 mortes em 2017 Após uma década de uso, no entanto, a resistência à CQ emergiu em alguns locais, incluindo no sudeste da Ásia, América do Sul e a região do Pacífico Ocidental, espalhando-se progressivamente por áreas endêmicas de malária, incluindo a África, onde aumentos na mortalidade por malária foram observados. Isso levou, nos últimos anos, à adoção de terapias combinadas à base de artemisinina. Terapias combinadas à base de artemisinina permanecem eficazes na maioria das partes o mundo, mas casos recentes de resistência no Sudeste Asiático exigem novas abordagens e sobretudo novos medicamentos para tratar a malária. Assim, a presente invenção apresenta análogos de CQ de Fórmula (I) que exibiram alta atividade contra parasitos sanguíneos sensíveis e resistentes à CQ e que também foram ativos em camundongos. A presente invenção também provê composições farmacêuticas compreendendo os compostos de Fórmula (I), uso dos referidos (...).	C07D; A61K.
14	BR1020190277114	INPI	MÉTODO PARA DETECTAR VÍRUS ZIKA E KIT	LINDOMAR JOSÉ PENA; SEVERINO JEFFERSON RIBEIRO DA SILVA	FUNDAÇÃO OSWALDO CRUZ	A presente invenção fornece um método para detectar o vírus da zika (ZIKV) em amostras de vetores ou de pacientes utilizando a técnica de Transcrição Reversa sucedida por Amplificação Isotérmica Mediada por Circuito associada a (RT-LAMP). O método é conduzido em única etapa de manipulação, sem a necessidade de extração de RNA da amostra teste, conforme é padrão no estado da arte. A invenção também fornece um kit para a realização do referido método.	C12Q; C12R.
15	BR1020200099116	INPI	MÉTODO PARA DIAGNÓSTICO OU PROGNÓSTICO DE INFECÇÃO POR HTLV-1 E/OU HTLV-2, E, KIT PARA DIAGNÓSTICO DE INFECÇÃO POR HTLV-1 E/OU HTLV-2 POR CITOMETRIA DE FLUXO.	OLINDO ASSIS MARTINS-FILHO; ANDREA TEIXEIRA DE CARVALHO; VANESSA PERUHYPE MAGALHÃES PASCOAL; KELLY ALVES BICALHO CARVALHO; BRUNO CAETANO TRINDADE; LUCIENE PIMENTA DE PAIVA; JORDANA GRAZZIELA ALVES COELHO DOS REIS; LUIZ CARLOS JÚNIOR ALCÂNTARA; JÚLIA PEREIRA MARTINS; ANNA BÁRBARA DE FREITAS CARNEIRO PROIETTI; ESTER CERDEIRA SABINO.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção se refere a um método para diagnóstico ou prognóstico de infecção por HTLV 1 e/ou HTLV2, que consiste em (1) coletar amostras de soro de pacientes; (2) preparar células MT-2 e MoT para fixação e permeabilização celular e posteriormente marcar células MT-2 e MoT; (3) misturar soros de indivíduos humanos e preparação de células MT-2 e MoT, com posterior incubação da mistura e lavagem; (4) adicionar anticorpo anti-IgG1 biotinilado e SAPE, com posterior incubação da mistura e lavagem; (5) aplicar as amostras em citômetro de fluxo; (6) analisar perfil de reatividade de anticorpos IgG1 anti-HTLV-1/2; e (7) avaliar por meio de um algoritmo sincrônico ou assincrônico se há ou não infecção por HTLV 1 e/ou HTLV2. A presente invenção se refere ainda a um kit para diagnóstico de infecção por HTLV 1 e/ou HTLV2 por citometria de fluxo que compreende células linfocíticas em suspensão fixadas e marcadas, infectadas por HTLV-1 (MT-2) e por HTLV-2 (MoT); reagente contendo anticorpos anti-IgG1 humano biotinilado; amostra de soro de indivíduos humanos não infectados, como controle negativo; amostra de (…)	G01N; C12N.

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent Office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
16	BR1020200228242	INPI	COMPOSIÇÃO, COMPOSIÇÃO FARMACÊUTICA, USO DE UMA COMPOSIÇÃO TÓPICA ESTÁVEL COMPREENDENDO UMA NANOEMULSÃO, E DE PELO MENOS UM COMPOSTO ANTILEISHMANIAL, E, MÉTODO PARA O TRATAMENTO DE LEISHMANIOSE CUTÂNEA	ANA LÚCIA TELES RABELLO; JORGE CARLOS SANTOS DA COSTA; DINALVA BRITO DE QUEIROZ.	FUNDAÇÃO OSWALDO CRUZ	Os medicamentos disponíveis para o tratamento da leishmaniose cutânea apresentam eficácia insatisfatória, efeitos adversos frequentes e graves e requerem longos esquemas terapêuticos. Assim, a busca por novas alternativas de tratamento para a leishmaniose cutânea é considerada prioritária pela Organização Mundial da Saúde. A administração parenteral de antimoniais pentavalentes para o tratamento de todas as formas de leishmaniose, incluindo a leishmaniose cutânea, apresenta várias limitações. A terapia é longa, exigindo doses repetidas e as reações adversas são frequentes. O tratamento tópico é uma alternativa atraente para a leishmaniose cutânea, oferecendo vantagens significativas sobre a terapia sistêmica: menos efeitos adversos, facilidade de administração e custos mais baixos. Os presentes inventores tiveram como objetivo prover uma composição tópica em dose fixa, contendo pelo menos um composto antileishmanial, provendo a absorção adequada do princípio ativo. Um outro objetivo da presente invenção é prover uma formulação tópica, em dose fixa, contendo uma combinação de compostos antileishmaniais que possua eficácia e segurança suficientes para ser utilizada no tratamento da leishmaniose cutânea.	A61K
17	BR1020200168908	INPI	: PROTEINA, POLINUCLEOTÍDEO, VETOR, CÉLULA HOSPEDEIRA, COMPOSIÇÃO, MÉTODO PARA TRATAR UMA DOENÇA, MÉTODO IN VITRO PARA PROGNOSTICAR ESCLEROSE MÚLTIPLA, E, USO DE UMA PROTEÍNA OU COMPOSIÇÃO	VINICIUS COTTA DE ALMEIDA; BEATRIZ CHAVES; CAROLINA LESSA AQUINO; JOÃO HERMÍNIO MARTINS DA SILVA; MARCOS ALBERTO MEDEIROS; WILSON SAVINO; INGO RIEDERER	FUNDAÇÃO OSWALDO CRUZ	A presente invenção se refere a uma proteína do tipo scFv em que a dita proteína compreende uma primeira cadeia de polipeptídeos e uma segunda cadeia de polipeptídeos unidas por um ligante, apresentando a fórmula como segue: (domínio VH) - (ligante) - (domínio VL). A presente invenção ainda se refere a um polinucleotídeo compreendendo a sequência de nucleotídeos apresentada na SEQ ID NO: 1; a um vetor compreendendo o polinucleotídeo como anteriormente definido; à célula hospedeira compreendendo o vetor como anteriormente definido; e à composição compreendendo a proteína anteriormente mencionada e um excipiente farmaceuticamente aceitável. A presente invenção se refere ainda a um método para tratar uma doença ou condição que resulta direta ou indiretamente da atividade da integrina a4ß1. A presente invenção se refere ainda a um método in vitro para prognosticar esclerose múltipla. A presente invenção se refere ainda ao uso da proteína ou da composição anteriormente definidas na fabricação de um medicamento para o tratamento de esclerose múltipla.	C07K; A61K; C12N.
18	BR1020200166620	INPI	: DISPOSITIVO PORTÁTIL, MÉTODO DE LEITURA PARA DETECÇÃO MOLECULAR AUTOMATIZADA DE PATÓGENOS POR LAMP, CONTROLADO POR APLICATIVO DE SMARTPHONE E SEUS USOS	RUBENS LIMA DO MONTE NETO; HÉRCULES PEREIRA NEVES; PEDRO AUGUSTO ALVES; HENRIQUE RESENDE MARTINS; BRUNO SILVEIRA AVELAR; ÂNGELO ESUTÁQUIO ZANDONA FREITAS; DENILSON LAUDARES RODRIGUES	FUNDAÇÃO OSWALDO CRUZ	A presente invenção provê um dispositivo de ensaios LAMP que promove a amplificação isotérmica de RNA/DNA aplicada a identificação de patógenos, compreendendo: uma câmara de ensaios (1) LAMP; um gabinete (4) de eletrônica, um meio de alimentação de energia (7); e uma tampa superior (2) para fechar a câmara de ensaios (1) LAMP, em que internamente o dispositivo compreende: um termobloco (8) cilíndrico metálico compreendendo aberturas (80) para posicionar microtubos (81); uma placa de controle com processamento central (14); uma placa eletrônica de potência (13); pelo menos um elemento aquecedor (10) em contato com o termobloco (8) e adaptado para aquecer o termobloco (8) por indução; um sensor de temperatura (9) adaptado para medir a temperatura do termobloco (8); uma pluralidade de LEDs RGB (12) posicionados inferiormente ao termobloco (8) e adaptados para excitar cada microtubo posicionado no termobloco (8); e uma câmera (11) posicionada inferiormente ao termobloco (8) e adaptada para captar imagens de cada um dos microtubos (81) posicionados no termobloco (8). Em adição a invenção provê um método para de identificação de patógenos a partir de um dispositivo de ensaios LAMP.	G01N
19	PCT/BR2021/050230 WO2022032364	WIPO	LAMP TESTING DEVICE AND METHOD USING ISOTHERMAL AMPLIFICATION OF RNA/DNA TO IDENTIFY PATHOGENS	NETO, Rubens; ALVES, Pedro; NEVES, Hércules; MARTINS, Henrique; AVELAR, Bruno; FREITAS, Ângelo; RODRIGUES, Denilson	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to a LAMP testing device using isothermal amplification of RNA/DNA to identify pathogens, comprising: a LAMP testing chamber (1); an electronics cabinet (4), power supply means (7); and a top cover (2) for closing the LAMP testing chamber (1), the device containing: a cylindrical metal dry block (8) with apertures (80) used to position microtubes (81); a control panel with central processing (14); an electronic power board (13); at least one heating element (10) which is in contact with the dry block (8) and is designed to heat the dry block (8) by induction; a temperature sensor (9) designed to measure the temperature of the dry block (8); a plurality of RGB LEDs (12) that are positioned beneath the dry block (8) and are designed to excite each microtube positioned inside the dry block (8); and a chamber (11) that is positioned beneath the dry block (8) and designed to capture images of each of the microtubes (81) positioned in the dry block (8). The invention also relates to a method for identifying pathogens using a LAMP testing device.	B01L; C12Q; G01N.

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
20	BR1020200195085	INPI	USO DE HEXAMETOXILOBELANINA, COMPOSIÇÃO FARMACÊUTICA, USO DA COMPOSIÇÃO FARMACÊUTICA E MÉTODO DE TRATAMENTO	LEONARDO DE AZEVEDO CALDERON; CAROLINA BIONI GARCIA TELES; ANA PAULA DE AZEVEDO DOS SANTOS; SAARA NERI FIALHO.	FUNDAÇÃO OSWALDO CRUZ	A invenção descreve a aplicação terapêutica do composto 3,3',4,4',5,5'- Hexametoxilobelanina no tratamento de leishmanioses. Composições farmacêuticas compreendendo 3,3',4,4',5,5'-Hexametoxilobelanina e uso destas também estão contemplados.	C07D; A61K; A61P.
21	PCT/BR2021/050307 WO2022061429	WIPO	USE OF HEXAMETHOXYLOBELANINE, PHARMACEUTICAL COMPOSITION, USE OF THE PHARMACEUTICAL COMPOSITION AND TREATMENT METHOD	CALDERON, Leonardo; TELES, Carolina; DOS SANTOS, Ana Paula; FIALHO, Saara	FUNDAÇÃO OSWALDO CRUZ	The invention describes the therapeutic use of the compound 3,3',4,4',5,5'-hexamethoxylobelanine for treating leishmaniasis. Pharmaceutical compositions comprising 3,3',4,4',5,5'-hexamethoxylobelanine and use thereof are also contemplated.	A61K; A61P; C07D.
22	BR1020200239813	INPI	MÉTODO DE DIAGNÓSTICO EM UMA AMOSTRA BIOLÓGICA, KIT DE DIAGNÓSTICO EM UMA AMOSTRA BIOLÓGICA E OLIGONUCLEOTÍDEO	DANIEL MOREIRA DE AVELAR; ARTHUR RIBEIRO CHELONI SOARES; VERÔNICA CARDOSO SANTOS DE FARIA.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção provê um método de diagnóstico, mais especificamente diagnóstico de Leishmaniose com base em ensaios LAMP. Adicionalmente, a invenção provê kit de diagnóstico em uma amostra biológica e oligonucleotídeos para uso no referido método.	C12Q; C12R; A61P.
23	PCT/BR2021/050368 WO2022109690	WIPO	METHOD OF DIAGNOSIS IN A BIOLOGICAL SAMPLE, KIT FOR DIAGNOSIS IN A BIOLOGICAL SAMPLE AND OLIGONUCLEOTIDE	AVELAR, Daniel; SOARES, Arthur; FARIA, Verônica	FUNDAÇÃO OSWALDO CRUZ	The present invention provides a method of diagnosis, more specifically a method of diagnosis of Leishmaniasis based on LAMP assays. Furthermore, the invention provides a kit for diagnosis in a biological sample and oligonucleotides for use in said method.	C12Q.
24	BR1020200265253	INPI	DERIVADOS FTALIMÍDICOS-TRIAZÓLICOS ÚTEIS NO TRATAMENTO DE LEISHMANIOSE, COMPOSIÇÃO FARMACÊUTICA, USO DA COMPOSIÇÃO FARMACÊUTICA E MÉTODO DE TRATAMENTO DE LEISHMANIOSE	REGINA CELIA BRESSAN QUEIROZ DE FIGUEIREDO; WELSON VICENTE DA SILVA; VANDERLAN NOGUEIRA HOLANDA; VERA LÚCIA DE MENEZES LIMA; RONALDO NASCIMENTO DE OLIVEIRA.	FUNDAÇÃO OSWALDO CRUZ	A invenção descreve a aplicação terapêutica do composto da fórmula FT1 ou FT2 ou um sal farmaceuticamente aceitável do mesmo, no tratamento de leishmaniose. Composições farmacêuticas compreendendo os referidos compostos ou um sal farmaceuticamente aceitável do mesmo, e uso destas são também contempladas no presente pedido.	C07D; A61K; A61P.
25	EP 3929210	EPO	CHIMERIC PROTEIN, METHOD OF PRODUCTION AND USE THEREOF, AND ALSO A NUCLEIC ACID MOLECULE, EXPRESSION CASSETTE, EXPRESSION VECTOR, HOST CELL, COMPOSITION FOR THE DIAGNOSIS OF LEISHMANIASIS, KIT FOR THE DIAGNOSIS OF LEISHMANIASIS AND METHOD OF DIAGNOSIS OF LEISHMANIASIS IN VITRO	NETO, Osvaldo, Pompílio, de Melo; REZENDE, Antonio, Mauro; TAVARES, Diego, de Hollanda, Cavalcanti; DOS SANTOS, Wagner, José, Tenório; NETO, Artur, Leonel, de Castro; MAGALHÃES, Franklin, Barbalho; DO NASCIMENTO, Marília, Barbosa	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to chimeric proteins, their uses and production method comprising native protein fractions from Leishmania infantum for the Visceral Leishmaniasis diagnosis. The invention also relates to nucleic acid, expression cassette, expression vector, host cell, visceral leishmaniasis diagnostic kit, visceral leishmaniasis diagnostic kit, visceral leishmaniasis diagnostic method, and vaccine composition.	A61K; C07K; C12N; G01N.
26	CN 113784975	CNIPA China EspaceNet	CHIMERIC PROTEIN, METHOD OF PRODUCTION AND USE THEREOF, AND ALSO A NUCLEIC ACID MOLECULE, EXPRESSION CASSETTE, EXPRESSION VECTOR, HOST CELL, COMPOSITION FOR THE DIAGNOSIS OF LEISHMANIASIS, KIT FOR THE DIAGNOSIS OF LEISHMANIASIS AND METHOD OF DIAGNOSIS OF LEISHMANIASIS IN VITRO	O·P·D·M·内托; A·M·雷森德; D·D·H·C·塔瓦雷斯; W·J·T·多斯桑托斯; A·L·D·C·内托; F·B·马加莱斯; M·B·多·纳西门托; NETO OSVALDO; REZENDE ANTONIO M; TAVARES DIEGO; DOS SANTOS WAGNER; NETO ARTUR; MAGALHAES FRANKLIN B; DO NASCIMENTO MARILIA	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to chimeric proteins, and the uses and method of production thereof, comprising protein fractions native to Leishmania infantum for the diagnosis of visceral leishmaniasis. The invention also relates to the nucleic acid, expression cassette, expression vector, host cell, composition for the diagnosis of visceral leishmaniasis, kit for the diagnosis of visceral leishmaniasis, method of diagnosis of visceral leishmaniasis and vaccine composition.	A61K; C07K; C12N; G01N.

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
27	BR1020210007940	INPI	PROTEÍNA QUIMÉRICA, KIT, MÉTODO PARA DIAGNÓSTICO DE LEISHMANIOSE, USO DE UMA PROTEÍNA QUIMÉRICA, COMPOSIÇÃO VACINAL CONTRA LEISHMANIOSE VISCERAL, E, USO DE UMA COMPOSIÇÃO VACINAL	ANA PAULA SALLES MOURA FERNANDES; RICARDO TOSTES GAZZINELLI; NATÁLIA SALAZAR DE CASTRO; SANTUZA MARIA RIBEIRO TEIXEIRA; ANNA RAQUEL RIBEIRO SANTOS; LARA CARVALHO GODOI; MARIA MARTA FIGUEIREDO; BIANCA DE OLIVEIRA	FUNDAÇÃO OSWALDO CRUZ	A presente invenção refere-se ao campo da medicina diagnóstica, vacinologia e da biotecnologia. Mais especificamente, a presente invenção refere-se a uma proteína quimérica para aplicação diagnóstica de leishmaniose visceral em seres humanos e cães, incluindo indivíduos coinfectados pelo vírus da imunodeficiência humana (HIV) e uma vacina contendo a referida proteína quimérica para uso profilático ou terapêutico.	C07K; G01N; A61K.
28	PCT/BR2022/050013 WO2022150899	WIPO	CHIMERIC PROTEIN, KIT, METHOD OF DIAGNOSIS OF LEISHMANIASIS, USE OF A CHIMERIC PROTEIN, VACCINE COMPOSITION AGAINST VISCERAL LEISHMANIASIS AND USE OF A VACCINE COMPOSITION	FERNANDES, Ana; GAZZINELLI, Ricardo; CASTRO, Natália; TEIXEIRA, Santuza; SANTOS, Anna; GODOI, Lara; FIGUEIREDO, Maria; OLIVEIRA, Bianca	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to the field of diagnostic medicine, vaccinology and biotechnology. More specifically, the present invention relates to a chimeric protein for use in diagnosing visceral leishmaniasis in humans and dogs, including individuals coinfected with the human immunodeficiency virus (HIV) and a vaccine containing said chimeric protein for prophylactic or therapeutic use.	A61K; A61P; C07K; G01N.
29	PCT/BR2021/050487 WO2022094685	WIPO	COMPOSITION, PHARMACEUTICAL COMPOSITION, USE OF A STABLE TOPICAL COMPOSITION COMPRISING A NANOEMULSION AND OF AT LEAST ONE ANTILEISHMANIAL COMPOUND, AND METHOD FOR THE TREATMENT OF CUTANEOUS LEISHMANIASIS	RABELLO, Ana; COSTA, Jorge; QUEIROZ, Dinalva; TEIXEIRA, Eliane	FUNDAÇÃO OSWALDO CRUZ	The drugs available for treating cutaneous leishmaniasis have unsatisfactory effectiveness, frequent and serious side effects, and require long treatment plans. The search for novel treatment options for cutaneous leishmaniasis is therefore considered to be a priority by the World Health Organisation. The parenteral administration of pentavalent antimonials for treating all forms of leishmaniasis, including cutaneous leishmaniasis, has several limitations. Treatment takes a long time, requiring repeat doses, and side effects are frequent. Topical treatment is an attractive option for cutaneous leishmaniasis, offering significant advantages over systemic therapy: fewer side effects, easy administration, and lower costs. The aim of the present inventors was to provide a topical fixed-dose composition containing at least one antileishmanial compound and providing suitable absorption of the active principle. Another aim of the present invention is to provide a topical fixed-dose formulation that contains a combination of antileishmanial compounds and is sufficiently effective and safe for use in treating cutaneous leishmaniasis.	A61K; A61P.
30	PCT/BR2021/050226 WO2022036422	WIPO	PROTEIN, POLYNUCLEOTIDE, VECTOR, HOST CELL, COMPOSITION, METHOD FOR TREATING AN ILLNESS, IN-VITRO METHOD FOR PREDICTING MULTIPLE SCLEROSIS, AND USE OF A PROTEIN OR COMPOSITION	ALMEIDA, Vinicius; CHAVES, Beatriz; AQUINO, Carolina; DA SILVA, João; MEDEIROS, Marcos Alberto; SAVINO, Wilson; RIEDERER, Ingo	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to an scFv protein, in which said protein includes a first chain of polypeptides and a second chain of polypeptides joined by a binder, having the following formula: (VH domain) – (binder) – (VL domain). The present invention also relates to a polynucleotide comprising the nucleotide sequence shown in SEQ ID NO: 1; to a vector including the polynucleotide as defined previously; to the host cell including the vector as defined previously; and to the composition including the aforementioned protein and a pharmaceutically acceptable excipient. The present invention also relates to a method for treating an illness or condition resulting directly or indirectly from the activity of the integrin α4β1. The present invention also relates to an in-vitro method for predicting multiple sclerosis. The present invention also relates to the use of the protein or of the composition defined previously in the manufacture of a drug for treating multiple sclerosis.	A61K; A61P; C07K; C12N; G01N.
31	BR1020210104694	INPI	PROTEÍNA QUIMÉRICA RECOMBINANTE, SEU USO, E, COMPOSIÇÃO	RICARDO TOSTES GAZZINELLI; JÚLIA TEIXEIRA DE CASTRO; CAROLINE FURTADO JUNQUEIRA; SANTUZA MARIA RIBEIRO TEIXEIRA; ANA PAULA SALLES MOURA FERNANDES.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção se trata de uma proteína quimérica recombinantes contendo regiões imunogênicas de TS e ASP-2 e uma composição contendo esta proteína que apresentou potencial vacinal em modelo murino. A invenção compreende ainda o uso de proteína quimérica para fabricação de vacinas.	C07K; A61K; A61P.

Table S1. Qualitative summary of the 35 patents (continued...)

Nº	Patent code/number	Patent office	Title (Original)	Inventors	Assigness	Abstract (Original)	Main IPCs
32	BR1020210088923	INPI	CASSETE DE EXTRAÇÃO DE ÁCIDOS NUCLEICOS, MÉTODO DE DIAGNÓSTICO EM UMA AMOSTRA BIOLÓGICA OBTIDA COM O REFERIDO CASSETE DE EXTRAÇÃO DE RNA, KIT DE DIAGNÓSTICO EM UMA AMOSTRA BIOLÓGICA E MÉTODO DE EXTRAÇÃO DE MATERIAL GENÉTICO	ANDRÉ NÓBREGA PITALUGA; LUÍSA DAMAZIO RONA PITALUGA; LEANDRO DE MEDEIROS SEBASTIÃO; SABRINA FERNANDES CARDOSO; CLÁUDIA TOLEDO DAUDEN.	FUNDAÇÃO OSWALDO CRUZ	A presente invenção está relacionada ao diagnóstico de COVID-19. Nesse cenário, a presente invenção provê um cassete de extração de RNA compreendendo: uma base (1) e uma tampa (2) inferior, o cassete de extração compreendendo, entre a base (1) a tampa (2) inferior, pelo menos uma camada composta por uma matriz porosa/fibrosa absorvente (6) adaptada para obter o RNA viral para amplificação pela técnica de RTLAMP; e uma camada de papel filtro (4), em que o cassete de extração compreende um sistema de travamento entre a base (1) a tampa (2) inferior, em que o sistema de travamento é adaptado para manter a camada composta por uma matriz porosa/fibrosa e a camada de papel filtro (4) pressionadas entre a base (1) e a tampa (2) inferior, em que a base (1) compreende uma abertura central (14) justamente superior à camada de papel filtro (4) e aberturas periféricas (15). Adicionalmente, a invenção também provê método de diagnóstico em uma amostra biológica obtida com o referido cassete de extração de RNA e kit de diagnóstico em uma amostra (...).	C12Q.
33	PCT/BR2022/050149 WO2022232892	WIPO	NUCLEIC ACID EXTRACTION CASSETTE, METHOD OF DIAGNOSIS IN A BIOLOGICAL SAMPLE OBTAINED USING SAID RNA EXTRACTION CASSETTE, KIT FOR DIAGNOSIS IN A BIOLOGICAL SAMPLE AND METHOD OF EXTRACTION OF GENETIC MATERIAL	PITALUGA, André; PITALUGA, Luísa; SEBASTIÃO, Leandro; CARDOSO, Sabrina; DAUDEN, Cláudia	FUNDAÇÃO OSWALDO CRUZ	The present invention relates to the diagnosis of COVID-19. Within this context, the present invention provides an RNA extraction cassette comprising: a base (1) and a bottom lid (2), the extraction cassette comprising, between the base (1) and the bottom lid (2), at least one layer composed of an absorbent porous/fibrous matrix (6) intended for obtaining the viral RNA for amplification using the RT-LAMP technique; and a filter paper layer (4), the extraction cassette comprising a locking system between the base (1) and the bottom lid (2), the locking system being designed to keep the layer composed of a porous/fibrous matrix and the filter paper layer (4) compressed between the base (1) and the bottom lid (2), the base (1) comprising a central opening (14) directly above the filter paper layer (4) and peripheral openings (15). In addition, the invention also provides a method of diagnosis in a biological sample obtained using said RNA extraction cassette and a kit for diagnosis in a biological sample comprising same.	C12Q.
34	BR1120210225927	INPI	COMPOSIÇÃO IMUNOGÊNICA, MÉTODO PARA TRATAR OU PREVENIR MALÁRIA, UMA OU MAIS PROTEÍNAS DERIVADAS DE PLASMÓDIO, PEPTÍDEO OU FRAGMENTO IMUNOGÊNICO DOS MESMOS, E, VETOR	ADRIAN VIVIAN SINTON HILL; PAULO JORGE GONÇALVES DE BETTENCOURT; ALEXANDRA JANE SPENCER; NICOLA MARIA NATHALIE TERNETTE; AHMED MAHMOUD AHMED AHMED SALMAN; CAROLINE FURTADO JUNQUEIRA; RICARDO TOSTES GAZZINELLI; CAMILA RAQUEL RODRIGUES BARBOSA.	FUNDAÇÃO OSWALDO CRUZ; OXFORD UNIVERSITY INNOVATION LIMITED	Uma composição imunogênica compreendendo: a) uma ou mais proteínas ribossomais ou associadas ao ribossomo derivadas de plasmódio ou fragmento imunogênico das mesmas, que tem uma sequência que é pelo menos cerca de 80%, 85%, 90%, 95%, 98%, 99% ou 100% idêntica a uma proteína ribossomal ou associada ao ribossomo ou um fragmento imunogênico de uma proteína ribossomal ou associada ao ribossomo representada na figura 1; ou uma proteína ribossomal ou associada ao ribossomo ou peptídeo ou fragmento imunogênico dos mesmos como representado na figura 2 ou figura 3; e/ou b) um polinucleotídeo que codifica uma ou mais proteínas, peptídeos ou fragmentos imunogênicos de a); em que a composição imunogênica é para uso em desencadear uma resposta imune em um sujeito para tratar ou prevenir malária. São também providas ETRAMPs e/ou histonas derivadas de plasmódio, ou fragmentos imunogênicos das mesmas, para uso em desencadear uma resposta imune em um sujeito, preferivelmente para tratar ou prevenir malária.	A61K.
35	EP 3965809	EPO	VACCINE IMMUNOGENS	HILL, Adrian Vivian Sinton; BETTENCOURT, Paulo Jorge Gonçalves de; SPENCER, Alexandra Jane; TERNETTE, Nicola Maria Nathalie; SALMAN, Ahmed Mahmoud Ahmed Ahmed; JUNQUEIRA, Caroline Furtado; GAZZINELLI, Ricardo Tostes; BARBOSA, Camila Raquel Rodrigues	FUNDAÇÃO OSWALDO CRUZ	An immunogenic composition comprising: a) one or more plasmodium-derived ribosomal or ribosomal associated protein or immunogenic fragment thereof which has a sequence which is at least about 80%, 85%, 90%, 95%, 98%, 99% or 100% identical to a ribosomal or ribosomal associated protein or an immunogenic fragment of a ribosomal or ribosomal associated protein recited in Figure 1; or a ribosomal or ribosomal associated protein or peptide or immunogenic fragment thereof as recited in Figure 2 or Figure 3; and/or b) a polynucleotide encoding one or more protein, peptide or immunogenic fragment of a); wherein the immunogenic composition is for use in eliciting an immune response in a subject to treat or prevent malaria. Also provided are plasmodium-derived ETRAMPs and/or histones, or immunogenic fragments thereof, for use in eliciting an immune response in a subject, preferably to treat or prevent malaria.	A61K